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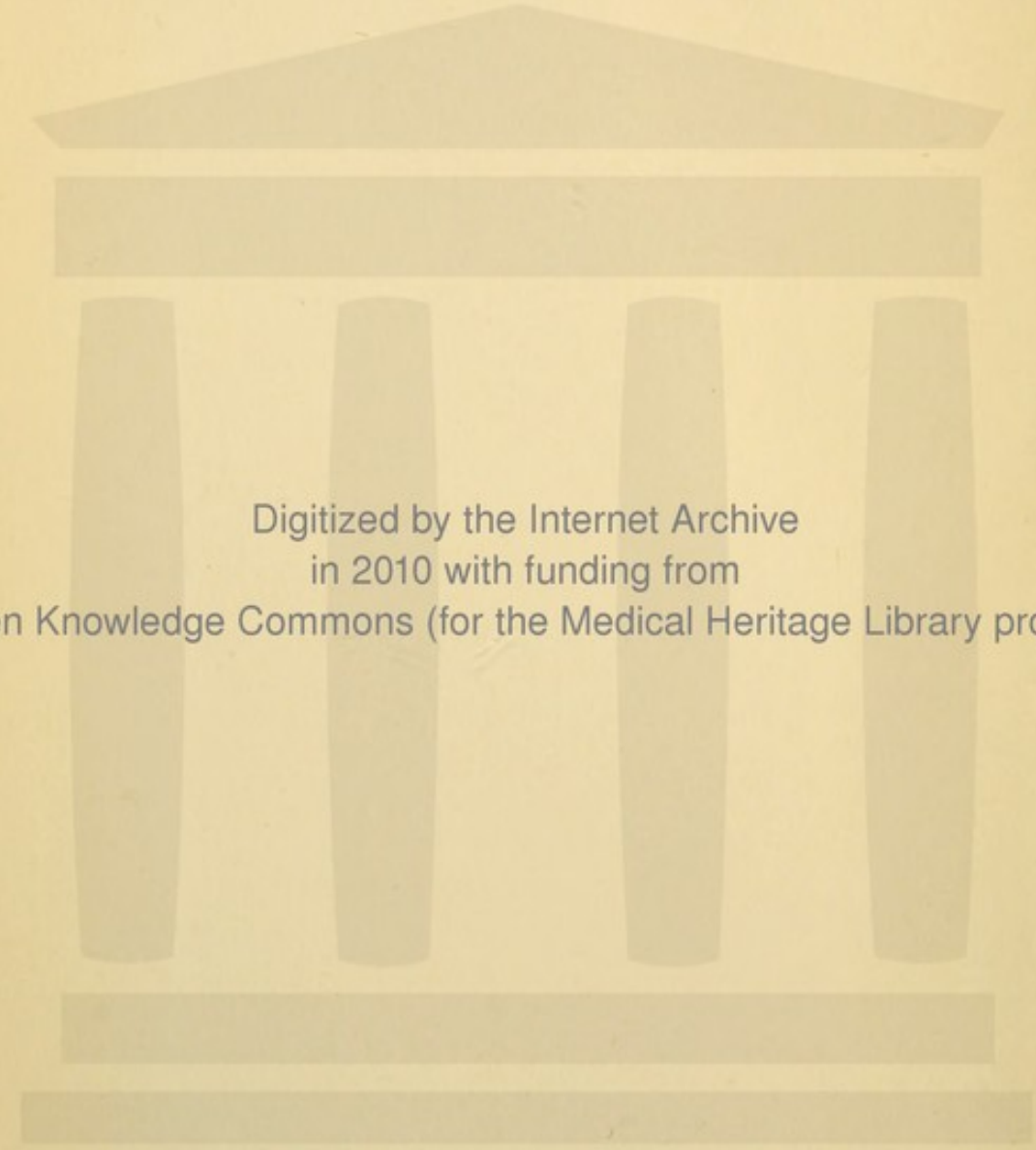

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FATIGUE AND EFFICIENCY

A STUDY IN INDUSTRY

By
JOSEPHINE GOLDMARK
PUBLICATION SECRETARY NATIONAL CONSUMERS' LEAGUE

INTRODUCTION
By Frederic S. Lee, Ph.D.

CONTAINING ALSO THE SUBSTANCE OF FOUR BRIEFS IN DEFENSE OF WOMEN'S LABOR LAWS BY LOUIS D. BRANDEIS AND JOSEPHINE GOLDMARK

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INTRODUCTION

AS I turn from my laboratory to consider in what words I may fittingly introduce Miss Goldmark's admirable book, two thoughts that have often been with me come to me again. The first is, that among the many conditions of human life which may be classed as causes of misery, there is none more potent than the failure of men to live in accordance with physiological laws. Many men fail so to live because of ignorance; many for the reason that even though knowledge be present, desire is defeated by the fact that within their chosen sphere of labor they are not free agents. If this cause of misery is to be removed, there is needed first of all a knowledge of what is physiological.

Like other men of science, the physiologist is too often content to spend his time in seeking, to which is added the occasional greater pleasure of finding. He tells his discoveries to his colleagues in the language common to both, but too often he does not interpret them to the people; and thus he lets the world at large remain in its ignorance and misery. Even more rarely does he venture to instruct those who shape the conditions under which multitudes of the people live. But he gladly welcomes the services of those individuals who understand physiological laws and their bearing upon human life, and are capable of bringing this knowledge convincingly home to those who are most in need of it.

The second thought that comes back to me is this: Industrialism has been quick to accept the achievements of science in inanimate things, but slow to recognize the teachings of physiology with regard to the man himself. Methods and machines have been revolutionized, but the human element has not yet been eliminated. The man or woman or child is still essential to the method and the machine, and while the inanimate agent demands more and more of him, his fundamental physiological powers are probably not so very different from what they were when he built the pyramids and made papyrus. He may sharpen his attention,

shorten his reaction time, and develop manual skill; scientific management may step in and direct his powers more intelligently; but sooner or later his physiological limit is again reached on the new plane. Try as we will we cannot get away from the fact that so long as machines need men, physiological laws must be reckoned with as a factor in industrialism.

These general principles are well illustrated by a consideration of fatigue. Fatigue is a potent physiological state which enters into all human activities. In its normal manifestation it is a warning. If the warning is not heeded, the condition may become pathological, and that is a sign of something serious. This remarkable mechanism of ours, the human body, is capable of meeting enormous demands upon itself—it is long resistant to abuse. But if work is done, rest is ultimately imperative. Work and rest indeed are as close coördinates as are light and darkness. Without the one the other is destruction. Much remains to be discovered of fatigue and rest, and especially as to their relations in industrialism, but enough is already known to make clear that such knowledge ought to be recognized in and applied to the rational industrial procedure of the future. There is nothing more pathetic than to see an employer disregard the laws of physiology, use his helper to the breaking point, and then cast him aside.

Miss Goldmark has performed a helpful task well. She is fortunate in possessing a knowledge both of physiological laws and of the conditions of industrial labor. Her keen vision, her intelligent sympathy, her capacity for critical analysis, and her apt power of expression are effectively united in this book. She has made a powerful plea for the alleviation on rational, scientific grounds of human misery in one sphere of its manifestation, and she deserves the appreciation and gratitude of all who are interested in the promotion of human efficiency.

FREDERIC S. LEE

Columbia University
April 2, 1912

AUTHOR'S PREFACE

ALMOST five years have elapsed since I first undertook, as Chairman of the Committee on the Legal Defense of Labor Laws of the National Consumers' League, to prepare the first of the briefs contained in Part II of this volume.

I have related in Part I, from the lay point of view, a variety of technical matters, physiological, economic, and legal. In the desire to cite concrete particulars in support of all general or abstract statements, much space has been given to illustrations from contemporary industrial life. And since these matters are for the most part still controversial, effort has been made to give, in the footnotes, the confirming documentary authorities. Wherever it has been necessary to choose between public or private research in describing facts, preference has been shown to the reports of government investigation, since they are usually held to be the more impersonal records.

I have endeavored throughout to steer a middle course between the technical and the popular, aiming to pursue the technical arguments only so far as they are essential for serious discussion, without involving the reader in technical intricacies needed only by the specialist.

This was the principle followed also in preparing the material for Part II which was originally contained in various briefs. The initial suggestion so to present the world's experience regarding women's hours of labor, in defense of the first woman's labor law before the United States Supreme Court, came from Mr. Louis D. Brandeis. I have described in Chapter IX his connection with these briefs. They were prepared under his personal direction, and have been used by him in the successful defense of various state laws limiting women's hours of labor. A special fund was raised by the

National Consumers' League to meet the heavy expense of printing briefs of such large compass. They are reprinted here to meet a steady demand for documents in a sense historical, from colleges and libraries, as well as from persons engaged in the more practical business of securing labor legislation. The briefs are reprinted substantially intact, as they were submitted to the courts; for while, taken separately, they contain evidence and opinions of unequal worth, yet their main value consists in precisely the cumulative testimony and the unconscious unanimities of experience revealed.

Thanks are due to many persons for their assistance in collecting the widely scattered material contained in the briefs. The Russell Sage Foundation coöperated with the National Consumers' League, supplying the funds for a small staff of readers, who under my direction covered a literature of wide but uncharted range. I am glad to acknowledge here the valuable assistance of Miss L. L. Dock, R. N., whose technical knowledge enabled her to supply most of the translations from French and German authorities quoted in the briefs. Dr. Ira P. Wile of New York kindly read all of the scientific authorities quoted in the briefs, and gave the benefit of his advice in the choice of such material. For access to the scattered files of European reports, and for other courtesies, I am indebted to several libraries, chief among them the Library of Columbia University, the Library of Congress at Washington, and the Library of the United States Bureau of Labor. To Dr. Zacher, of the German Imperial Insurance Office, I am indebted for material not otherwise easily accessible.

In writing the text of Part I—a task which has been necessarily interrupted by the various cases and legislative work arising within the past four years—I have been constantly aided, in untold ways, by Mr. Brandeis' generous and stimulating counsel, without which this book would not have been undertaken, and for which I am more in his debt than these poor words can express.

I am under great obligations to Dr. Frederic S. Lee, Dalton Professor of Physiology at Columbia University, for

taking time, in the midst of his scientific activities, to read all the proof sheets of my text and to give the benefit of his criticisms in the field of which he is a master.

The manuscript was read also by two other persons—my sister, Pauline Goldmark, and Mrs. Florence Kelley. To both I am indebted for valuable criticism. To Mrs. Kelley I owe gratitude also for years of the most generous association in the work of the National Consumers' League, and for the stimulus of that pure spirit of justice towards all mankind of which she is, as it were, a voice and an embodiment.

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PART I

FATIGUE AND EFFICIENCY

I

INTRODUCTORY

THE aim of this book is to present, as a new basis for labor legislation, the results of the modern study of fatigue. It seeks to show what fatigue is, its nature and effects, and to explain the phenomena of overwork in working people. It draws upon the scientific study of fatigue —one of the most modern inquiries of physiological, chemical, and psychological science—for aid in the practical problem of reducing the long working day in industry.

Such a scientific basis of legislation has been almost wholly absent during the century which has elapsed since the first factory laws were enacted. First for lack of the necessary scientific equipment, and in recent times, for lack of that coördination of knowledge which should apply the teaching of science to the problems of a new industrial order, labor legislation has been deprived of the authoritative sanction which it might have. In this country, at least, the laws of fatigue, verified by years of experiment in the seclusion of the laboratory, have been practically unknown to those who have been most active in preserving for working people a minimum of human leisure.

Yet such scientific authority is precisely what is most needed today for a more rational progress in the future than in the past; something more exact and demonstrable than the appeal to pity, less subject to temporary variations than what the Italian physiologist Treves calls the "illusory profits of long hours." Just because the more cruel, dramatic exploitation of workers is in the main a thing of the past, exact scientific proof is needed of the more subtle injuries of modern industry, its practically illimitable speed and strain. After a hundred years of human experience

throughout the world, it remains true in our own country that the most helpless workers are still, in respect to the length of their working hours, the least protected.

The most recent government investigation of the iron and steel industry in the United States shows* that of the 172,671 employes whose hours of labor were reported in May, 1910, nearly one-half (42.58 per cent) were kept at work seventy-two hours a week or over; that is, at least twelve hours daily on six days of the week. Nearly a quarter of all the workers (20.59 per cent) were kept employed eighty-four or more hours in the week; that is, at least twelve hours each day, including Sundays. In the largest single department in the industry, the blast furnaces, 88 per cent of the 31,321 employes, engaged in both productive and general occupations, were regularly kept at work seven days in the week.

These prodigious and terrible figures concern the work of men. It might reasonably be supposed that the century-long effort to gain legal protection for women and children in industry would have safeguarded them from the bare possibility of such inhuman usage.

But, to mention only random examples, young boys of fourteen years may still be employed all night long in Pennsylvania, West Virginia, and other great glass producing states; girls upon reaching their sixteenth birthday in New York state may be employed twelve hours a day during five days of the week in factories,† and unlimited hours in stores during the season of "rush" before Christmas. The decision of the Illinois Supreme Court in 1910, upholding the constitutionality of the ten-hour law for women employed in factories and laundries, is estimated to have freed from overstrain in Illinois alone more than 30,000 working women who were employed over ten hours a day. Some great manu-

* Report on Conditions of Employment in the Iron and Steel Industry in the United States. Summary of the Wages and Hours of Labor, pp. 36 and 57. Senate Document No. 301, 62nd Congress, 2nd Session, 1912.

† The New York factory law was amended in 1912 so as to prohibit the employment of women more than ten hours in one day or fifty-four hours in one week.

facturing states, such as Alabama and Mississippi in the south, and New Jersey in the north,* set no legal limitation whatsoever upon the hours of women's employment. This is true also of other states, such as Delaware, Kansas, and Iowa, where manufacture is not yet foremost but where thousands of women are working overlong hours in laundries, restaurants, and department stores. Indeed, only 15 states† have enacted laws to check the overwork of women in the exhausting service of the modern department store; and conspicuous by their absence from among these, are states with large commercial centers, such as Maryland,* New York, Ohio, and Rhode Island.

Like most human institutions, factory legislation has been founded on no *a priori* logic. It has been, rather, essentially illogical, the result of half-way measures and opposing forces. During the nineteenth century, while agricultural Europe and America were gradually becoming industrial and the whole face of nature reflected the new order, the history of factory legislation—the state's defense of its workers—has been devious advance and compromise. Self-interest on the one side, self-defense and philanthropy on the other, hampered by prejudices of every sort,—these for the most part have brought about such protection as exists today. Not man's foresight, but the inexorable results of labor long carried on counter to nature's laws, have been on the whole responsible for the meager protection which industrial communities have granted their workers.

In the main, opposition to laws protecting working women and children has come from the unenlightened employer, who has been blind to his own larger interests and who has always seen in every attempt to protect the workers an interference with business and dividends. To this day, it is the shortsighted

* New Jersey, Maryland and Kentucky have enacted ten-hour laws for women as this book goes to press (April, 1912).

† California, Connecticut, Illinois, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Oregon, Pennsylvania, South Carolina, Utah, Washington, and Wisconsin. The New York law applies only to girls up to 21 years.

and narrow-minded spirit of money-making that is the most persistent enemy of measures designed to save the workers from exhaustion and to conserve their working capacities. Work itself is of the essence of life; without it, man's physical as well as his moral nature decays. Regular continuous labor and exertion is as necessary for the worker's health as it is for subsistence, and if legislation regulating the workday had sought to invade legitimate work, it would long ago have defeated its own end. What it does seek is to check and control overwork, to conserve the workers from labor which leaves them spent and worn at thirty-five and forty years, when they should be in their prime.

In most European countries, and in some of our states, legislation has usually been preceded by parliamentary commissions and investigations. The testimony of physicians who have practiced among factory populations, and factory inspectors who have been in daily contact with the workers, furnishes an impressive array of opinions and evidence on the practical effects of the long working day.

Thus, for example, when in the first days of factory legislation, almost a century ago, Sadler's Committee sat and learned what the working children of England were suffering, the most impressive testimony was that of the physicians. Many medical men in turn testified to the hideous overwork menacing the health of England. By 1844 Lord Shaftesbury could maintain in Parliament that, since 1816, 80 surgeons and physicians and three medical commissioners speaking for the medical men of Lancashire, had asserted "the prodigious evil of the system." * Buried in musty volumes on remote library shelves, describing cruelties to children now happily long past, these terrible pages of testimony strike at the outset the keynote of factory legislation: the benefit to health and output, to physical and economic life.

Just seventy-five years later, in another continent, another memorable group of physicians presented what is, perhaps, the most impressive medical testimony of the last

* Hansard's Parliamentary Debates, 3rd Series, March 15, 1844.

quarter century on the subject of overwork. This was in the controversy between the Bell Telephone Company of Toronto, Canada, and their girl employes, concerning a species of industrial strain unknown to the early nineteenth century, typical of almost incredible changes wrought in less than three generations. Twenty-six prominent Toronto physicians and neurologists described the injuries accruing to young women in the exhausting telephone service, and laid down what seemed to them minimum requirements for health and efficiency.*

The testimony of physicians, of which these are the earliest and latest examples, and the long files of factory inspectors' reports, repeat in country after country, in historical sequence, similar experiences: the same enthusiasm for industrial expansion with indiscriminate employment of old and young; the same exploitation, the same suffering, and the same need of protection. Conditions and industrial processes differ, different trades are described, different people discussed, but, unknown to one another, and terrible in their unconscious unanimity, these observers ring the changes upon the common human facts at issue—exhaustion and deterioration following in the wake of the long working day and working night. Workers of many nations pass before one as one reads; men, women, and young children drawn into the industrial whirlpool, as the wave of invention and development strikes their respective countries,—and protection follows slowly after.

Thus, England stood first in industry at the close of the eighteenth century. By the time one generation had grown up under the new régime, the evils of exploitation called irresistibly for some check, and the first general act in protection of working children—feeble precursor of a long sequence—was passed in 1833. France, the next to enter the industrial race, began to legislate for the workers in the late

* Report of the Royal Commission on a Dispute Respecting Hours of Employment, between the Bell Telephone Company of Canada, Ltd., and Operators at Toronto, Ontario. Ottawa, 1907.

forties, Switzerland following in the seventies, Austria, Holland, and Germany in the next two decades, Italy at the close of the century. Similarly in our own country, Massachusetts and the other New England states where the first cotton mills were operated, were the first to find that legislative protection must shield the workers to conserve them.

First the new industry, then exploitation, then the demand for some measure of protection—such is the universal story. Nor is this a chance sequence. It is the relentless record of history, the more impressive for its unconscious testimony to a waste of human effort and experience, in retrospect scarcely credible among a thinking people, yet in our very midst persisting steadily to this day.

II

THE NATURE OF FATIGUE

STRIKING as is the unanimity of the world's industrial experience and the testimony of observers in each country as to the need of more complete protection for the workers, such empirical data furnish, after all, no scientific basis for labor legislation. They are arguments, legitimate presumptions in its favor, not scientific proof.

Yet a scientific ground for such legislation does exist and is available today. The fundamental basis for laws regulating the working hours of men, women, or children in industrial occupations—at the spindle or loom, in machine shops or laundries, behind the counter or in the glass-houses—is the common physiological phenomenon, fatigue, the normal result of all human action. For fatigue is nature's warning signal that the limit of activity is approaching. Exhaustion, or overfatigue, follows when the warning is disregarded and the organism is pushed beyond its limits by further forced exertions.

In this inexorable sequence, subject to countless variations but never failing, we have a broad fundamental basis for the short working day in industry: a physiological necessity inherent in man's structure for allowing an adequate margin of rest. The regulation of working hours is the necessary mechanism to prevent overfatigue or exhaustion, forerunner of countless miseries to individuals and whole nations.

It is precisely in explaining the normal and abnormal aspects of fatigue, its nature, effects, and relation to all human life, that science can give its authoritative sanction to labor legislation. For, during the last century, unknown to those who saw the practical results of overwork in industry and

sought a legal remedy year after year, so often in vain, men of various sciences were studying the same phenomena in the laboratory. The physiologist, chemist, bacteriologist, and psychologist have contributed to the study. The scientific investigations of fatigue in its varied aspects make up a wide and growing literature. In spite of still unverified details, the underlying principles and laws have been agreed upon.

The study of fatigue, as applied to industry, is not an academic nor a remote speculation. It shows why the system of long hours must, physiologically, result in human deterioration and inferior output. It should help, also, to determine what protection is needed in the future for workers under modern conditions of labor, viewing the new conditions and their demand on human energies from the physiological standpoint.

Such a change of front, indeed, from the purely economic to the broadly physiological, is what this study chiefly advocates. Heretofore, the scientifically wellknown principles of fatigue have not been utilized in the protection of the workers, just because they have been unknown to those persons who could have benefited most directly: the legislators who frame the laws, the enlightened employers who need legislation to restrain unscrupulous competitors, the trade unions and philanthropic agencies which have promoted legislation, and the judges whose official sanction of the laws must precede enforcement. To all these, in the main, the contributions of science on the subject have been unknown. To the scientist, on the other hand, the industrial world has been an undiscovered country. Even physicians and students of hygiene are to a large extent unacquainted with the vast speed and complexity of processes to which industrial workers are subjected. They hardly know, for instance, how machinery is additionally speeded each year; how, to cite a single example from the needle trades, the newest power sewing machines run by girl operators carry 12 needles instead of one, or set almost 4000 stitches a minute, each thread and needle to be intently watched for breaking as

the material is guided on its rapid passage. Changes of which this is typical have added to the strain of industry in a progressive ratio, and, obviously, add also to all the elements which make up the worker's fatigue.

1. ONE FACTOR IN FATIGUE: ACCUMULATION OF WASTE PRODUCTS

A brief account of the scientific views of fatigue must be given, before considering their practical application to the problem of overstrain in industry. We must familiarize ourselves with enough of the technical vocabulary and history to understand the scientific conception of fatigue in general, and that of industrial workers in particular.

Physiology teaches that life is a continual change of structure. The structural basis of all tissue, muscular, nervous, connective, etc., is the cell. The life of the tissue consists in chemical combination of the protoplasm or substance of the tissue cells with the nutritive materials derived from food stuffs and the oxygen of the air. The distinctive property of the cell—that indeed which makes it living—is its power of taking to itself and converting to its own substance materials that are not living. This is a double process; for, just as the potential stuff is seized and wrought into live tissue, so the outworn, dead matter which is no longer of use is cast off and ultimately expelled from the body.

This never-ending, never-ceasing business of life was depicted by Sir Michael Foster, the foremost British physiologist, with all the delicacy of fancy.*

"Did we possess some optic aid," he writes, "which should overcome the grossness of our vision, so that we might watch the dance of atoms in this double process of making and unmaking in the living body, we should see the commonplace lifeless things which are brought by the blood, and which we call the food, caught up into and made part of

* Foster, Sir Michael: Weariness. (Being the Rede Lecture delivered before the members of the University of Cambridge, June 14, 1893.) *The Nineteenth Century*, Vol. 34, No. 199, p. 339. (Sept., 1893.)

the molecular whorls of the living muscle, linked together for a while in the intricate figures of the dance of life, giving and taking energy as they dance; and then we should see how, loosing hands, they slipped back into the blood as dead, inert, used-up matter. In every tiny block of muscle there is a part which is really alive, there are parts which are becoming alive, there are parts which have been alive but are now dying or dead; there is an upward rush from the lifeless to the living, a downward rush from the living to the dead. This is always going on, whether the muscle be quiet and at rest, or whether it be active and moving. Some of the capital of living material is always being spent, changed into dead waste, some of the new food is always being raised into living capital."

Two processes of cellular life are thus continually carried on in the living body: assimilation, or building up, known as anabolism; disassimilation, or breaking down material into simpler chemical forms (ultimately expelled as waste products), known as catabolism. Upon these two processes together, or metabolism, life itself depends, and to this fundamental basis of life we must turn for an explanation of what fatigue is.

The blood is the medium through which nutritive materials are carried to the tissues, and through which also the chemical products of tissue destruction are carried off. These chemical wastes are poisonous impurities, created by the vital activities of the organism, and it is precisely to their accumulation in the blood that fatigue is largely due.

In Sir Michael Foster's words:*

"As the breath of man is poison to his fellow men, so the outcome of the life of each part of the body, each tissue, be it muscle, brain, or what not, is a poison to that part and its fellows, and may be a poison to yet other parts. Of each member, while it may be said that the blood is the life thereof, it may with equal truth be said, the blood is the death thereof; the blood is the channel for food, but it is also a pathway for poison."

* Op. cit., p. 350.

During activity, as will be shown later, the products of chemical change increase. A tired person is literally and actually a poisoned person—poisoned by his own waste products. But so marvelously is the body constructed that, like a running stream, it purifies itself, and during repose these toxic impurities are normally burned up by the oxygen brought by the blood, excreted by the kidneys, destroyed in the liver, or eliminated from the body through the lungs. So rest repairs fatigue.

This balance is kept true and fatigue is repaired just as long as it remains within physiological limits; that is, as long as activity is balanced by repose, when the noxious products of activity are more quickly eliminated and tissue is rebuilt. Just as soon as the metabolic equilibrium is destroyed the organism becomes clogged by its own poisons, exhaustion results, and health is impaired. The physiological normal phenomenon of fatigue becomes pathological, or abnormal exhaustion.

Health, even life itself, hangs upon the metabolic balance. In extreme instances of overexertion, as when hunted animals drop dead in the chase, they die, not from overstrain of any particular organ, such as the heart, but from sheer chemical poisoning due to the unexpelled toxins of fatigue.

"The poisons are more and more heaped up, poisoning the muscles, poisoning the brain, poisoning the heart, poisoning at last the blood itself, starting in the intricate machinery of the body new poisons in addition to themselves. The hunted hare, run to death, dies not because he is choked for want of breath, not because his heart stands still, its store of energy having given out, but because a poisoned blood poisons his brain, poisons his whole body."*

In animals which have so died of exhaustion, the blood is found loaded with the products of chemical action. Abnormally rapid putrefaction and rigidity of the muscles follows after death. In man, the occurrence of actual death

* Foster, op. cit., p. 351.

from overexertion is rare. A historic instance often quoted is the case of Eukles, the immortal runner from Marathon, who fell dead as he announced to Athens victory over the Persians. An Italian pathologist, Professor Pieraccini of Florence, quotes two interesting modern examples in Algeria.* Two native runners fell dead on arrival, one after covering 192 kilometers in 45 hours, the other 252 kilometers in 62 hours. Abnormally rapid rigidity and putrefaction of the bodies followed, and after an autopsy death was ascribed to the "excess of fatigue."

Such then are the extremest results of the self-generated poisons of fatigue. Physiological processes turn pathological; the normal instruments of life become agents of death. Obviously, on this side of death, there is a wide range of injuries which metabolic products can inflict upon the human frame. But before addressing ourselves to such specific ills we must examine more closely the proofs that fatigue results from the chemical wastes of activity. We must acquaint ourselves with the complex processes by which fatigue exhausts and rest repairs the muscular and nervous functions. And since this study of fatigue which we are to review, has scarcely yet concerned itself with the appearance of fatigue in industrial workers, we must turn our attention temporarily from labor and industry to the apparatus of the laboratory and to animal experimentation.

2. THE MEASUREMENT OF MUSCULAR FATIGUE

(a) In Animals

More than forty-five years ago, in 1865, the German physiologist Ranke first investigated the depressant action of certain products of protoplasmic activity upon muscular contraction.† He demonstrated that if an extract of fatigued frog muscle was injected into a second frog, the muscles of

* Pieraccini, G.: Patologia del Lavoro, p. 18. Milan, 1906.

† Ranke, J.: Tetanus. Englemann, Leipzig, 1865; Centralblatt für die medicinischen Wissenschaften, 1868, Vol. IV, p. 769.

the second animal showed evidences of fatigue. Their power of contraction on stimulation was diminished. A similar experiment with an extract made from resting muscle had no such effect.

About twenty-five years later, the Italian scientist Mosso showed that the depressant action of fatigue substances is not confined to the tissues in which they arise.* He demonstrated that the blood becomes charged with these chemical wastes produced in the muscles, and carries them to all parts of the body. He proved this by injecting the blood of a dog fatigued by long continued running into the vessels of a second dog from which an equivalent amount of blood had been drawn. Upon this, the second dog showed the usual signs of fatigue.

Products of muscular activity are thus shown to cause symptoms of fatigue when injected into resting tissue. In the study of muscular fatigue we may learn how these waste products are created and how they affect the organism. Muscular fatigue has been longest studied since fatigue of the muscles can be most easily observed and registered by certain instruments of precision or measurement. The observation of fatigue or diminished power of reaction in frog muscles preceded Mosso's famous studies of human fatigue.

The myograph, designed by H. von Helmholz, shows how the loss of energy in wearied frog muscles results from noxious substances in the muscles, produced during work. The leg muscle of a frog is separated from the rest of the body and hung by one end upon a support. To the other end of the muscle a lever is attached which comes in contact with a revolving cylinder covered with sooty paper. If the leg is at rest, a straight line is traced upon the revolving cylinder. If the muscle is electrically stimulated to contract, the lever records the contractions by upward and downward marks upon the sooty surface of the revolving cylinder, the height of the curves being determined by the force of the contrac-

* Mosso, Angelo: Arch. für Anatomie u. Physiologie. Physiologische Abtheilung, 1890, p. 89.

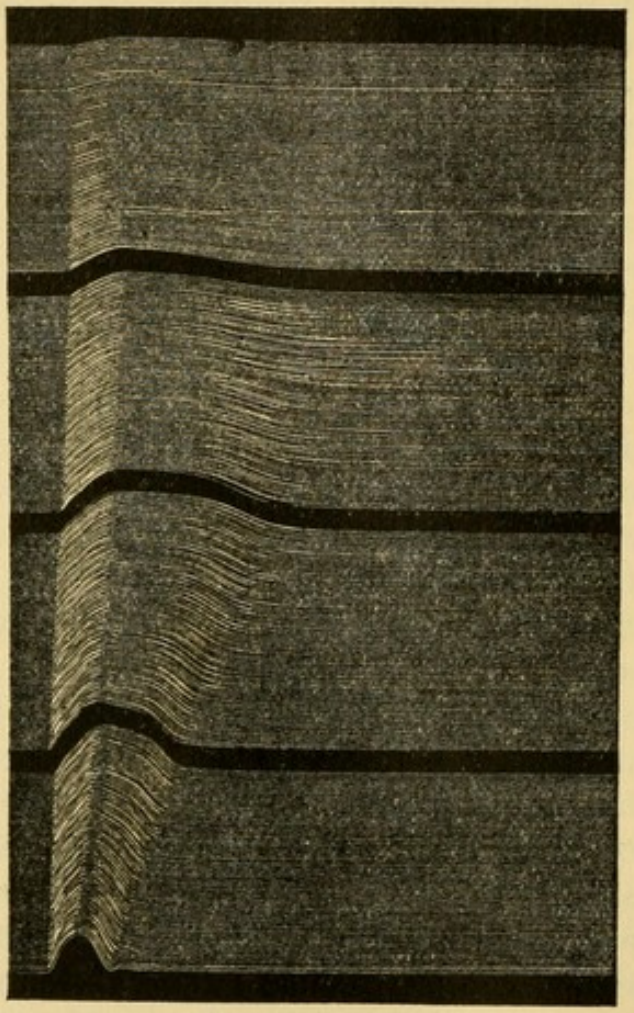


Fig. 1

Series of 550 contractions of a frog's gastrocnemius muscle, excised and stimulated at intervals of two seconds. Every contraction is recorded, except at the places indicated by the black bands, at each of which the records of fourteen contractions are omitted. The record of the first contraction is at the bottom of the figure: that of the last one at the top. Fatigue is shown in the progressive decrease in height and the increase in length of the curves.

tion. As the muscle tires, the contractions grow smaller and smaller until finally the lever cannot be raised at all.*

It can be shown that this fatigue of the muscles is due to the paralyzing action of the accumulated fatigue products

* See Figures 1, 2, and 3. The illustrations are from The Nature of Fatigue, by Professor Frederic S. Lee. *Popular Science Monthly*, Feb., 1910. (Reproduced by permission.)

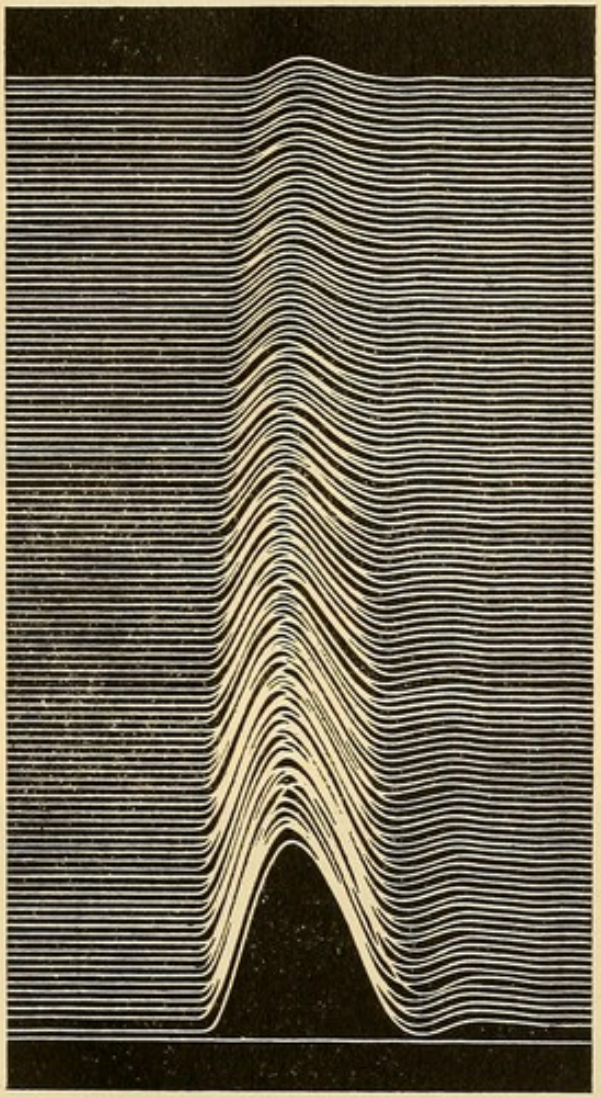


Fig. 2

Series of contractions of a rat's gastrocnemius muscle, excised and stimulated at intervals of two and one-half seconds. Fatigue is shown in the progressive decrease in height of the curves.

in the blood. For if at any time after fatigue has set in, the muscle, while suspended, is washed out through its blood-vessels with a normal salt solution, its power to contract returns. As soon as the fatigue products are washed away, the muscle is rested.*

* See Figure 4.

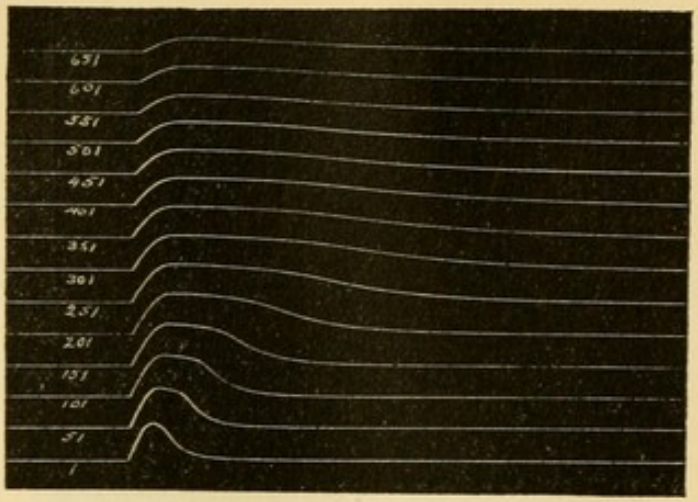


Fig. 3

Series of contractions of the frog's gastrocnemius muscle, excised and stimulated at intervals of two seconds. Every fiftieth contraction is recorded. Fatigue is shown in the progressive lengthening of the descending limb of the curves.

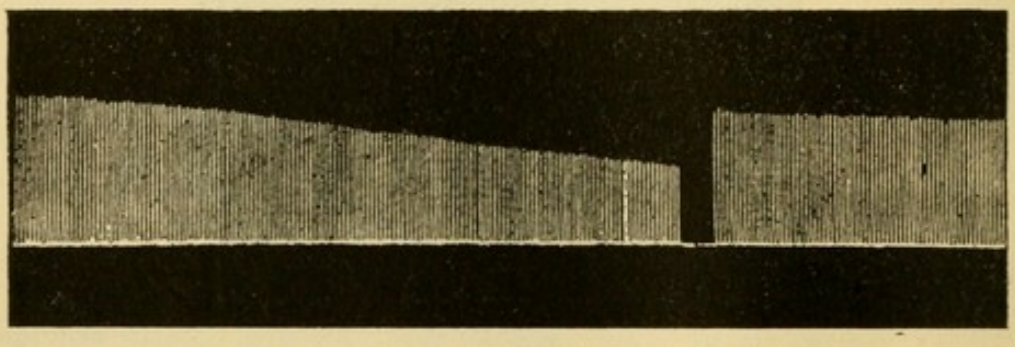


Fig. 4

Series of contractions of a frog's gastrocnemius muscle *in situ* and stimulated at intervals of two seconds. The flow of blood through the muscle was stopped by ligating the artery, and the record of fatigue was made. At the break in the series, the muscle rested five minutes, during which time the ligature was removed and the blood was allowed to circulate through the muscle. The record of contractions at the right of the break was made immediately after the resting period, and while the blood was still circulating.

(b) In Man

Using the same principle described above, Mosso devised an apparatus called the ergograph, to study muscular contraction in man.

"By its means," writes Professor Frederic S. Lee, himself one of the foremost American investigators in this field, "(Mosso) began the long series of studies of voluntary contractions in man, which has made the Turin School famous and has immeasurably extended our knowledge of fatigue in living human beings."*

The ergograph is an instrument constructed so as to record the contractions of a single muscle or group of muscles. Thus, for instance, the arm and hand, except the middle finger, may be supported and held fast. The person experimented upon contracts his middle finger at regular intervals, thereby lifting a known weight to a definite height or stretching a spring of known tension. As in the myograph, contractions are recorded by curves upon a revolving cylinder, and show a steady diminution of the lifting power of the muscles, the rate and regularity of the diminution differing with individuals. If the highest points of the curves recorded on the cylinder are joined together, the result is a curve of characteristic form for each individual, known as the curve of fatigue. This curve remains practically the same for each person whether his contractions are voluntary or due to electric stimulation. Some persons obviously tire less quickly than others; some work at high pressure for a short time, giving out suddenly, while others work more slowly and regularly. All this is borne out by the record of the ergograph, which shows graphically on paper how great are the varieties of individual working capacities. (See Figure 5.)

In industrial occupations, obviously, the working time cannot be measured off for each individual according to his special capacity. But the testimony of the ergograph to the infinite varieties of endowment in strength and staying capacity emphasizes the need of setting a fair maximum working period which shall not over-reach the natural limits of the majority of individual workers.

By the use of the ergograph we learn more of the funda-

* Lee, Frederic S., Ph. D. (Professor of Physiology, Columbia University, New York): Fatigue. Harvey Lectures, 1905–06, p. 172. Philadelphia and London, Lippincott, 1906.

mental factors in fatigue. It is shown that if sufficient rests are allowed between contractions, no fatigue results. With a load of six kilograms, for instance, the flexor muscle of the finger showed no fatigue when a rest of ten seconds was given between contractions. But after complete fatigue, once the

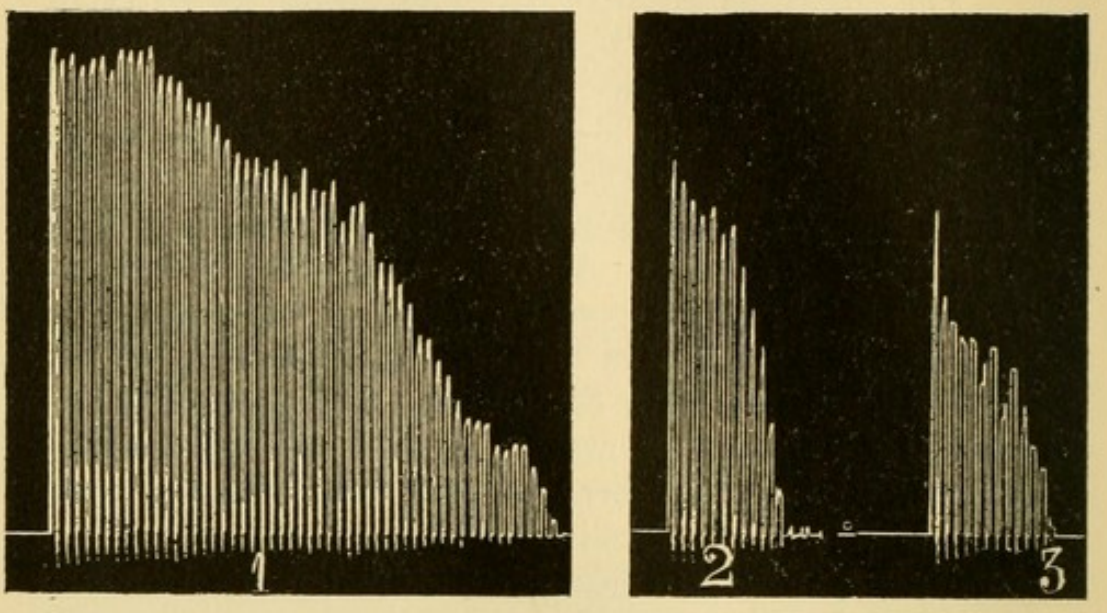


Fig. 5

Series of contractions of the flexor muscles of a human finger. The muscle was stimulated electrically every two seconds, and the resulting contractions were therefore involuntary. Record 1 was made when the muscle was fresh; record 2 immediately after three and one-half hours had been spent in the oral examination of students; record 3 two hours after the completion of the examination. (From Mosso's "Fatigue.")

muscles are exhausted, the utmost expenditure of will power does not enable them to contract further. A very long interval—two hours—is needed for the muscle to make a complete recovery.

3. ANOTHER FACTOR IN FATIGUE: CONSUMPTION OF ENERGY-YIELDING SUBSTANCE

So long an interval of rest would evidently not be necessary for the removal of the poisonous metabolic products, if fatigue were due to the depressant action of these

products alone. The ergographic record, therefore, throws light upon another fundamental factor in fatigue besides the accumulation of fatigue products: the actual consumption of the material from which energy for contraction is obtained. At the termination of hard muscular work the muscle contains a lessened supply of energy-yielding material, because during contraction the processes of disassimilation or catabolism are in excess of those of assimilation or anabolism. This fundamental change in the muscle substance can be made plainer by a brief consideration of the chemical processes in contraction.

(a) The Chemistry of Muscular Contraction: How Glycogen is Supplied and Consumed

Every voluntary muscular contraction is due to the stimulus received from the central nervous system through the nerves. Of the nature of this stimulus little is known, and the nerve elements in activity and fatigue will be considered later. We know that each muscular act has as its basis chemical processes. It is a form of combustion, as we readily recognize by the greater heat generated within us by any muscular effort. For combustion there must be union of some substance with oxygen. The union may be slow, as when iron rusts or is slowly oxidized, or fast, as when wood or coal burns with a flame. In muscular combustion the oxygen is supplied by the blood, the substance with which it combines being the so-called animal starch of the muscles, called glycogen.

Let us, then, first consider how the organism is supplied with these two essential factors for muscular action, glycogen and oxygen.

Glycogen is one of the stored materials of the muscle, a compound of carbon, hydrogen, and oxygen; and muscular tissue has the power of forming this glycogen from the sugar or dextrose brought to it by the blood. Dextrose is the form of sugar in which our carbohydrate foods (starches, sugars, etc., the bulk of our usual diet) are eventually absorbed into

the blood and carried by the blood to the muscular tissues, there to be transformed into glycogen. The stored glycogen of the muscles keeps uniting chemically with the oxygen of the blood. The glycogen is broken down into a simpler chemical form, giving off the gas carbon dioxide and other acid wastes, and releasing heat and mechanical energy in the process.

With the released energy, contraction of the muscle takes place and hence ultimately the industrial labor which is our special theme. The heat contributes to our body temperature. The chemical wastes, as we have seen, poison the whole organism unless prevented from accumulating unduly, and go to constitute what we know as fatigue.

But, as we saw above in considering the ergograph, there is another fundamental factor in fatigue which must be taken into account here: a consumption of energy-yielding material of the muscle itself. This takes place in the following manner:

Glycogen is, as it were, stored for use. It is always being replenished, always being depleted. The metabolic wastes, produced when glycogen is broken down into simpler chemical form, are constantly thrown off; the potential stuff brought by the blood is constantly being seized and built up again into living tissue. But when the muscle is active and contracts energetically, there is a run upon our glycogen. It is used up faster than it is built in muscle. The glycogen is spent so rapidly that there is not time for the bloodstream to bring back to the tissue the potential material for its repair. Glycogen may even be entirely consumed and disappear from the muscle.

But there is another organ of the body which acts further as a storehouse for glycogen. This is the liver, whose cells are so constructed that they too convert the dextrose or sugar in the blood into glycogen and retain it, until the store in the muscles is so far depleted that it must be replenished. If it were not for the stored glycogen of the liver which is supplied to the muscles at their need, starvation would more quickly end in death.

Even this provision of stored glycogen, however, does not suffice after prolonged and severe work to supply oxidizable material for muscular activity. After excessive labor the entire store of glycogen in the liver as well as in the muscle may be practically used up. Thus we have reached the other fundamental factor in fatigue,—the consumption of the energy-yielding substance itself. Not only does tissue manufacture poison for itself in its very act of living, casting off chemical wastes into the circling bloodstream; not only are these wastes poured into the blood faster with increased exertion, clogging the muscle more and more with its own noxious products; but finally, there is a depletion of the very material from which energy is obtained. The catabolic process is in excess of the anabolic. In exhaustion, the organism is forced literally to "use itself up."

We shall see later how destructive to health this phenomenon of exhaustion is, to which nervous as well as muscular tissue is subject; how long it takes to make good such losses; how exhaustion, indeed, taps the very source of our energies.

(b) How Oxygen is Supplied for Muscular Contraction

Hitherto in this discussion we have referred constantly to the chemical reaction between glycogen and oxygen, and the results obtained when glycogen is thus broken down by oxygen. It remains now to trace how at every breath we draw, oxygen is supplied for our internal combustion of glycogen; how at every exhalation we breathe out the gas carbon dioxide—product of muscular action. The pathway for these gases is the blood.

When oxygen is breathed into the air sacs of the lungs, it comes into contact with the smallest blood vessels of the body, the capillaries. The blood in these thin-walled capillaries is separated from the oxygen in the air sacs only by moist and permeable membranes. By diffusion, the oxygen passes through these moist membranes and combines chemically with the hæmoglobin or red coloring matter of the red corpuscles in the capillaries. These tiny blood vessels, now

oxygen bearers, penetrate in a fine network to every tissue and organ in the body. As soon as the blood reaches the muscles, the loose chemical union of the haemoglobin and oxygen is again broken down, the oxygen combining with the glycogen of the muscle tissue, setting free energy, as we have seen, and evolving waste products. For, as the oxygen streams out to combine with the glycogen, there streams back in the opposite direction the gas carbon dioxide, thrown off in the chemical process.

"There is an upward rush from the lifeless to the living; a downward rush from the living to the dead."

The lifeless carbon dioxide in its turn combines with the blood, which has given its oxygen to the tissue; and in the intricate flow of our vascular system, carbon dioxide is carried back by the blood to the lungs and thence expired. We may get some notion of the combustion or chemical process carried on within our muscles by the fact that at every breath air loses about 5 per cent of its oxygen and increases in carbon dioxide a hundred fold.*

	O	N	CO_2	
Inspired air contains.....	20.96	79.00	0.04	
Expired air contains.....	16.40	79.19	4.41	
Loss.....	4.56	.19	4.37	Gain

Moreover, it has been proved that after heavy muscular work, an animal gives off even larger proportions of carbon dioxide in its expired air. The physiologists Voit and Pettenkofer showed as early as 1866, that during a day in which much muscular work was done, a man expired almost twice as much carbon dioxide as during a resting day. During activity the internal combustion is more active, glycogen is being broken down more rapidly, more wastes are being thrown into the blood, more carbon dioxide is evolved. The wastes indeed accumulate more rapidly than they can be carried off, and hence, as we have seen, after excessive exer-

* Notter, J. Lane, and Firth, R. H.: The Theory and Practice of Hygiene, p. 151. Third Edition. London, J. V. A. Churchill, 1908.

tion, the metabolic equilibrium is destroyed. But during rest at night the processes of repair are again in the ascendant. If sufficient rest is not allowed between working days, obviously a physiological deficit must result.

This is the essential injury of consecutive days, weeks, and months of overtime work, which we shall find common to many branches of industry,—that the normal season of tissue repair, between working days, is cut down at the very time when the severest demands are being made upon the human organism.

4. THE NATURE OF THE FATIGUE PRODUCTS

The production of carbon dioxide has been called the most significant change in the muscle during contraction. The nature of other toxic products of muscular action is shown by laboratory examination. Fatigued muscle is shown by litmus paper to be acid in reaction. A wellknown experiment illustrates the acidity of fatigued muscle by the use of acid fuchsin. This stain is injected under the skin of a frog. It is absorbed and distributed in the body without injuring the tissues. As long as the body remains at rest, the solution is colorless; but if one of the legs is electrically stimulated the muscles take on a red color, showing that an acid is produced locally.

"It is now customary," writes Professor Lee, "to recognize three distinct metabolic products as fatiguing, namely—sarcolactic acid, monopotassium phosphate and carbon dioxide, all of which are acid in reaction."*

Within the last few years the German scientist, W. Weichardt, has published special studies of chemical fatigue

*Op. cit., Harvey Lectures, 1905–06, p. 183. See also by the same author: Cause of the Treppe. *Amer. Jour. of Physiology*, Vol. XVIII, No. III, p. 267 (April 1, 1907). The Action of Normal Fatigue Substances on Muscle. Ibid., Vol. XX, No. I, p. 170 (Oct. 1, 1907). Pseudo-Fatigue of the Spinal Cord. Ibid., Vol. XXIV, No. IV, p. 384 (July 1, 1909). Physical Exercise from the Standpoint of Physiology. *Science*, N. S., Vol. XXIX, No. 744, p. 521 (Apr. 2, 1909). The Nature of Fatigue. *Popular Science Monthly*, Feb., 1910, p. 182.

substances. In 1904 Weichardt claimed to have isolated from fatigued muscles a specific toxin of fatigue, entirely analogous to other bacterial toxins, such as that of diphtheria or tetanus.* He asserts that if this toxin obtained from the extract of fatigued muscles is injected into animals, it produces all the symptoms of fatigue. When given in large doses it is said even to cause death. In human beings the production of fatigue toxin is supposed to take place with ordinary physiological fatigue.

Weichardt even lays claim to having obtained a true anti-toxin of fatigue. He asserts that when small doses of the toxin are administered to animals, a specific anti-toxin is produced in the blood, under the influence of which the muscles of the animals experimented upon display far less fatigue than under ordinary conditions. Their endurance capacity is said to be largely increased by injection of the anti-toxin. When corresponding amounts of the anti-toxin were given with doses of toxin, the paralyzing effects of the latter were said to be counteracted.

These later theories and experiments, verging on the fantastic, have not been cordially accepted by the scientific world. In the eight years which have elapsed since Weichardt's discovery was announced, it has been confirmed by no other eminent investigator. At present, his theories of fatigue toxin and anti-toxin must still be regarded as uncorroborated.

Moreover, even if further scientific investigation should sustain Weichardt's assertions, they would be of theoretic not practical interest and value. The injection of an anti-toxin of fatigue might possibly be resorted to in athletic endurance tests and *tours de force*, such as six-day bicycle races. Ob-

* Weichardt, W.: Über Ermüdungstoxine und deren Antitoxine. Münchener medizinische Wochenschrift, 1904, 51. Jahrgang, No. 1, pp. 12–13.
Ibid., 1904. No. 48, pp. 2121–2126.
Ibid., 1905. No. 26. pp. 1234–1236.
Ibid., 1906. No. 1, pp. 7–10.
Ibid, 1906. No. 35, pp. 1701–1702.
Vierteljahresschrift für öffentliche Gesundheitspflege. XXIX. 1907. Ermüdungs u Übermüdungsmassmethoden.

viously no such artificial stimulus could be of any concern in the daily regimen of industry with which we are concerned.

A glimpse at theories of fatigue toxin and anti-toxin is of interest to us chiefly as additional evidence of the gravity and the scientific nature of our problem. Overstrain in industry is obviously no invention of sentiment or fiction when the chemical nature of fatigue and its complex relations with life are realized. The more we learn of the scientific nature of fatigue, the more it invites us to utilize such knowledge for the improvement of working conditions.

5. THE NATURE OF NERVOUS FATIGUE

Thus far we have confined ourselves to a consideration of the main underlying causes of fatigue in the breakdown of normal metabolism, and we have glanced at the manifestations of muscular fatigue. We must proceed now to other forms of fatigue, nervous and psychic.

Such is the oneness of life, the controlling unity of the living body, that we cannot practically estimate any one form of fatigue separately; we cannot set definite limits where nervous fatigue ends and muscular fatigue begins, or vice versâ. They are inevitably bound up together, since every voluntary muscular act is due to the stimulus received through the nerves from the central nervous system. Of the nature of the nerve impulse or of the energy generated in the centers, little is agreed upon, excepting that some form of electric activity is involved.

But though the origin of nerve impulses be still unknown, shrouded in the mystery of life itself, it is undoubted that our levels of nervous endurance and resistance may be permanently lowered by excessive pressure upon them. Further, we know that nervous energy is not only the stimulus of muscular action, but the controller of all our functions; the "very pulse of the machine." Hence nervous fatigue and exhaustion is the most destructive because the most inclusive form of fatigue.

We have seen that toxic products are thrown off by the muscles and are carried in the blood. When fatigued blood becomes laden with these substances they affect other muscles through which the blood circulates. Thus, after an exhausting walk, as Mosso explains, the muscles of the arms as well as of the legs are indisposed to further great exertion. Maggiora, a student and follower of Mosso, demonstrated this fact with the ergograph. He says:

"After a fatiguing day's march, certain soldiers' hand tracings showed a notable diminution of energy even after the night's rest, being very low at 7 a.m., less so at 9 and 11 o'clock, but rising to normal energy only by 3 p. m."*

Now, just as the metabolic poisons created in one set of muscles are carried by the blood, and act upon other muscles, so they act also upon our nervous system—upon nerve endings in muscle and upon central nerve cells. Further, it is agreed that there is a metabolism of the nervous tissue itself similar to that of muscle tissue, a similar building up and breaking down of energy-yielding material. Hence fatigue of the nervous system is ascribed to the same double origin as muscle fatigue: accumulation of toxic waste products, and consumption of substances essential for activity.†

(a) The Nervous System, Central and Peripheral

The nervous system is composed of the central nervous system,—the brain and spinal cord; and the peripheral system, —nerve ganglia and nerve fibers arising from the centers. When a number of nerve fibers are bound together in a bundle or trunk, we have the plainly visible whitish nerves. These are distributed to all parts of the body. Every organ and tissue has its own supply of nerves connecting it with the brain or spinal cord.

* Archiv für Anatomie u. Physiologie, 1890, p. 191. Physiologische Abtheilung. Maggiora, Dr. Arnaldo: Über die Gesetze der Ermüdung.

† Howell, Wm. H.: Textbook of Physiology, p. 110. Philadelphia and London, W. B. Saunders Co., 1908.

Nerve fibers are divided into two great groups: the efferent fibers, which carry impulses out from the nervous system to the peripheral tissues (skin, muscles, etc.), and the afferent fibers, which carry impulses inward from the peripheral tissues to the nerve centers.

Some of the efferent fibers, carrying impulses outward from the centers, are also called motor nerve fibers. If these fibers end in muscles, the effect of their impulses is to produce muscular contraction. If they end in glands, they cause a secretion, depending on the kind of tissue with which the nerve fiber is connected. Some afferent fibers, bearing impulses inward to the nerve centers, are also called sensory fibers, because in many instances these impulses reach the brain and give rise to sensations of various kinds. Often, however, these inward carried impulses do not reach the brain in consciousness, but are manifested as reflex actions, such as the movements of the heart, intestines, etc. These reflex activities constitute a fundamental part of our nervous system, but we may for the time being leave them out of account.

(b) The Location of Nervous Fatigue

The question at once arises how our intricate nervous system succumbs to fatigue and how such fatigue is manifested. It obviously cannot easily be measured and registered, like muscular fatigue, upon a revolving drum. Laboratory study of nervous fatigue has been beset with enormous difficulties and the unsolved problems are many. There is profound disagreement among scientists as to what part of the nervous system first succumbs after excessive exertions.

We know that the nerve fibers themselves—carriers of energy—are apparently not readily subject to fatigue. That is, they can conduct impulses to the peripheral tissues almost indefinitely. Varied experiments have proved that their normal functional activity may be carried on to an almost indefinite extent without causing fatigue. In these experiments the underlying idea has been to stimulate the

nerve continuously, but to interpose a block somewhere along the course of the nerve, so that the impulses shall not be conducted to the muscle experimented upon. This is obviously necessary because otherwise the muscle would become fatigued, and there would be no way to distinguish between fatigue of the muscle or of the nerve fiber. By the use of curare, a South American arrow poison, the passage of the electric stimulus to the muscle is blocked, the poison affecting the terminations of the nerves, or motor end-plates, as they are called, and preventing their transmission of impulses to the muscles. By the use of curare, then, the sciatic nerve has been continuously stimulated for as long as ten hours.* When the effects of curare were removed (which can be accomplished within a few minutes) the nerve was found to be still conducting, the muscle responding. Thus, nerve fibers are practically unfatiguable.

It has long been supposed that while nerve fiber is proved highly resistant, the central portion of the nervous system is extremely susceptible to fatigue. It has been thought that after prolonged muscular activity the brain and spinal cord tire first, before the muscle. Thus, after a finger muscle has become so fatigued by the ergograph that it can no longer voluntarily lift a given weight, it can be made to do so by electric stimulation. The muscular mechanism is apparently still in working order, at least for a space of time. After a longer or shorter period, even the given electric stimulus cannot cause the muscle to contract, and the individual's curve of fatigue drops after electric stimulation in very much the same way that it does in voluntary contraction. Apparently the muscle has not entirely lost its power of contraction when it can no longer voluntarily contract. According to this theory, what seems to be muscular fatigue is in reality nervous fatigue, fatigue of some part of our nervous system.

Laboratory experiments upon animals show that after prolonged activity demonstrable histologic changes take

* Howell, Wm. H., op. cit., p. 111.

place in the nerve cells of the brain and spinal cord.* Mosso drew attention to the marked modifications in the brains of exhausted birds. He gives a delightful account of his experimental dove cote and of his fatigue tests upon military carrier pigeons provided by the Italian Ministry of War. He studied also the changes and characteristics in wearied migrating birds, such as the quail which arrive each year in great numbers from Africa upon Italian shores. Exhausted by their journey, hundreds are killed, dashing themselves in plain daylight against walls and houses. Either they are too much exhausted to see these bright objects which seem to fascinate them from afar, or their exhaustion is too great to allow them to raise themselves even one extra yard in their rapid flight. Mosso ascribed their impaired vision to the cerebral anæmia found in birds exhausted by long flights. Later in his book he shows how profoundly a diminished circulation of the blood affects the functions of nervous tissue in man. A few seconds' pressure upon the eyelid, lessening the blood supply, is enough to distort vision, and a diminution of the brain's blood supply is followed by loss of consciousness after six or seven seconds.†

Other more recent experiments throw some measure of doubt upon these demonstrations of fatigue in the central nervous system. Some investigators suggest that the first part of our neuro-muscular mechanism to tire after sustained contraction is the nerve-ending in the muscle, or motor end-plate.‡

* Hodge, C. F.: *Amer. Jour. of Psychology*, 1887–1888, Vol. I, p. 479; 1889, Vol. II, p. 376. *Jour. of Morphology*, 1892, Vol. VII, p. 95.
Vas, Fr.: Archiv für mikroskopische Anatomie, 1892, Vol. XL, p. 375.
Mann, Gustav: *Jour. of Anatomy & Physiology*, 1894, Vol. XXIX, p. 100.
Lugaro, E.: *Lo Sperimentale*, Sezione biologica, 1895, Vol. XLIX, p. 159.
Eve, F. C.: *Jour. of Physiology*, 1896, Vol. XX, p. 334.

† Mosso, Angelo: La Fatica. Milano, 1891. English translation, pp. 1–29, 72 and 73. New York, Putnam, 1904.

‡ Müller, G. E.: Zeitschrift für Psychologie und Physiologie der Sinnesorgane, 1893, Vol. IV, p. 122.
Müller, Robert: Wundt's Philosop. Studien, 1901, Vol. XVII, p. 1.
Hough, Theodore: *Amer. Jour. of Physiology*, 1901, Vol. V, p. 240.
Storey, Thomas A.: *Amer. Jour. of Physiology*, 1903, Vol. VIII, p. 355.
Joteyko, Mlle. J.: Fatigue. Richet's Dict. de Physiologie. Paris, 1904, Vol. VI, p. 29.
Woodworth, R. S.: N. Y. University Bulletin of the Medical Sciences, 1901, Vol. I, p. 133.

Scientists themselves disagree as to the precise nature and localization of nervous fatigue. Little is known as to the production of fatigue substances by the central system. It may even be that central nerve cells are less readily susceptible to fatigue than has been supposed and that they succumb only to a really high degree of exertion. Yet it should be clearly understood that the uncertainty of scientists as to the precise localization of nervous fatigue does not touch the acknowledged fatiguability of *some portion*, not yet completely verified, of our nervous endowment. Thus Professor Frederic S. Lee, one of the physiologists who inclines most strongly to the belief that central cells are more resistant than has been supposed, specifically states that "nervous fatigue is an undoubted fact,"* and that, "we cannot deny fatigue to psychic centers," though "the intimate relations of central and peripheral fatigue are much in need of exact experimental study."†

Moreover, it is not essential to our present inquiry to know whether muscle or nerve substances tire first, or exactly what part of our nervous system is first affected. These still unsolved problems may not go unmentioned in any account of the study of fatigue. They are the unanswered questions fronting the scientist, for whom the "humblest catabolic product" must be a challenge, until he has plucked out the mystery of its composition and effect. For our purposes it is enough to realize that nervous fatigue, be it central or peripheral, exists, a relentless fact, reacting inexorably upon our total health and life. It is the form of fatigue most fraught with possibilities of mischief. For when fatigue affects the nervous system, it attacks what has been called the "administrative instrument of the individual," which "directs, controls and harmonizes the work of the parts of the organic machine and gives unity to the whole."

When that administrative instrument is impaired by overwork and exhaustion, formidable forms of disease appear

* Op. cit., *Science*, N. S., Vol. XXIX, No. 744, p. 525.

† Op. cit., Harvey Lectures, 1905–06, p. 180.

which we shall subsequently view so far as they may be traced to industrial causes. But first we must proceed to examine how nervous fatigue is manifested in the laboratory.

6. THE RISE AND FALL OF WORKING CAPACITY

(a) Work Continued Under Fatigue Costs More Effort

One of the most valuable contributions of the Turin school was in proving graphically the nervous strain in overwork.

It is a fact familiar to every one that work done after fatigue has set in requires much greater expenditure of nervous energy than work done before fatigue. This is illustrated by the simple act of holding up a weight in outstretched arms after they have become tired. It is shown in the so-called tension of the will needed to complete a difficult task, the unmistakable sense of effort in "keeping-up."

Mosso showed that a much stronger electric stimulus is required to make a wearied muscle contract than one which is rested. He devised an apparatus, the ponometer, which records the curve of nervous effort required to accomplish muscular action as fatigue increases. He showed that the nerve centers are compelled to supply an ever stronger stimulus to fatigued muscles. As the muscle tires and accomplishes less work, more and more energy must be supplied for contraction. In the language of the laboratory, the ponometric curve follows a course which is the inverse of the ergographic curve; or, more intelligibly put, effort increases with fatigue.

In another way, and as impressively, Maggiora showed how much greater effort is needed to make wearied than fresh muscles work. He found that after his finger muscles were exhausted by a series of contractions in the ergograph, he had to allow a two-hour rest before they were completely rested. If he diminished this period, and allowed only one and one-half hour's rest, the muscle was insufficiently restored and could not do as much work as when thoroughly rested.

By analogy it might be supposed that if the work were lessened, the period of rest might be reduced in the same proportion; that if Maggiora cut in half the work which required two hours' rest, he would need only one hour to recover entirely from a shorter series of contractions. But experiment proved, surprisingly, that even less rest was needed after the shorter period of work. If work is reduced by one-half, the period of necessary rest can actually be reduced half or three-quarters as much again. Thus, if 30 contractions exhaust the finger muscle so that it needs two hours' rest, 15 contractions require not one hour but only a half-hour for recuperation. In other words, the expenditure of energy in the last 15 contractions, after fatigue has set in, is much greater than the energy expended in the first 15 contractions, since the last set of contractions exhaust the organism much more than the first set.

Moreover, the tracings of work done in the second set of contractions are much smaller than the first tracings; the output falls off, as we say of industrial work. Hence strain, or work done after fatigue has set in, not only costs more effort but accomplishes less. The last 15 contractions are decidedly smaller, while the effort to keep up costs the organism four times as long a rest for recuperation.

The ergographic record shows also the remarkable recuperative effect of rest taken at the critical moment before exhaustion is reached. For if work is stopped after the first set of contractions, before the muscle is completely exhausted, it accomplishes just twice the amount of work which was produced when the muscle was pushed to the actual point of exhaustion. As Mosso puts it:*

"Our body is not constructed like a locomotive which consumes the same quantity of coal for every kilogrammetre of work. When the body is fatigued, even a small amount of work produces disastrous effects. . . . . The workman that persists in his task when he is already fatigued not only produces less effective work, but receives greater injury to his organism."

* Op. cit., English translation, pp. 152 and 157.

(b) The Nature of Training

Professor Treves at Turin, a follower of Mosso, throws further light upon the injuries due to an excessive run upon nervous energy. It is a wellknown fact that in muscular exertion there is a marked gain in efficiency during the first period of work. In the muscular contractions of men as well as of animals, the curve of fatigue rises before it begins to fall. That is, before fatigue begins to diminish the muscle's power of contracting, there is a period during which the muscle gains strength at every effort and is able to raise the weight to a higher and higher level. This upward progression of the curve is known to physiologists as the staircase, or

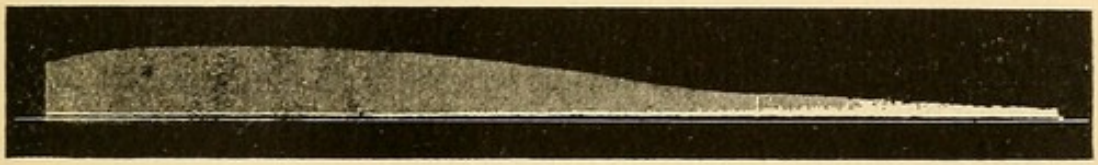


Fig. 6

Series of contractions of a frog's sartorius muscle, excised and stimulated at intervals of two and one half seconds. Each successive vertical line is the record of a single contraction, The contractions at first increase in extent, this stage constituting the treppe, and later decrease, this stage constituting fatigue.

"treppe." The treppe means that, in its early stages, the working power of muscle is augmented. Its physiological irritability, or power of responding to a stimulus, increases, so that the same stimulus results in greater contractions. After a certain period the treppe is at its height, and contraction continues at its maximum until the development of fatigue causes it to diminish and fail.

In the study of isolated muscle these three general though not sharply defined stages of work may be observed. First, the treppe, when working power is on the increase and excitability is growing; second, the period when the muscle is in its best working condition, its excitability highest; and third, the period when fatigue products clog

the muscle more and more until contraction is finally forced to cease.

These three general stages of work, graphically shown in the contractions of isolated muscle, are familiar to every one in ordinary experience. It is an epitome of life at which we are looking—a picture of human work drawn without perspective. Everyone knows that in every long-continued task, the first stage is one of "limbering up"; then we gradually reach the plane where our working power is at its maximum (more or less variable to be sure), until fatigue inclines it unmistakably downward towards our minimum—the zero of exhaustion.

Training is of inestimable value in all work, as well as in sports. It increases our working capacity by practically retarding the onset of fatigue for a longer or shorter period. It does this by making the tissues more or less resistant to those poisons which, as we have seen, are generated in action and accumulate unduly in overexertion.

Training, like the fatigue which it combats, has a true physiological basis, and physiology explains its virtue as clearly as it does the essential injuries of fatigue. It is a wellknown fact that the body adapts itself in extraordinary measure to even large quantities of poisonous drugs, when they are taken in gradually increasing doses. So, also, it adapts itself to moderate and increasing amounts of the fatigue poisons. Now, proper physical training provides graded and increasing exercises, and these increasing exercises, by producing successively larger amounts of fatigue poisons, inure the tissues gradually to such poisonous products. This resistance of tissue to the depressant action of our self-generated poisons is the most important element in all training or practice.

The athlete is enabled by training to undergo exertions which would kill an ordinary untrained man. Training even saves a certain amount of nervous energy by a more ready coördination of muscles and by calling upon a smaller number of muscles than are used by the untrained man.

The question, however, arises whether in intensive regular labor which makes great demands on the organism, muscular efficiency may not be bought at too dear a cost of nervous energy. Overtraining is as unmistakable a phenomenon as training, and the pathologic effects of overtraining are not confined to athletes. We have seen that the strain of the wearied muscle to keep up, after fatigue has set in, costs more effort and accomplishes less than the work of unwearied muscle; we have seen that nervous stimulation must increase as working capacity declines. Now Professor Treves asserts that when muscles have attained their greatest strength, the nervous energy at their command will not have grown in proportion. He says:*

"According to my experience, it has not been found that training has as favorable an effect upon energy as upon muscular strength. . . . This fact explains why muscular training cannot go beyond certain limits and why athletes are often broken down by the consequences of overexertion. And this fact teaches also the practical necessity of preventing women, children, and even adult men from becoming subjected to labor which, indeed, a gradual muscular training may make possible but at the price of an excessive loss of nervous energy which is not betrayed by any obvious or immediate symptom, either objective or subjective. While the individual works, the reserves of disposable nervous energy in the neurones which preside over muscles diminish much more rapidly than the production of work which may keep to the normal level. . . . In spite of this diminution, if circumstances continually demand intense and constant work, the stimulus will continue to be sent to the muscle with the intensity necessary to accomplish the purpose. . .

"Here we have an arrangement of things which is of inestimable value to man in the production of work; but this beneficent provision becomes injurious to the dynamic equilibrium of the organism as soon as it is irrationally employed. It is this that needs to be avoided in the practical organization of industry."

*Thirteenth International Congress of Hygiene and Demography Brussels, 1903, Vol. V, Sec. IV, pp. 6–7. Treves, Dr. Z. (University of Turin): Dans quelle mesure peut-on par des méthodes physiologiques étudier la fatigue, ses modalités et ses degrés dans les diverses professions.

One step more and we reach the terminus of our analysis. We have seen that the curve of muscular work normally begins to decline after it has reached its maximum, when the fatigue products clog the muscles excessively. Now it is a fact of vast consequence to our total health that with nervous fatigue the curve of work often does not descend as normally it should. Nervous fatigue may indeed seem to increase our working capacity temporarily. Most persons are familiar with what is colloquially called "working on one's nerves," when nervous fatigue instead of depressing our working capacity, as it normally should do, stimulates it to greater activity. The temporary increase in efficiency is, of course, illusive, though it may for a while lead to a really heightened capacity. But at too dear a cost! After a longer or shorter period the false stimulation breaks like a bubble, leaving the worker nervously unstrung and dropped abruptly down to a plane of efficiency far lower than normal fatigue should have declined to.

This form of nervous over-stimulation thus conceals from the worker the oncoming of fatigue, so that he may approach the stage of exhaustion before he is aware of the fact. Consciousness of fatigue does not at all keep pace with the progressive exhaustion of the nervous mechanism, with its apparently heightened irritability or power of response.

At this point the scientific interpretation of industrial problems advocated at the outset of this study becomes obvious enough. A flood of light is thrown upon the intricate injuries of speed, overtime, piece-work, and the like industrial requirements. For if fatigue be due to demonstrated chemical action, removable only by proper intervals of rest; if overfatigue or exhaustion results from the accumulation of chemical fatigue products and the destruction of energy-yielding material in nerve and muscle tissue; if strain or labor carried on after fatigue has set in is proved more exhausting than simple work, and if muscular training outruns nervous strength,—then the need for the shorter

workday rests upon a scientific basis. Science makes out its case for the short day in industry.

No one has expressed this mission of science to labor and industrial legislation with more discernment than M. Hector Denis, of the Belgian Council of Labor. In a few eloquent sentences he has transformed the dry business of law-making into a calling of insight and the imagination.*

"Man has a new right," he says, "the right to leisure and rest, as well as work. . . . The history of labor legislation can be given in two words: The right to rest is inherent in man's physiological structure. From this follows the social need to do away with the exhaustion resulting from overwork and to conserve working power, the most precious possession of a nation. . . . Science traces out a path for the modern lawmaker. His difficult but glorious mission is to accomplish the normal synthesis of these two inalienable rights springing from the very laws of life—the right to use one's working powers and the right to conserve them."

7. THE GREATER MORBIDITY OF WOMEN

We have now examined some of the features of our common physiologic life, persistent, though varying with our ages, our states of health, our native intensities, our individual psychological motives and checks. Before proceeding to examine some industrial operations and their demands on human energies, it remains to point out the special susceptibility to fatigue and disease which distinguishes the female sex, *qua* female.

This physiological differentiation between men and women is important in this study because women's physiological handicaps make them subject more than men to the new strain of industry. If now the health of women in industry is shown to be specially open to the inroads of fatigue and disease on account of their physical make-up, they clearly need the protection of special laws.

* Royaume de Belgique. Conseil Supérieur du Travail, 6e Session. 1901–1902. T. I., Fasc. II. Le Repos Hebdomadaire, pp. 168 and 169.

It goes without saying that the fundamental fact which distinguishes women physiologically from men, is their particular sex function—the bearing of children. Their anatomy and physiology is adapted for this primal function, whether or not it is ever to be realized, whether or not they are ever to become mothers of children. The unmarried as well as the married woman, therefore, is subject to the physical limitations of her sex, and each suffers alike from those incidents of industrial work most detrimental to the female reproductive system, such as overstrain from excessive speed and complexity, prolonged standing, and the absence of a monthly day of rest. These and similar conditions are common to most industrial operations and they are particularly harmful to women.

In addition to their susceptibility to injuries of the generative organs, working women have been found more liable than men to disease in general. There is a consensus of opinion among those who have longest observed girls and women at work, that the burdens of industrial life press much more heavily upon them than upon men. Wherever statistics of the morbidity of both workingmen and workingwomen exist, the morbidity of women is found to be higher. Such statistics do not exist in this country, but they are to be found abroad in the records of foreign sickness insurance societies.* The two most important facts to be noted are women's higher morbidity when compared with men in the same occupations, and their longer duration of illness, measured by the number of days lost from work.

More than twenty years ago the eminent Swiss writers, Schuler and Burckhardt, the one a factory inspector and the other professor of hygiene at Bâle, showed† that in cotton mills where both sexes were employed the relative morbidity of men and women was as 100 : 128. This was in the spin-

* See *Journal of the American Medical Association*, Vol. LII, No. 2, p. 138. Editorial, Jan. 9, 1909.

† Schuler, Dr. Fridolin, und Burckhardt, Dr. A. E.: Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz, p. 34. Aarau, Sauerländer, 1889.

ning rooms. In the weaving rooms the morbidity of women was even higher, being as 139 : 100.

These figures have since been confirmed and amplified by other authorities. The most recent authoritative American book on workingmen's compensation gives the morbidity figures of German insurance societies during a period of years. These figures concern men and women *not* of the same trades. The number of cases of sickness among men is greater than among women, but the duration of women's illnesses is longer. Hence, what is technically called the co-efficient of morbidity, that is, the "duration of sickness per member each year," is higher for women than for men.*

PER CENT AND DURATION OF SICKNESS IN GERMAN SICKNESS INSURANCE SOCIETIES, 1888–1907

		1888	*1892*	*1903*	*1904*	*1905*	*1906*	*1907*
Cases of sickness per year per 100 insured.	Men	33.5	36.8	38.3	40.9	41.4	39.4	42.7
	Women	28.8	31.1	33.0	35.4	35.0	33.4	35.6
Average number of days of sickness per case	Men	16.6	17.0	18.1	18.7	18.7	18.5	18.5
	Women	17.7	18.3	21.9	23.2	23.5	24.1	23.4
Days of sickness per annum per 100 insured	Men	555.6	626.6	695.3	762.1	775.9	728.6	788.7
	Women	508.3	569.7	720.4	822.9	927.9	804.7	833.1

The same thing is shown in a recent Swiss report regarding the morbidity of men and women in the Swiss mutual insurance societies.†

* Frankel, Lee K., and Dawson, Miles W.: Workingmen's Insurance in Europe, pp. 240 and 241. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1910.

† Die Gegenseitige Hilfsgesellschaften in der Schweiz im Jahre 1903. Berne, 1907.

"Among 100 insured men an average of 26.76 received sick relief; but among 100 women only 24.26. The men who received sick relief averaged 23.55 days of illness; the women averaged 32.46.

"The women, therefore, showed a lower percentage of relief but a longer average duration of sick time, and as a result of these two circumstances the average morbidity of the women is higher than that of the men—7.87 as against 6.30."

A German authority gives somewhat less recent but interesting comparative figures of German and Austrian sickness insurance societies, showing in each case the same longer duration of women's illnesses. For each 100 persons the days of illness per person averaged as follows: In the German society referred to, the men averaged 21.6 days lost through illness, the women averaged 24.4 days so lost. In the Austrian society the men lost on an average 16.5 days as compared with an average of 18.8 days lost by the women.*

Thus are women physiologically handicapped by a greater general liability to disease, and a peculiar susceptibility to injuries of the generative organs. In a word, they are less resistant to fatigue than men, and their organisms suffer more gravely than men's from the strains and stresses of industrial life, to whose newer aspects we are next to turn.

* Prinzing, Dr. Friedrich: Handbuch der Medizinischen Statistik, p. 110. Jena, Fischer, 1906.

III

THE NEW STRAIN IN INDUSTRY

WHAT, then, are the special forms of overstrain found in modern industry, viewing industrial conditions, as was our premise, from the physiological point of view? In a brief sketch of this vast field it will be possible to single out only a very few features for comment. We can do no more than glance, as it were, at some of the innumerable processes which directly or indirectly feed the machinery of the world, supplying man's needs and luxuries.

Of those elements in industry which are most characteristic and which make the greatest demands on human energies, we may select the following: speed and complexity, monotony, piece-work, and overtime. Let us attempt to gauge the part played by these factors in a few trades, so as to have before us some concrete examples of industrial things as they are. Other fatiguing influences in machine work, such as noise and the mechanical rhythms, will of necessity come within the scope of our brief analysis, as well as the now recognized relation between fatigue and the incidence of industrial accidents.

1. SPEED AND COMPLEXITY

(a) The Telephone Service

Let us begin with our first factors, speed and complexity. Measured by these, few trades can equal in their demands upon the human organism an occupation newly open to the girls and women of our generation and practically new to the last decade. This is the ubiquitous telephone service,—that network of wires which spans continents and binds together,

as never before in history, at least the outward and visible activities of men. Indeed, we could scarcely picture to ourselves the spectacle of modern life without a telephone at every hand, servant of every whim and desire, and by the same token, a new tyrant that few can escape.

Now, one part of this mechanism, one link in the chain between two speakers, is the girl's voice which answers every call by day or night, a link, to most persons, as disembodied and automatic as the receiver on its hook.

We are to look a little more closely at this girl's conditions of work. They are special to her business, but not unfairly typical of the new strain in all industry. Two recent official investigations* give us an unusual abundance of facts by which to gauge that phase of the work in which we are here interested: its effects on the health of the workers; its cost, not in money, but in the outlay of woman's physiological powers.

The whole telephone business is new, dating from 1876. Originally it employed only men and boys. In 1907, according to a report of the Bureau of the Census, there were 76,638 female operators in the United States as against 3,576 male operators. Something like twice as many persons were employed in other positions as clerks, mechanics, officials, and so on. We shall confine ourselves here to the work of the women operators.

These thousands of "telephone girls" whose ages vary from sixteen years upward, are in a sense picked workers.† In most cities, the companies require for the efficiency of the service, a physical examination of all applicants, and seek to exclude girls and women suffering from eye, ear, throat, or heart trouble. Most companies have also an educational

* Report of the Royal Commission on a Dispute Respecting Hours of Employment between the Bell Telephone Company of Canada, Ltd., and Operators at Toronto, Ontario. Ottawa, 1907.

Investigation of Telephone Companies made by the United States Bureau of Labor. Senate Document No. 380, 61st Congress, 2nd Session. Washington, 1910.

† In one large city, out of 6,152 applicants, 2,229 were refused. (Senate Document No. 380, p. 19.)

requirement, accepting no applicants who have not completed the fifth or grammar grades of the public schools. Most companies also give a month's training in a telephone school where applicants learn the mechanism of the switchboard and the manifold duties of telephone operating.

These picked workers also receive, on the whole, more intelligent care than other industrial workers. Fair ventilation of workrooms, rest rooms, luncheons provided at cost, and free, hot beverages at lunch time,—all these elementary "welfare" provisions have been found useful in keeping up the operator's efficiency and are therefore provided by most companies.

So much we have on the credit side of the business, physiologically viewed. What, then, is on the debit side? To gauge this, we must briefly describe what telephone operating is. The most concise description of this intricate subject involves a certain amount of technical detail, since the simplest form of telephone connection requires eleven separate processes on the part of the operator. Yet in no other way than by tracing these separate operations can we intelligently gauge the tax of this occupation. The nature of the work, the large and daily growing number of girls and women engaged in it throughout the country, and the fact that prominent physicians in one community have expressed themselves forcibly upon its physical effects, warrant our devoting material attention to these otherwise unrelated details.

The center of the telephone system is the "exchange." On entering the operating room of an exchange one sees perhaps one hundred young women seated side by side, on adjustable chairs facing the switchboard, which extends in the form of a semicircle or "U" around three sides of the room. The switchboard looks not unlike a continuous line of upright pianos in front of which the girls are seated. Only, the key-board or flat shelf extending out from the six-foot high vertical face of the board is usually wider than a piano key-board, varying in width from six inches to a foot. The

vertical face of the board is marked off into sections and panels, honey-combed with holes. Each hole in the lower panel of the vertical board is the terminal of a subscriber's telephone, and the holes are so distributed that each operator has before her a certain number of telephones for which she is directly responsible. Just over each hole, or "answering jack" as it is called, there is a glass-covered orifice, containing a miniature incandescent lamp, which glows whenever a subscriber lifts his receiver from the hook. This light, together with a clicking sound which she hears through her receiver whenever she "listens in," signals to the operator that she is being called.

On the upper half of the vertical board known as the "multiple" are the terminals, or jacks, of all telephones connected with the exchange, by means of which the operator can connect her subscribers with the persons whom they wish to reach. These upper jacks are repeated or "multiplied" over and over throughout the switchboard, usually once in each section, or each six feet, so that the operator can reach any line for which she is asked.

On the horizontal shelf or key-board, extending out from the vertical face of the board, there are two rows of small metal plugs, attached to cords, the points of the plugs alone showing above the surface of the board. A little nearer to the operator, on the shelf, are two rows of tiny glass-covered signal lamps similar to those over the subscribers' jacks described above, and still closer to the operator, on the shelf, there is a row of small levers or keys.

Such is the apparatus, together with the operator's individual "set,"—a receiver strapped over her ear and a mouth-piece or transmitter suspended so that she can conveniently speak into it, leaving both hands free. When a subscriber lifts his receiver to call "central," the signal light immediately flashes out at the terminal of his line on the switchboard. The operator thereupon gets into communication with the subscriber by inserting one of the plugs with its attached cord into the hole or jack correspond-

ing with the glowing light. She then throws forward one of the levers known as the "listening key." This connects her with the calling subscriber and extinguishes the signal light. She asks, in the wellknown phrase, "Number, please," and upon receiving a reply makes the desired connection as follows: She inserts the companion end of the cord which she has used (the cords are in pairs with a plug at the end of each), into the proper hole on the upper "multiple" portion of the board, bearing the number of the desired person. She also rings up this second person by pressing another lever, at the same time discontinuing her listening key.* Then she makes her first entry upon a prescribed slip, in order to register the call.

Thus two subscribers are in communication. But there must be some way for the operator to learn automatically when the conversation is ended. Therefore each pair of cords have connected to them two of the tiny signal lamps. When the operator inserts the plugs into the jacks their corresponding lights begin to glow. As soon as the called subscriber lifts his receiver the signal light goes out, showing the operator that her ringing has been answered. The lights remain out during conversation, but as soon as the subscribers have finished and hang their receivers, the lights above the companion plugs again begin to glow. This warns the operator to sever the connections and to clear the jacks for the next call.

Thus the telephone girl must be continually at the top-notch of expectancy, watching intently for the flash of the signal lights, responding instantly to the clicking sounds heard whenever impatient subscribers move their hooks up and down, making and severing connections with all the speed she may.

The mere statement of these operations in the simplest form of telephone connection, gives us some insight into the prodigious strain of this occupation upon the special senses,—

* In New York City, the operation of ringing and listening is done with one key.

sight, hearing, touch,—as well as the muscular exertion of reaching high up and to the side. We cannot here enter into the complex modifications of the general system described above (as when a subscriber is called whose telephone terminates in a different exchange), and the many different color signals which the operator must instantly recognize when they flash before her, such as, toll calls, nickel machine calls, and many others.

As regards the physical effects of the work, we are fortunately not thrown upon surmise but have expert medical testimony to draw upon. This is available in the remarkable report of the royal commission appointed to investigate a dispute between the Bell Telephone Company of Canada and their operators at Toronto. The 26 physicians who testified had examined the exchanges and the nature of the work. We must postpone until our next chapter their detailed statements as to the detriment to health from overwork in the taxing telephone service, the specific injuries to the sense organs, and the disastrous reactions upon the operator's nervous system. Here it is enough to say that after weighing the physicians' testimony and recommendations, the royal commission, with some misgivings, permitted the total number of working hours for women switchboard operators to be fixed at seven hours, broken by several relief periods and spread over a period of nine hours.

The commission took pains to say, however, that in view of the medical evidence before them, a seven-hour workday for telephone operators seemed to them "still too long," and they concluded:

> "In our opinion a day of six working hours spread over a period of from eight to eight and three-quarter hours, and under as favorable conditions as may be expected in an exchange doing a large business, is quite long enough for a woman to be engaged in this class of work, if a proper regard is to be had for the effect upon her health."*

* Two hours' work, ½ hour relief, 1½ hours' work, 1 hour intermission, 2 hours' work, ½ hour relief, and 1½ hours' work. Report of the Royal Commission, pp. 99–100.

Such being the royal commission's mature conclusions, we turn to consider the same work in the United States, as set forth in the recent report of the United States Bureau of Labor. The methods of operating here and in Canada are the same.

Where the royal Canadian commission found seven hours "still too long" and recommended six hours, we find the *average* hours of work in the United States reported as eight and a half hours per day. But this is one of the averages which hide the truth, and, in practice, owing to various reasons, the actual working hours are much longer. Telephone operators are divided into various working groups, or "tricks," who come on and go off duty at widely varying terminal hours, and have their luncheon and relief periods at separate times. During certain busy hours of the day, known as "peak of the load," morning and afternoon, the service is vastly increased and requires an increased number of operators. These various arrangements of work are necessary because the telephone exchange is never closed. The fires of Vesta burn day and night! They must be tended unceasingly.

If the *average* working hours are eight and a half per day, then many girls must work longer than that each day, as others work less. Thus, to mention merely at random some daily hours far in excess of the average eight and a half, in 1910 the night operators of the Bell Telephone System were reported working fifteen hours in Springfield, Missouri; twelve hours in Kansas City, Missouri; nine hours in New Orleans, Louisiana, and in Dallas, Texas. Day operators were reported as employed ten hours net in Kansas City, and nine hours net in Atlanta, Georgia. And the day operators of the American Telephone and Telegraph Company were reported as employed nine hours net in Kansas City and New York City.*

The requirement of overtime work makes the workday even longer, although the hours officially reported already

* Senate Document No. 380, 61st Congress, 2nd Session, pp. 37 and 38.

by far exceed the maximum deemed compatible with health by the Canadian physicians.

The custom of requiring overtime in most companies lengthens the workday by adding from a few minutes to two and a half hours. The American report is full of references to this pernicious practice. In one city, for instance, where overtime is "not above the average," the company reports that, on overtime, their day operators are on the premises twelve and a half hours and on duty ten hours. Overtime is stated to be an "integral part" of the schedule of hours in a number of telephone companies.

"Operators not only are asked to take their turn in working extra hours, but in some companies a regular extra period is assigned to each operator for certain days each week. She is virtually compelled to do this extra work, lest by refusing she incur the displeasure of her chief operator, or get the reputation of shirking her share of work."*

The report of the commission to investigate the conditions of working women in Kentucky, states that in one exchange where the regular hours were nine in one day, an operator worked 39 hours overtime during the first two weeks of November, 1911, in addition to her daily work. The report adds: "This is not an exceptional case. Many other girls are working as long hours."†

One of the most vicious forms of overtime is known as "working through"; that is, working on both a day and a night shift. Thus, in one company, where the shift known as the "split trick operators" usually work eight hours (from 11 a. m. to 2 p. m., and from 4 to 9 p. m.), an operator who "works through" is employed thirteen and one-half hours (from 11 a. m. to 2 p. m., and again from 4 p. m. to 7 the next morning), with four and one-half hours off duty during the night.

* Senate Document No. 380, p. 110.

† Report of the Commission to Investigate the Conditions of Working Women in Kentucky, p. 30. Louisville, December, 1911.

"The next day the operator reports as usual. In one case a fifteen-year-old girl (who claims to be sixteen) is reported 'working through' four times in two weeks. While this is not a regular thing," says the report, "it is done with sufficient frequency to be worth noting."*

In connection with overtime work, nothing is more striking than the extreme variation in the number and percentage of operators employed on overtime in various cities. In New York City, for instance, it is reported that less than one-fifth of one per cent of the operators work overtime in a given period. In Boston and Washington, also, the number is small, while in New Orleans and Omaha over 90 per cent of the operators worked overtime during the same period. In Cleveland, Louisville, and Nashville, over 85 per cent, in San Francisco and Dallas, Texas, and Atlanta, Georgia, over 60 per cent of the operators are reported to have worked overtime.†

Besides overtime, several other hardships of the telephone service which are prominent in the American report, and greatly intensify the strain of this occupation, need mention. One of these is the almost universal requirement of Sunday work twice a month. This hardship speaks for itself and scarcely needs comment. It means that for most operators the day of rest, which may not be lost without physiological retribution, comes only once a fortnight. Sunday and holiday work clearly cannot be avoided in the telephone service, but as the report remarks, only two large companies "have discovered that this need not mean seven days' work each week."

A second acute hardship of the service concerns the relief periods, usually fifteen minutes long, which are designed to break the morning and afternoon work. The Canadian physicians laid supreme stress upon the importance of such reliefs as absolutely indispensable periods of recuperation, considering even twenty minutes off duty too short to compensate for a two-hour period of work; but in many com-

* Senate Document No. 380, pp. 111–112. † Ibid., pp. 90–91.

panies these reliefs are regarded by the management as favors to be given or withheld at will, rather than necessities. At any "rush" when most needed, the reliefs are most often curtailed. Of 331 girl operators interviewed by agents of the Bureau of Labor, 126, or more than one-third, reported that they had either no relief or received it only on request.

"Where this system obtains, girls feel a reluctance to ask for relief; sometimes they feel that to do so is to jeopardize promotions, and the new operators who need it most are usually the very ones who fail to get it, because a feeling of strangeness or timidity keeps them from asking favors."*

A third hardship of the telephone service, as disastrous to the operator's health as the loss of the "relief," is known as "excess loading." This concerns the number of calls handled by each operator per hour. Most of the experts for the companies consider 225 calls per hour the "breaking point of efficiency," that is, the number which cannot be greatly exceeded for many minutes without injuring the service rendered to the public. As the report rightly states:

"It is safe to say that the breaking point of the operator's health is not far from the breaking point of efficient work."†

"She is expected to give all the subscribers the quickest possible service in the order in which their calls come in, but when several signals come at once and others come before these can be cared for, the order of calls is necessarily lost and the effort is concentrated merely on clearing the board, or catching up. It must not be forgotten that with each signal there is not only the flashing of a small light in the operator's eyes, but there is a clicking sound in her ears through the receivers fastened to her head. So when the impatient subscriber, angry because his call has not been answered, moves the receiver hook of his 'phone up and down rapidly, he flashes the signal light in front of the operator, and produces a click in her ears every time the hook goes up and down. The consciousness of numbers of people waiting for call connections she is unable to make, and that each one is growing more impatient each second; that a supervisor is standing

* Senate Document No. 380, p. 33. † Ibid., p. 60.

behind her either hurrying her or calling her numbers to be taken by other operators; that a monitor may plug in and criticise any moment,—these, with the height of up-reach and length of side-reach, go to form the elements of strain on the operator who is 'overloaded.'"*

Yet, in spite of its known effect upon health and efficiency, an inexcusable degree of overloading exists in a wide range of cities, chiefly in the south and west. Accepting an average of 225 calls per hour as the breaking point, many exchanges were found exceeding that number for all operators in the exchange. The table below gives some of the cities found exceeding not only this accepted limit, but exceeding 275 calls per hour.†

TELEPHONE EXCHANGES IN FIVE CITIES WHERE CALLS EXCEED 275 PER HOUR

Company	*City*	*Exchange*	*Hour Ending*	*No. of Calls*
Mo. and Kansas Tel. Co.	Kansas City, Mo.	West	9 P.M.	281.7
Pac. Tel. and Telegraph Co.	Los Angeles, Cal.	East	6 P.M.	285.2
			7 P.M.	317.0
			8 P.M.	303.0
	San Francisco, Cal.	Market	11 P.M.	279.0
		Franklin	3 P.M.	308.3
	Seattle, Wash.	Queen Ann	6 P.M.	283.2
So. Bell Tel. and Telegraph Co.	Birmingham, Ala.	Main	11 P.M.	301.5

(b) Speed in the Needle Trades

Turning now to other industries in which women and children are employed in great numbers, we find a similar

* Ibid., p. 56. † Ibid., p. 61.

state of affairs. Let us next consider the typically feminine occupation of sewing, the traditional sphere of womankind.

It is undeniable that a great saving of human energy was accomplished when the first power machines replaced the ordinary foot sewing machine. Long hours of work at foot sewing machines had been responsible for many female disorders and had wrecked the lives of many women. But we must not close our eyes to the cost of the new order.

Mention has already been made of the increasing perfection of motor sewing machines. Some kinds, as we have seen, now carry 12 needles, others set almost 4000 stitches a minute. Let any observer enter a modern roaring, vibrating workroom where several hundred young women are gathered together, each at her marvelous machine, which automatically hems, tucks, cords, sews seams together, or sews on the embroidery trimming of white underwear. In the well equipped shops each girl has a brilliant electric light, often unshaded, hanging directly in front of her eyes over the machine. Her attention cannot relax a second while the machine runs its deafening course, for at the breaking of any one of the 12 gleaming needles or the 12 darting threads, the power must instantly be shut off. The roar of the machines is so great that one can hardly make oneself heard by shouting to the person who stands beside one.

What must be the physiological effect of work so carried on during long hours? In New York state, for instance, the great center for the manufacture of women's stitched white wear, which is supposed to have been perfecting its laws for women since their first enactment twenty-six years ago, young girls who have reached their sixteenth birthday may legally be employed at power machines twelve hours in the day during five days in the week.* Illegally, they are employed even longer at "rush" seasons.

The strain of this industry is further intensified by two other factors, which will be discussed subsequently more at length, but which must not go unmentioned here. Pay so

*See page 4 for new law enacted in 1912.

low that it makes a less than living wage, and great irregularity of employment, exist in the stitching trades in combination with the excessively long hours, possibly because of them. These factors, at any rate, make an evil combination,—upper and nether millstones between which the health of the girls and women in this trade is almost inevitably ground. It is true that some girls earn high wages at piece-rates during the busy season, reaching $18 and $20 per week. But the busy season is short—varying from two to three months for the winter, and again for the summer trade, and the year's earnings of the best paid workers fall short of decent self-support. The great majority earn wages so low and so precarious (from $4.00 to $8.00 or $10 per week), with weeks and months of non-employment, that were it not for the testimony of trustworthy witnesses it would be scarcely credible that women living away from home and wholly dependent upon themselves, could support life on such a yearly income.*

These allied problems of low wages and irregularity of work may seem to lead too far afield from our special interest in industrial overstrain. But they are closely knit to it, and in a dozen ways are related to the length of the day's work. With over-long hours, even with the ten-hour day, all that double burden of household work added to wage work, which no workingwoman can wholly escape, becomes more burdensome. Whether she lives at home, her own or her parents', and helps in the household, or lives alone and is thrown on her own resources for clothing and clean linen as well as for food and for some sort of habitat, she must find time for some domestic duties after her wage work is done.

Two traditional economies of women, unattained by men, are washing their linen, and mending, if not making, their own clothes; and after a working day of reasonable length, working girls can and do achieve these economies without too great a tax upon their endurance. But when overtime

* Clark, S. A., and Wyatt, Edith: Making Both Ends Meet. New York, Macmillan, 1911. (These articles are based upon a study made for the National Consumers' League of the income and outlay of more than 200 working girls, living away from home, in New York City.)

confines them, as it does in the stitching trades, until nine and ten o'clock at night, irregularly, for weeks in succession, we find such pitiable items as those disclosed in the study above referred to, of 200 working girls who live away from home in New York City. In one case of extreme overwork, out of a total yearly expenditure of only $41.85 for all clothing, an unhappy overworked girl spent $15.60 for stockings. She lacked time and strength for the humblest care of her wardrobe, darning stockings, and instead, continued all year to buy two pairs a week, at 15 cents each. In another case a similar disproportionate expenditure of $23.52 for 24 shirtwaists at 98 cents a piece, out of a whole year's expenditure of $194.50, resulted also from an exhausted girl's lack of time and spirit for mending. The remarkable folly of such expenditures makes them none the less piteous evidences of the exhaustion of these girl operators, alternately overworked at high power machines and then left destitute of work and health.

Many other ways might be shown in which low wages together with the excessive length of the workday contribute to the new strain of industries. Physiologically considered, as we shall see, the worst effect of low pay, especially low piece-rates such as prevail in the stitching trades, is their incentive to a too great intensity of work, and to a feverish speed on the part of the operators.

(c) The Textile Industry

In the sewing trades, then, the elements of speed and complexity are growing by leaps and bounds. The same thing is evident in another great trade, employing women and children, the textile industry. Here the increasing strain upon the workers, due to improved equipment, may be described by one of the officials whose daily work brings them into contact with the conditions of which they speak.

"For the first time women were interviewed who were running twelve and sixteen Draper looms. These machines

are practically a recent addition, and are so arranged that the filling in the shuttle is changed automatically, thus enabling them to go at a greater rate of speed and with less interruption. The women are not expected to clean, oil or sweep. This matter was quite fully discussed and the complaint made that the work was too hard, but that they tried to do it, as they were dependent upon their positions and they knew there were plenty of foreign men waiting for their places. Where a woman has been accustomed to tend a six-loom set, with the Drapers she is given from twelve to sixteen, which extend over quite an area. There is no time for sitting during the day, as when employed on the other looms. One woman said she could not sleep at night after running these vast machines, and many have had to give up their places and find other work.

"This marks another evolution in the machinery world. Years ago, a woman tended two slowly running looms. Later, as the hours of work grew less, the number of looms was increased to four and six, and now with the Drapers, an operative is expected to look out for twelve or sixteen."*

Even this statement does not fully cover the facts. It is not uncommon in New England mills for one weaver to tend from 16 to 24 Northrup or Draper looms. The number of looms attended by one weaver has even risen as high as 36 in southern and, less frequently, in northern mills. But the output is said to be less satisfactory than when each worker runs a smaller number of looms.

It is true that the new automatic attachments of the Draper loom enable weavers to run a larger number of such machines with no greater effort or fatigue than was formerly involved in running a smaller number of old looms. But this is true only up to a certain point. According to a liberal estimate, after a weaver is required to attend more than 18 looms, the advantages of the new devices are more than counterbalanced by the increase in numbers, and the strain of the occupation becomes too great. Thus, for instance, the strain upon the weaver's attention was greatly lessened by such an automatic invention as the recent warp stop-motion, whereby

* Report of the Maine Bureau of Industrial and Labor Statistics, 1908, pp. 42–43.

power is automatically turned off and the loom stops at breakage of the warp. But when one weaver has perhaps 24 looms to tend in place of the former eight, the strain upon attention in watching for the automatic stoppage of the looms is even greater than before. Since the weaver's wages depend upon the continuous running of the machines, the strain is continuous.

The space over which 24 looms extend requires also much more walking on the part of the weaver, since she may be called to and fro to any one of the looms in turn, to any place in the alley or alleys along which they are ranged. Yet the physical and nervous cost of running three times as many looms as before the Drapers were invented, has been so little regarded that the manufacturers of the loom prophesy* an even greater increase in the number of machines per worker. They see no reason why in time one weaver should not run 50 looms, provided only that a sliding seat be arranged along the alley to relieve her from constant walking to and fro. If this hopeful prophecy is not fulfilled, it will probably be due to the unsatisfactory economic results of the machinery rather than to any consideration of the human agents.

2. MONOTONY

Besides speed and complexity of operation, work with the Draper looms illustrates also a third factor in industrial strain, mentioned at the outset; that is, monotony of occupation. Weavers formerly varied their work by cleaning and oiling the machines, fetching their own filling, etc. Now all these things are done by less skilled hands, while the weaver, in order to keep up with the number of her looms, attends strictly and continuously to running the machines.

In all trades, operations tend to become more and more machinelike in regularity and sameness. Labor tends to become more and more subdivided, each worker performing steadily one operation, or part of one operation.

* Labor Saving Looms, p. 112. Third Edition. The Draper Co., Hopedale, Mass., 1907.

This kind of single-minded concentration of the workers upon their immediate tasks obviously makes for speed and perfection of output. It is an integral part of the new industrial efficiency of our day and it saves constant waste, both of time and of materials. But we must also consider the reverse side of the picture. If concentration and subdivision are part of the new efficiency they are part, too, of its new strain. So far as the workers are concerned, subdivision and concentration are added hardships of the long day. For they lead to that monotony which results from the endless repetition of the same operations, and against which the human spirit innately revolts. Monotony, indeed, may make highly taxing to our organism work which is ordinarily considered light and easy. This may be observed in many different occupations.

(a) The Canneries

Thus, in the canneries, which are increasing from year to year in every fruit and vegetable growing state from Maine to California, the chief fatigue of the work is due to its combined speed and monotony.

We may well examine a little in detail some of the ordinary cannery processes, because they illustrate the new strain of industry which we are considering, and because the physical and nervous tax of these occupations has been little recognized throughout the country. A comparatively short span of time has sufficed to see evolved from the yearly preserving and jelly pots of our mothers' generation the highly speeded, intricate machinery of the modern canneries. Indeed, the transformation of the industry is not yet complete. Canning has still the double disadvantage of a household and a factory business. Cannery workers suffer from all the pressure and speed of great commercial establishments. They suffer also from the canner's inadequate methods of management, inherited from the original home work which preceded the canneries. When each family provided for itself a winter's supply of fruits and sweets, there was little hardship in a

few days' work at picking and preserving. It is popularly supposed that canning today is very much the same, and that it affords farmers' wives and children, in certain parts of the country, pleasant holiday work and pin money during the summer.

But in reality this is far from true. We may take as typical, in spite of local differences, the canneries in New York state, since a recent official investigation* describes the conditions there, and they happen also to be familiar to the writer.

Any person who is not familiar with these establishments must imagine them situated sometimes in open country, sometimes on the outskirts of small towns, throughout the central and western part of New York state. A cannery usually consists of one central building, where the machinery is supposed to be located, and adjoining sheds where the work of preparation—such as stringing beans, husking corn, hulling strawberries, peeling beets, tomatoes, etc.—is supposed to be performed.

On the whole, the new strain in the canning industry has come, as in most industries, with the introduction of machinery. It is true that even the familiar work of preparing fruits and vegetables for canning has become more taxing to the health of the workers, on account of the greater speed at which it is done, owing to the very low piece-rates paid for this work.† But the main change since canning was taken out of private kitchens has been due to the machine processes. Two of the most important of these are known as "sorting" and "capping."

For "sorting" vegetables, conveyors or endless moving bands carry past the girls and women seated or standing at the sorting tables, a ceaseless stream of peas or beans to be picked over for broken or spotted vegetables, thistle buds, or other imperfections. Hour after hour, from morning until

* Annual Report of the Bureau of Factory Inspection. Report on the Work of Children and Women in Canneries. New York State Department of Labor, 1908.

† One-half to one and one-half cents per pound for stringing beans, etc.

night (except for stoppages from breakdowns and irregularity of supply), the workers' eyes and attention must be intent upon the moving stream before them, shoving back the tide with one hand if it comes too fast, while with the other they pick out the imperfections which must not be allowed to pass into the cans. The work is sufficiently easy, so far as muscular exertion goes, but the tax upon eyes and attention is severe, and even after considerable experience, women complain of the nausea and dizziness resulting from the monotonous examination of the moving surface of the conveyors.

The work of the "cappers" is more severe than that of the "sorters" on account of the greater speed at which the conveyors are run. When the cans have been filled with fruits or vegetables, and covered with brine or syrup, they are ready to be hermetically sealed. The conveyors carry them from the automatic "filler" to the sealing or capping machine. One to three "cappers" are employed, who place the metal caps or covers on the filled cans in rapid succession as they file past swiftly to be soldered. The capping girl sits close to the red-hot sealing irons, usually holding a number of caps in her hand, and dropping them monotonously, one at a time, upon the cans as they pass swiftly on the tireless conveyor, at a rate varying from 54 to 80 cans per minute. It is said that a second capper is usually employed on machines operating faster than 60 cans per minute.

The fatigue of the work at the conveyors or sorting tables is increased by the unnecessarily constrained and uncomfortable positions to which the girls are subjected. The tables are rarely at a right height to make this work as easy as possible. Sometimes they are so high that the workers must stand all day; sometimes so low (3 feet from the ground) that the workers cannot sit with their knees under the tables, but work in twisted and awkward attitudes. Moreover, the seats themselves are totally inadequate. According to the New York report, of about 1,400 girls and women engaged in sorting peas and beans at various factories in the summer of 1908, only about 180 had chairs to sit upon. The others

were supplied with inadequate boxes, crates, stools, or benches. During a long workday, not infrequently exceeding twelve hours, the difference between being comfortably seated at work or crouched upon an improvised support is self evident. Yet these two operations of "capping" and "sorting" employ more women in the canneries than any other machine operations. The New York report states that about 1,400 persons were employed at "sorting" peas and beans alone. Two hundred and twenty-seven girls were employed in "capping" peas, beans, corn, tomatoes, and fruits.

Besides the work of "sorting" and "capping," another machine operation is highly taxing. This is feeding the corn cutters, and it is also performed by women. The workers feed ears of corn into the cutters at topmost speed.

"It is very rapid work," says the New York report,* "the machine is very noisy, kernels of corn are flying everywhere, and everything is damp and sticky from the juice of the cut corn. Of the 61 women employed at this work, 41 were standing. The cutters are operated at high speed and as 'their capacity is only limited by the rapidity with which the feeder can place the ears in the feeding trough,'† the operators are expected to work, and do work, at high tension."

Such is the nature of the most important machine operations at which women are employed in the canneries.

It is true that the working *year* is short. Canning is, perforce, a season trade, though the season lasts much longer than merely a few weeks, as the canners would have us suppose. In establishments which can peas, beans, and corn only, the season is from about the last week of June until about the middle of October; that is, between three and four months. Canneries where fruit is packed have a longer season: strawberries ripen in June and apple packing is often carried on into December, so that the season lasts between six and seven months.

* Op. cit., p. 374.

† "Circular of sales house distributing one of the leading makes of corn cutters."

Even longer duration of employment is reported by the latest government investigation of canning establishments in Maryland and California. Agents of the United States Bureau of Labor studied the conditions of employment in both city and country canneries. The government states that 10 Baltimore canneries, operated during twenty-nine to fifty-two weeks in the year; that is, between seven months and an entire year. Four of the canneries reported a range of fifty weeks or over. Five city canneries in California varied in duration of operation, but four of the five had a season of more than twenty-nine weeks; that is, over seven months. Four country canneries in California varied between nineteen and one-half to twenty-four weeks in operation.*

Moreover, our studies in fatigue have shown us that overwork is not balanced by idleness, when the physiological limits have been over-run. Girls in the critical period of adolescence, and women who are overstrained during half the year, or even during a quarter of the year, may be permanently wrecked in health. That they are so overstrained has been shown by repeated private investigation of New York canneries. During the summer of 1911, women were observed working fifteen hours a day during successive days.

According to the Bureau of Labor Bulletin, in 10 Baltimore canneries employing 2,214 women the hours of labor reported by the employers themselves include "days of 17½, 16½, 15½ hours, and weeks of 93, 91½ and 81 hours."† In California, the employers themselves report "days of 18, 15 and 13½ hours, and weeks of 96½, 90 and 83 hours."

In the cannery occupations, eyestrain is an added tax, but in many kinds of work it is the sheer repetition of uninteresting samenesses that makes the work fatiguing. So in the making of paper boxes, the infinite repetition of mechanical movements—steadying a strip of paper in a box-covering machine, guiding it by a gauge and replacing the

* Bulletin of the U. S. Bureau of Labor, No. 96, September, 1911. Hours of Women's Work in Maryland and California, pp. 355 and 393.

† Ibid., pp. 355 and 393.

strip by another when it runs out—continues for ten hours in the day, or longer at "rush" periods. In a factory where hinges are made, girls spend a long day's work putting 50 hinges a minute through a machine, lifting a hinge out, slipping it into place, replacing it by another hinge, unvaryingly —and the list of such occupations might be indefinitely extended.

(b) Shoe Making

Even in trades which require highly skilled workers, the processes of manufacture are so subdivided, and are so reduced to the simplest units, that a man or woman spends his or her entire working life performing over and over a fractional part—sometimes less than one-hundredth—in the construction of a whole.

No trade illustrates better this minutest subdivision of work than the making of shoes. Ten years ago the United States Industrial Commission, in its report on the hours of labor in various industries, took occasion to mention specifically the greater intensity of labor "in the boot and shoe factories where the operator is required to handle thousands of pieces in a day and guide them through the machine." In the decade which has passed since this was written, the speed and subdivision of work at shoe machinery have been greatly increased. We may obtain an idea of the extraordinary specialization in this trade at present when we learn that a well-built shoe has passed through the hands of about 100 workers and through the operations of about 60 different kinds of shoe making machinery.* These figures do not include the workers in the stitching room, where a separate force sews together, on specially constructed sewing machines, the pieces of leather and lining which make up the so-called "uppers." From the stitching room, the flat, sewed uppers are sent to the making or "bottoming" room, where they are shaped over lasts fastened to the soles, and made up into the forms which we recognize as shoes.

* Goodyear Welt Shoes, How They Are Made. United Shoe Machinery Co., Boston, 1909, p. 11.

Of all these machines and operations which go into the making of shoes, we will examine two a little more closely. The first of these is the "upper trimming" machine, through which the shoe passes on its way to completion.

The stitched upper has already been pulled over the wooden last, which gives the shoe its shape, by an extraordinarily ingenious machine that pulls the leather with pincers evenly and tightly down over the last, driving in a tack at every pull, so as to hold the upper exactly in place on the last. In pulling the leather over the bottom edge of the last, there is naturally a surplus amount of leather left at the rounded toes and some along the sides of the shoe. This is "crimpled" or fulled in against the insole. Now the trimming machine, which we are considering, trims off this surplus leather fulled in at the toes and side, so as to make the bottom as smooth as possible before the sole is sewed on. The trimming machine consists of a sharp knife edge, operating constantly against a sharp edged revolving top. The man who works the machine stands, holding upside down somewhat below the level of his eyes, the partly made, still unsoled shoe. He turns it skilfully and rapidly on the revolving top, against whose sharp edge the second knife-blade operates, cutting off all the surplus crimpled leather. The work is extremely rapid and absolutely uniform. But it takes skill and close attention. The machine could easily cut off too much, or could cut into the upper, if the swift handling of the shoe were not exactly correct. The workman must be skilled, but all that constitutes his work is daily to revolve in his two hands about 2600 pairs of shoes, or 5200 single shoes. The expert workers are able to trim off that number of uppers daily in this machine. It is not surprising that such monotony of occupation should be a factor in fatigue. For the work is unvaried. The man who operates the upper trimmer does nothing else. His skill and speed have been acquired by the extremest specialization. He performs, perhaps, less than one-hundredth part in the making of a single shoe, and he does not know how to operate, or

would be extremely awkward at, the machine next him which performs a different hundredth fraction of the manufacture.

This is men's work in shoe making. The next example is women's work. It is the operation of the new eyeletting machines, which move with what the makers rightly describe as "bewildering rapidity." The girl who operates this machine sits in front of it, guiding the flat sewn uppers, which are to have eyelets punched into them, somewhat as she would guide the material in a sewing machine. She adjusts levers and various mechanical contrivances to regulate the speed and spacing of the eyelets. Women maintain that they can work faster than men at this machine, because they can keep a supply of uppers ready in their laps, while men are obliged to keep their supply of uppers next to them and have to make an extra motion of the arm to pick them up. The output of the machine varies according to the spacing of the eyelets. Men's shoes, which have only four or five evenly spaced holes, naturally go more quickly than women's, which have often as many as 12 holes irregularly spaced. An expert worker at the eyeletting machine can finish 2000 pairs of ladies' shoes in one day, although this amount, like that given above, is probably 20 per cent higher than the average worker's output.* Again, the work is skilled, extremely swift, and monotonous. The workers do not have the opportunity of relaxing the particular kind of attention which their machine requires, for each one is a specialist in her own fractional field only. It is the acme of subdivision.

Astonishing as are the material results in output, this minute division of labor and the unrelieved monotony of work which it brings must be counted in any effort to appraise the new strain of industry. Not machine workers only, mere feeders of larger automata, but hand workers too, suffer from the blight of monotony. The girls and women who pack the innumerable small objects which must be wrapped before

* Statement in a letter from a representative of the United Shoe Machinery Co., March 4, 1912.

they reach the retail stores—such as all sorts of glass objects, lamps, crackers, candy, and other food-stuffs—have an occupation of unrelieved monotony. It requires no more judgment or skill than to feed a machine, only speed and the indefinite repetition of dull, mechanical movements.

3. PHYSIOLOGY OF MONOTONY

It goes without saying that monotony of work, of which these are random examples, cannot be avoided in our industries. It is a part of their development, and even when ingenious machines are invented to do work previously done by hand, the running and feeding of such machines often provides only another form of monotonous work for the human agent. With subdivision, and the loss of craftmanship, monotony of work in greater or less degree is inevitable, and may well be accepted as such. For when once monotony is recognized as a real hardship, and as in itself a source of fatigue, rational means of relieving it may be sought, in shortening hours of monotonous labor and alternating work of different kinds. An interesting example is given by a German factory inspector of excessive fatigue resulting from light, but monotonous, work on corset steels, which was relieved by periodical changes of work for the employes in question.* Enlightened employers in various industries have found such alternations of work practically beneficial in stemming fatigue.

From our physiological point of view, this is entirely logical, because the strain of monotony is not due merely to the distaste for work and the aversion it engenders. Monotony of occupation is a true factor in inducing fatigue, because it has a true physiological basis, which can briefly be made clear. We know that with repetition and sameness of use there results continuous fatigue of the muscle or organ used. So, too, with the nerve centers from which our motive power

* Quoted by Dr. Emil Roth. Ermüdung durch Berufsarbeit. Fourteenth International Congress of Hygiene and Demography, Berlin, 1907, Vol. II, Sec. IV, p. 614.

springs. We must bear in mind that the special functions of the brain have separate centers. Thus, there is a center for hearing, another for sight, another for speech, etc. When certain centers are working continuously, monotonously, from morning to night, day by day and week by week, it is physiologically inevitable that they should tire more easily than when work is sufficiently varied to call upon other centers in turn.

The monotony of so-called light and easy work may thus be more damaging to the organism than heavier work which gives some chance for variety, some outlet for our innate revolt against unrelieved repetitions. Monotony often inflicts more injury than greater muscular exertion just because it requires continuous recurring work from nerve centers, fatigue of which, as we have seen, reacts with such disastrous consequences upon our total life and health. The evils of monotony illustrate again how closely all the functions of our life are bound up together; how the physical and nervous and psychic parts of us react and interact upon one another. Aversion from a monotonous grind of work, the effort of the will to "keep up," requires just so much more nervous stimulus from already tired nerve centers.

4. NOISE

In both the needle and textile trades, which we have taken as types of work involving speed and complexity, fatigue is the more quickly induced by other attendant influences which are common to most machine work. One of these fatiguing influences is the noise of the machinery.

The fatiguing effect of the roar of machinery is chiefly due to its influence upon the faculty of attention. Mental fatigue is "characterized pre-eminently by a weakening of the powers of attention."* Voluntary attention is essentially a selective process, a "focalization and concentration of consciousness"† upon one thing or a few from among the multi-

* Lee, op. cit. Harvey Lectures, 1905–06, p. 180.

† James, William: The Principles of Psychology. Advanced Course, p. 426. New York, Henry Holt and Co., 1899.

plicities, physical and mental, in whose midst we live. There is thus in attention a sensation of effort, and fatigue of attention is in direct proportion to the continuance of the efforts and the difficulty of sustaining them. Now, under the influence of loud noise, attention is distracted and the difficulty of sustaining it increased.

The term reaction time, as is well known, is used for the minute interval between the occurrence of some external phenomenon and the signal of its having been perceived by any given individual. This interval is, as a rule, almost infinitesimal. It is counted in hundred-thousandths of a second, yet individuals differ markedly in the speed of their reactions. In laboratory experiments these infinitesimal differences are exactly measured by the use of Hipps' chronometer, a stop watch constructed to mark the thousandth part of a second. The laboratory experiments confirm what we know from everyday life, that attention increases, and fatigue of attention decreases, our promptitude of reaction. Thus in a game of tennis, for instance, or in any sport where the reaction must be instant, we fail to make prompt returns as soon as attention is in any way distracted and we are off guard. Measured by the chronometer, most people take about 134 thousandths of a second before responding with the hand to a touch on the foot, but fatigue of the attention may double the length of this reaction, prolonging the interval to as much as 250 thousandths of a second.

Now, further laboratory study shows how noise, like fatigue, retards the time of reaction. Mosso quotes* an experiment which showed that when an organ was played, reaction time was increased from 100 thousandths of a second to 144 thousandths, before the subject of the experiment showed that he felt a touch upon his left hand. This retardation took place in spite of a greater intensity of attention, and whenever the disturbing sound ceased, the time of physiological reaction became as before. James quotes more careful, detailed studies of Wundt which disclose the

* Mosso, Angelo: La Fatica. English translation, pp. 204 and 205.

same kind of retardation in reaction through the influence of disturbing noise.*

* James, William, op. cit., pp. 427–432.

"Under this head, the *shortening of reaction-time*, there is a good deal to be said of attention's effects. Since Wundt has probably worked over the subject more thoroughly than any other investigator and made it peculiarly his own, what follows had better, as far as possible, be in his words.

'I made experiments in which the principal impression, or signal for reaction, was a bell-stroke whose strength could be graduated by a spring against the hammer with a movable counterpoise. Each set of observations comprised two series, in one of which the bell-stroke was registered in the ordinary way, whilst in the other a toothed wheel belonging to the chronometric apparatus made during the entire experiment a steady noise against a metal spring. In one-half of the latter series (A) the bell-stroke was only moderately strong, so that the accompanying noise diminished it considerably, without, however, making it indistinguishable. In the other half (B) the bell-sound was so loud as to be heard with perfect distinctness above the noise.

		Mean	*Maximum*	*Minimum*	*No. of Experiments*
A (Bell-stroke moderate)	Without noise	0.189	0.244	0.156	21
	With noise....	0.313	0.499	0.183	16
B (Bell-stroke loud)	Without noise	0.158	0.206	0.133	20
	With noise....	0.203	0.295	0.140	19

'Since, in these experiments, the sound B even with noise made a considerably stronger impression than the sound A without, we must see in the figures a direct influence of the disturbing noise on the process of reaction. This influence is freed from mixture with other factors when the momentary stimulus and the concomitant disturbance appeal to different senses. I chose, to test this, sight and hearing. The momentary signal was an induction-spark leaping from one platinum point to another against a dark background. The steady stimulation was the noise above described.

Spark	*Mean*	*Maximum*	*Minimum*	*No. of Experiments*
Without noise....	0.222	0.284	0.158	20
With noise	0.300	0.390	0.250	18

'When one reflects that in the experiments with one and the same sense the relative intensity of the signal is always depressed (which by itself is a retarding condition) the amount of retardation in these last observations makes it probable that *the disturbing influence upon attention is greater when the stimuli are disparate than when they belong to the same sense.* One does not, in fact, find it particularly hard to register immediately, when the bell rings in the midst of the noise; but when the spark is the signal one has the feeling of being coerced, as one turns away from the noise towards it.'" (Wundt. Physiol. Psych., 2nd ed. II, pp. 241–5.)

Thus, noise not only distracts attention but necessitates a greater exertion of intensity or conscious application, thereby hastening the onset of fatigue of the attention. A quite uncounted strain upon this easily fatigued faculty results among industrial workers, such as girl machine operators, when the deafening intermittent roar of highly speeded machinery adds its quota to the tax of a long day's work. The roar is not even continuous enough to sink into monotony. With each stoppage and starting of a machine, it bursts out irregularly.

The subject of noise in industrial establishments is usually dismissed with the remark that the workers "get used to it," and doubtless, in many occupations, the workers themselves are scarcely, or not at all, conscious of any increased application on their part, due to the noise. But, in the main, the process of getting used to it involves precisely that increased intensity of nervous effort, that "feeling of being coerced," of which Wundt speaks in the laboratory experiments, and which, as we have seen, is most favorable for the approach of exhaustion.

5. FATIGUE AND INDUSTRIAL ACCIDENTS

Fatigue of the attention and lack of muscular control are important in another connection hitherto little regarded. It has been shown to play a subtle part in the occurrence of industrial accidents. The statistics of all countries which have recorded the hours at which such injuries occur prove that, other things being equal, the accidents increase progressively up to a certain time in the morning and again in afternoon work.

In estimating the accidents of working people, we are too much accustomed to dwell only upon the concrete objects of danger, such as the unguarded machinery, or the prodigious size and weight and speed of industry's mechanisms; or the atmospheric conditions of work such as intense heat and glare, or cold and dark, and the like. But besides all these

external factors and their effects, we must reckon with the human subject himself, and the reason why, among so many ever-present chances of danger, so many are escaped as well as succumbed to.

Here, again, the causes of immunity or the reverse cannot easily be isolated. The worker's total makeup,—his coolness, his experience, his native quickness of reaction, his *state of being*, physical and mental, taken as a whole, determine his chances. Yet we know that even in the healthiest organism the products of fatigue accumulate with progressive hours of work; we know that our promptitude of reaction rises and falls with the freshness of our attention; that nothing is more potent than fatigue to increase reaction time and develop muscular inaccuracies.

Hence, when we find the number and ratio of accidents increasing up to a certain point with each successive hour of work during the morning, falling towards zero at the noon hour and again rising to a maximum in the afternoon, it is reasonable to ascribe the increase in large part to the effects of fatigue, direct and indirect.

In a general way, the increase of accidents late in the day has long been known. These "melancholy details" were urged as arguments for shortening the workday by Lord Shaftesbury and the earliest English reformers.* But it has been only within comparatively recent years that any statistics on the hours of incidence have become available. The data from various states and countries are not in complete accord and show various discrepancies. The statistics quoted below should be regarded merely as initial studies. Yet they are significant, notwithstanding their defects, because they reveal tendencies too uniform and consistent to be the work of chance.

The most valuable and complete statistics come from Germany, the first country to adopt, in 1884, a comprehensive system of accident compensation on a national scale. Germany was one of the first nations to require that the hours

* Hansard's Parliamentary Debates. 3rd Series. March 15, 1844.

of the incidence of accidents be reported. The Imperial Insurance Office has made a practice of publishing, at ten-year intervals, special studies of industrial accidents for which compensation has been paid to working people under the national accident insurance system. Such investigations were made for the industrial insurance associations in 1887, 1897, and 1907. The following table shows that during the year 1887 the highest accident rate, for all industries, occurred between ten and twelve in the morning and between five and six in the afternoon.*

NUMBER AND PER CENT OF ACCIDENTS DURING THE YEAR 1887, BY HOUR OF THE DAY (GERMANY)

Hours	Accidents		*Hours*	Accidents	
	Number	*Per Cent*		*Number*	*Per Cent*
Morning			Afternoon		
6 to 7 . . .	435	2.82	12 to 1 . . .	587	3.81
7 to 8 . . .	794	5.16	1 to 2 . . .	745	4.84
8 to 9 . . .	815	5.29	2 to 3 . . .	1037	6.73
9 to 10 . . .	1069	6.94	3 to 4 . . .	1243	8.07
10 to 11 . . .	1598	10.37	4 to 5 . . .	1178	7.65
11 to 12 . . .	1590	10.31	5 to 6 . . .	1306	8.48

The latest German statistics give the number of hours worked by injured persons on the days of their accidents,† and show that the accident rate is highest during the fourth and fifth hours of morning work.‡

* Quoted from the Amtliche Nachrichten des Reichs-Versicherungsamts, 1890, in the 24th Annual Report of the United States Commissioner of Labor. Workmen's Insurance and Compensation Systems in Europe, Vol. I, p. 1134.

† Amtliche Nachrichten des Reichs-Versicherungsamts, 1910. I. Beiheft I. Teil. Gewerbe-Unfallstatistik für das Jahr 1907, pp. 329–335. Bulletin of the United States Bureau of Labor No. 92, Jan., 1911. Harris, Henry J., Ph. D.: Industrial Accidents and Loss of Earning Power: Germany's Experiences in 1897 and 1907, p. 50.

‡ See table on next page. It has been suggested that the German custom of allowing about 15 minutes for afternoon lunch (Vesperpause) at 4 o'clock or later is responsible for the decrease beginning with the eighth hour of work. See Harris, Henry J., op. cit., p. 49.

NUMBER AND PER CENT OF PERSONS INJURED OR KILLED DURING THE YEAR 1907, BY NUMBER OF HOURS OF WORK ON THE DAY OF THE ACCIDENT (GERMANY)

Number of Hours Injured Persons had been at Work	All Industries, etc.	
	Number Reported	*Per Cent*
Less than 1	3,939	4.94
1 to 2	6,885	8.63
2 to 3	7,351	9.21
3 to 4	9,004	11.28
4 to 5	9,739	12.20
5 to 6	8,106	10.16
6 to 7	6,462	8.10
7 to 8	6,908	8.66
8 to 9	6,817	8.54
9 to 10	6,041	7.57
10 and over	8,539	10.71
Total	79,791	100.00

In France, too, the distribution by hours, of accidents occurring among French workmen, has been studied. Between 1904 and 1907, Professor Imbert of the University of Montpelier, in conjunction with French factory inspectors, investigated accidents occurring in sundry occupations such as the building trades, metal and wood-working trades. They also showed graphically the hours of accidents occurring among 140,407 workers affected during the year 1903 by the French accident compensation law.* In all these studies the general features of the curves were the same. The summit was reached between 10 and 11 a. m. and again between 4 and 5 p. m.

Similar studies showing similar results were published in 1907, by the Belgian factory inspectors† and by two Italian

* Revue Scientifique, 4e Juin, 1904. Ibid., 24e Septembre, 1904. Ibid., 21e Octobre, 1905. Bulletin de l'Inspection du Travail Fasc. 3–4. Paris, 1906.

† Royaume de Belgique. Rapports Annuels de l'Inspection du Travail, 1907, p. 206.

physicians who investigated more than 5,000 accidents occurring in machine shops of Italian railroads during a period of four years.*

So far as concerns the United States the study of work injuries has been so much belated that the significance of their times of incidence has not been noted until very recently. As late as the year 1909 the writer was unable to learn of any American investigations into this subject. Since then several have appeared. In its report for the year 1909–10, the Wisconsin Bureau of Labor published a brief table of accidents, according to their distribution by hours.†

Some unpublished accident statistics of the Illinois State Department of Factory Inspection for the year 1910

NUMBER OF ACCIDENTS DURING THE YEAR 1910, BY HOUR OF THE DAY (ILLINOIS)

Morning	*Accidents*	*Afternoon*	*Accidents*
7 to 7 : 59.....	79	1 to 1 : 59.....	111
8 to 8 : 59.....	120	2 to 2 : 59.....	156
9 to 9 : 59.....	193	3 to 3 : 59.....	227
10 to 10 : 59.....	246	4 to 4 : 59.....	260
11 to 11 : 59.....	257	5 to 5 : 59.....	145
12 to 12 : 59.....	49	Other hours.....	289

were quoted in a recent study of industrial accidents in the *American Journal of Sociology*.‡ The author states that of the accident reports examined, 2,687 gave a fairly accurate description of what had happened preceding the accidents, and of these, 2,203 or 82.2 per cent "conceivably might have been avoided if the injured, or the fellow servant who was the

* *Il Ramazzini.* Giornale Italiano di Medicina Sociale. Anno. I. Fasc. 10–11. Oct., 1907. Pieraccini, Prof. G., and Maffei, Dr. R. (R. Arcispedale di S. M. Nuova, Firenze): Le stagioni, i giorni, le ore nel determinismo degli infortuni del lavoro.

† 14th Biennial Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1909–1910. Part II, p. 78.

‡ Bogardus, Emery S.: The Relation of Fatigue to Industrial Accidents. *American Journal of Sociology*, University of Chicago Press. Volume XVII, Nos. 2, 3, and 4. (September and November, 1911, and January, 1912.)

NUMBER AND PER CENT OF ACCIDENTS BY HOUR OF THE DAY
(United States—Some Comparative Statistics)

Hours	Cotton Mills				Metal-works	
	126 Mills 1 Year		*1 Mill 8 Years*		*Total*	
	No. accidents	*Per cent*	*No. accidents*	*Per cent*	*No. accidents*	*Per cent*
6 to 7 a. m.	73	6.19	63	8.22	..	..
7.01 to 8 a. m.	95	8.05	68	8.88	486	7.81
8.01 to 9 a. m.	126	10.68	82	10.71	677	10.87
9.01 to 10 a. m.	**161**	**13.64**	90	11.75	**860**	**13.81**
10.01 to 11 a. m.	128	10.85	**114**	**14.88**	763	12.25
11.01 to 12 m.	78	6.61	43	5.61	491	7.89
12.01 to 1 p. m.	58	4.92	9	1.18	241	3.87
1.01 to 2 p. m.	78	6.61	63	8.22	602	9.67
2.01 to 3 p. m.	98	8.30	67	8.75	676	10.86
3.01 to 4 p. m.	**126**	**10.68**	**77**	**10.05**	**716**	**11.50**
4.01 to 5 p. m.	90	7.63	57	7.44	511	8.21
5.01 to 6 p. m.	59	5.00	33	4.31	203	3.26
6.01 to 7 p. m.	7	.59	..	..	..	..
7.01 to 8 p. m.	3	.25	..	..	..	..
Total	1,180	100.00	766	100.00	6,226	100.00

Hours	General Manufacture				Grand Total	
	Indiana 3 Years		*Wisconsin*			
	No. accidents	*Per cent*	*No. accidents*	*Per cent*	*No. accidents*	*Per cent*
6 to 7 a. m.	..	..	..	..	136	0.91
7.01 to 8 a. m.	546	11.31	76	4.02	1,271	8.53
8.01 to 9 a. m.	492	10.19	126	6.67	1,503	10.09
9.01 to 10 a. m.	**603**	**12.49**	227	12.01	**1.941**	**13.04**
10.01 to 11 a. m.	469	9.71	**245**	**12.96**	1,719	11.54
11.01 to 12 m.	338	7.00	208	11.00	1,158	7.78
12.01 to 1 p. m.	183	3.79	49	2.59	540	3.63
1.01 to 2 p. m.	441	9.13	126	6.67	1,310	8.80
2.01 to 3 p. m.	481	9.97	213	11.27	1,535	10.31
3.01 to 4 p. m.	**598**	**12.38**	**240**	**12.70**	**1.757**	**11.80**
4.01 to 5 p. m.	480	9.95	229	12.12	1,367	9.18
5.01 to 6 p. m.	197	4.08	151	7.99	643	4.32
6.01 to 7 p. m.	..	..	..	..	7	.05
7.01 to 8 p. m.	..	..	..	..	3	.02
Total	4,828	100.00	1,890	100.00	14,890	100.00

cause of the accident in some cases, had had accurate muscular control." Of the 2,203 accidents which might have been avoided, the time was given at which 2,162 had occurred, and again showed the summit of the accident curve between 10 and 12 o'clock in the morning and 4 and 5 in the afternoon.

The federal investigation of wage-earning women and children includes a study of accidents among about 14,000 metal workers, male and female, and more than 75,000 cotton mill workers. For purposes of comparison it includes the Wisconsin table and some unpublished statistics from the Indiana Bureau of Factory Inspection. "Here," says the report,* "are four sets of figures, collected by different agencies in different parts of the Union at different times and covering different industries, each agency working independently of the others. Yet the figures thus gathered show . . . striking similarity." Omitting the hour from 6 to 7 a. m., the accident rate is shown to be highest during the third and fourth hours of work.

Such, in brief, is the testimony of the statistics. It is true that most of these studies of accidents are open to various criticisms. They are not sufficiently full and specific to be scientifically accurate. They do not state the actual number of workers employed at each hour of the day. More workers are employed at some hours than at others; hence the increased number of accidents during the third and fourth hours of the morning or afternoon may be due to the presence of a larger working force. In that case the number of accidents would necessarily be heightened.

The question has also been raised why, if fatigue is a primary cause for these accidents, their number is not greatest during the last hour of the morning and of the afternoon? If it is the workers' exhaustion which inclines them to these hazards, why does it not do so most when they are presumably most fatigued?

* Senate Document No. 645, 61st Congress, Second Session, 1911. Report on Condition of Woman and Child Wage-Earners in the United States, Vol. XI, pp. 96–97. See table on p. 76.

To this objection there are several conclusive replies. In the first place, the variation in the lunch hour in different establishments lessens the number of persons at work between eleven and one o'clock.* So, also, variations in "quitting time" and the smaller number of persons at work between five and six, go toward explaining the usually smaller number of accidents which occur at that time. Moreover, some familiar psychological phenomena help further to explain the smaller number of accidents during the first and last hours of morning and afternoon employment. It is well known that the first period of work is one of "limbering up," when the worker has not yet reached his normal plane of efficiency or production. During the last hour of work, also, with increasing fatigue, the rate naturally falls. In a subsequent chapter we shall observe, from actual experiments, how markedly the productivity and output drop during the last hours of the morning and afternoon.

Now this lower rate of activity, due to complex causes, is in all probability a highly important factor in the reduced accident rate during the first and last hours of the morning and afternoon. It is well known that operations requiring increased speed tend to produce a heightened accident rate, and the reverse is as true. With the slackening of speed and production, therefore, it is natural for the accident rate to fall. Thus the effects of fatigue upon the accident rate are both direct and indirect. As the American report acutely says:†

"It is evident that in the interrelation of influences acting upon the situation now one and now another may be dominant. The most constant factor will be fatigue. It will be present in varying proportion in every case. It may act with the tendency to increase speed to produce

* "In one Chicago plant employing about 3,000 men and women, the writer found that practically one-half of this number took their lunch from 11:30 to 12. Frequently the employees begin their afternoon period of work at 12:45 p. m. and in some cities at 12:30 p. m."—Bogardus, op. cit., p. 513.

† Senate Document No. 645, Vol. XI, p. 100.

a greater number of accidents. It may in the end become so pronounced that speed is reduced and the accident rate lowered. . . . It is a steadily progressive process. It gradually upsets those nice adjustments of the living organism upon which depend efficient labor and the safety of the worker. The margin of safety in modern industry is small. It is measured too frequently by fractions of an inch. Reduce the alertness and the exactness with which the body responds to the necessities of labor, and by just so much have you increased the liability that the hand will be misplaced that fraction which means mutilation."

Obviously these statistics and surmises as to the relation of fatigue to the accident rate urgently need further confirmation. They do not completely agree and need to be clarified by a really scientific examination of both the production rate and the accident rate in the same establishments. In order to clarify the influence of fatigue on the accident rate, the number of hours worked by injured persons on the days of their injuries should obviously be included in all future statistics, besides the actual hours of incidence.

Side by side with the perfection of mechanisms and safety appliances should go the study of those underlying physiological and psychological factors which so largely contribute to swell the accident rate and which may, when better studied and understood, be modified if not obliterated by the provision of periodic rests or pauses, and similar devices to check the inroads of fatigue and exhaustion.

6. RHYTHM

The strain of machine work upon the faculty of attention thus leads to the gravest consequences. Another subtly fatiguing element in machine work, which we have not yet examined, is due to its rhythm. It is apparent that the rhythm of any power-driven machinery is fixed and mechanical, depending upon its construction and its rate of speed. Now it is true also that human beings tend to work rhythmically, and when the individual's natural swing or rhythmic

tendency must be wholly subordinated to the machine's more rapid mechanical rhythm, fatigue is likely to ensue.

Rhythm in human beings is not a fanciful or theoretic notion; it is a common endowment. The human organism instinctively attunes itself to rhythm, as a dancer yields herself to her measure, without thought or even consciousness. This is a matter of everyday experience. Some persons are palpably disturbed by the sudden stopping of a clock to the ticking of which they have been accustomed. The rhythm of the tick may be missed even in sleep; its sudden cessation is sufficient to awaken one when a bedroom clock runs down at night. Everyone knows how acutely the rhythm of a train or vessel may be missed, when one first sets foot on solid earth after a long journey.

Since the beginning of time, this natural instinct for rhythm has found an outlet in dance and song.* It was the mother of the arts. It gave birth to the folksongs and folkdances, in which primitive people expressed themselves—their loves and hates, their dreams of life and death, and their concrete activities. Not the poetry of existence only, but all the daily offices of life—spinning, weaving, sowing the grain, harvesting, and the rest—inspired song and dance, their own rhythms.

Even today innumerable survivals persist, marking our kinship with the earlier children of men. Sailors and other workmen almost unconsciously chant or "hoy-ho" as they haul. In the midst of discordant city traffic, workmen who are mending the pavements drive steel wedges with rhythmic shouts and rhythmic alternating blows of their sledges. They know, instinctively, that the rhythm makes the work easier. So, too, soldiers march better and with less exertion to a tune. It is not only the emotional excitement of a martial air, it is the rhythmic beat of the music that helps to swing the march along in unison.

* Bücher, Karl: Arbeit und Rhythmus. Fourth edition. Leipzig, Teubner, 1909.

"For the world was built in order
And the atoms march in tune;
Rhyme the pipe, and Time the warder,
The sun obeys them and the moon. . . .
None so backward in the troop,
When the music and the dance
Reach his place and circumstance."

Even in the animal world, rhythm is natural. The rhythm of the trotting horse or the ambling camel is as individual to itself as the beat of the blacksmith's, the cobbler's or the carpenter's hammer, or the swing of the housemaid's broom. With a musical people, such as the American Negro, not only rhythmic movements but rhythmic songs persist among such diverse workers as cotton-pickers in Georgia, laborers laying railroad and trolley rails in Kentucky, and the roustabouts on the Mississippi.*

The reason why rhythm makes work easier as well as more enjoyable is that in any given tempo, each effort is followed by a corresponding rest. There is a perfect balance of swing and recovery, rise and fall, exertion and repose—"primal chimes" as Emerson, the lover of rhythm, calls them:

"Primal chimes of sun and shade,
Of sound and echo, man and maid; . . .
For Nature beats in perfect tune,
And rounds with rhyme her every rune."

If such a balance could be permanently established in work, fatigue could never occur. Such a condition exists in the physiological rhythm of the heart and respiratory muscles, which function unceasingly through life, alternating work and rest, work and rest. In its steady rhythmic tempo the heart relaxes at each contraction, exerting energy estimated at about 20,000 kilogrammeters in one day.†

Thus are we physiologically attuned to rhythm. It is our common heritage. The injury of highly speeded machine work lies, as we have said, in this, that the mechanical, rapid

* Bücher, op. cit., pp. 235–251.

† Roth, Dr. Emil: Ermüdung durch Berufsarbeit. Op. cit., p. 606. Kilogrammeter = 7.2 foot pounds. For definition of foot pound see p. 195.

rhythm of machinery dominates the human agent, whatever be his natural rate or rhythmic tendency. The machine sets the tempo; the worker must keep to it.

Not only is the beat of the machine much more rapid and regular than the more elastic human rhythms; it is often wholly lost in the chaos of different rhythms of the various machines, belts, and pulleys in one workroom. The roar and vibration of machinery tends further to distract any sense of rhythm on the part of the workers.

7. PIECE-WORK

Another enemy of the physiological tempo lies in the abuse of the piece-work system. Here we must preface our physiological objections to the abuse of a system, by realizing the inherent value of the system itself, properly managed. Briefly, piece-work presupposes a naturally varying rate of work and output among individuals, according to which each worker is paid. Obviously, this should be the most just way to allow for the play of natural talents. Increased effort or skill brings its immediate reward, and the best worker is the best paid. In highly organized trades, where the piece-work system has been minutely worked out, as in the great shoe industry, neither workers nor employers would for a moment consider returning to a time basis, where individuals are paid alike by the hour.

In criticising the piece-rates, therefore, we are dealing with an entrenched practice, and criticism must attack not the system, but its flagrant abuses. These, unfortunately, are common and widespread, especially among workingwomen in poorly organized trades, where no collective bargaining protects individuals from pressure. In such occupations, of which the ramified needle and clothing trades are the best examples, piece-work develops chiefly into a system of "speeding up" the workers in both machine and hand work. The workers are spurred to a feverish intensity. They apply themselves hectically. It is almost inevitable that the most

rapid workers should be so-called "pace-makers" and set the rhythm for all the other workers. For pay is usually adjusted to the rate of the quickest workers, and in order to earn a fair wage, all the others must keep up as near to them as possible. Thus, if a quick girl can stitch ten dozen pieces of white underwear in a day, she can earn $1.50 at the rate of 15 cents per dozen. Another girl can at her natural pace stitch no more than six dozen in one day. But since she would earn only 90 cents a day at the same rate of pay, she drives herself feverishly to greater exertion. Piece-work, then, means working watch in hand. When every minute means loss of an already meager wage, the incentive to spurt is irresistible.

Many employers contend that unless workers have such incentives, or a personal stake in working steadily, they tend to slacken and are indifferent to the amount of their output so long as wages are assured. The workers, on the other hand, return that in piece-work, even the utmost speed does not assure them of their wages, since the piece-work price is often cut when the rapid workers are thought to be earning too much in one day. The rate per piece is lowered. Then the same speed is required to earn the lower wage.*

Another hardship in piece-work of which the workers justly complain and which adds greatly to the nervous tax of any occupation is due to the extraordinarily rapid changes of fashion. Thus, for example, just when a girl has become proficient enough to earn a fair wage at piece-rates in tucking women's shirtwaists, the tucks go out of fashion, and a new kind of stitching is required. Even the skilled worker is a novice at first, and cannot for some time equal the speed she had acquired by practice at her former work. Yet the manufacturer, in fixing piece-rates, rarely makes allowance for such sudden freaks of fashion, and the hardship of the inevitable changes falls on the one least able to support it, the worker.

* For a striking example of the abuse of the piece-work system in the manufacture of electric lamp bulbs, see Report on Condition of Woman and Child Wage-Earners in the United States, Vol. III, p. 480. Senate Document No. 645, 61st Congress, 2nd Session, 1911.

Her wage practically is cut and her work intensified by every shift of fashion.

Thus, though the piece-work system is sound in theory and works admirably in highly organized trades where collective agreements assure the workers fair, fixed rates, it fails among the most helpless workers who most need to be protected from over-pressure and the inroads of fatigue. With them it almost inevitably breeds a spirit of permanent "rush" in work, and to that extent it is physiologically dangerous: "the most pernicious thing that could be devised to weaken what, for a better term, might be described as the dynamic efficiency of the nervous system,"* writes a physician familiar with the effects of unregulated piece-rates among garment workers.

8. OVERTIME

The factors which we selected as typical of the new strain in industry are all aggravated and intensified by the system of overtime evening work, to which we have already made passing reference. Overtime means that after the regular day's work is done, evening work is required in addition.

Overtime is an elastic term. In its extremest forms, reported in printing and binding establishments, it lengthens the workday to twenty-four hours in one stretch. In less extreme degree, overtime is worked during the fall months until eight or nine or ten o'clock each evening in factories which supply the Christmas market; in paper box making; in the manufacture of innumerable articles of women's wear—from lace collars to Japanese kimonos; in leather and jewelry work; in making the cheaper and more lasting candies, and in many other occupations.

Indeed, overtime is common to almost all industries and

* Schwab, Dr. Sidney I. (Professor of Nervous and Mental Diseases, St. Louis University): Neurasthenia among Garment Workers. *American Labor Legislation Review*, Vol. I, No. I, p. 27. (January, 1911.)

is prevalent in every industrial center, to a degree wholly unknown to most persons. No more arresting fact emerges from the comprehensive study of wage-earning women and children made by the federal government, than the almost incredible length and duration of this form of extra employment.

People speak habitually, and labor statistics usually treat of, the so-called "normal" hours of labor, dismissing overtime as an insignificant and merely occasional side issue. Overtime is regarded as a sort of temporary emergency, similar to many other of life's stresses which people weather without permanent injury, thanks to their reserve strength. But, in fact, overtime is an integral part of the workers' lives, persisting not only for days at a time but for weeks and months; not occasionally lengthening the day's work, but during a large part of the year straining health and endurance to the utmost.

Thus, in the recent federal investigation of wage-earning women and children, agents of the government reported the normal hours of work, in miscellaneous manufactures, as 55½ in New York, 56.4 in Chicago, 53.3 in Philadelphia, 53 in Baltimore. But the average duration of overtime of selected workers in those cities, during 1907–08, was 17.3 weeks or over four months in New York, 13½ weeks or more than three months in Chicago, 16.6 weeks or again over four months in Philadelphia, 13 weeks in Baltimore.* In one printing establishment in New York City, girls were employed once and sometimes twice a week, during a period of sixteen to twenty-six weeks, for 16¾, 20¼, 22½, and 24¼ continuous hours.†

These longest *days* of overtime work are reported in New York binderies. But in a special investigation of Chicago box factories the *weeks* of overtime persisted longest.‡

* Report on Condition of Woman and Child Wage-Earners in the United States, Vol. V, pp. 204, 208, 211, 213. Senate Document No. 645. 61st Congress, 2nd Session. 1910.

† Ibid., p. 205.

‡ Bulletin of the U. S. Bureau of Labor No. 91, Nov., 1910. Working Hours of Wage-earning Women in Chicago, pp. 875–880.

Eleven box factories employing 1010 workers were investigated. Their average duration of overtime was fifteen weeks in the year; one factory reported overtime extending over thirty-seven weeks in the year; that is, more than *nine months*.* In this case, the so-called "normal" hours were worked only three months; the supposedly extra "overtime hours" were worked regularly more than nine months in the year,—a *reductio ad absurdum* of the whole matter. Yet this is not merely an eccentricity of nomenclature. It is a trick of psychology; a not unfair example of our habitual mental attitude towards the custom of overtime, accepting the shorter hours as normal and habitual, dismissing from mind the excessive hours no matter how long they may persist, as exceptional, under the head of "overtime."

Obviously, when overtime extends over such hours as those quoted here, it shares all the dangers inherent in regular night work. Upon these dangers we shall dwell subsequently, in discussing more fully the phenomenon of all night work. Here it suffices to draw attention to the fact that beside the dangers to health, there are inevitably moral dangers also, potential in all employment of women after dark.

The return home at late night or early morning hours is fraught with the peril of insult if not of attack; association with men employes at night, and during the midnight recess in establishments running all night long, presents special temptation; women who live away from home cannot easily return to reputable living places late at night.

Such hardships are incurred by the worker kept for overtime as well as by the all night worker. But physiologically considered, overtime sins against health in a way peculiar to itself. It means that the elements which make up industrial stress—speed, complexity, monotony, and the

* In this firm, the normal hours were fifty-nine in one week, the "long day" being ten hours; in the busy season (thirty-seven weeks) the "long day" was thirteen and one-half hours, and the week was made up as follows:

"One nine-hour day, three thirteen and one-half-hour days and two ten-hour days, making the total number of hours for the six-day week sixty-nine and one-half." Op. cit., p. 877.

rest—must be endured by an organism which has presumably already reached its limits.

The essential injury of overtime is due to what we have seen graphically proved with the ergograph: that effort increases with fatigue; that work continued after fatigue has set in requires so much more subsequent time for recuperation. But during a "rush" or overtime season such time for recuperation is necessarily lacking. The girl who is kept in the great department stores until ten or eleven or twelve o'clock at night during one or two frenzied weeks before the holiday which heralds the reign of Peace; the girl who works at fever heat all evening stitching women's shirtwaists in January for the spring trade, is not relieved from the necessity of reporting for work at seven or eight o'clock the next morning. She comes to work unrepaired, and with each day of overtime, accumulated fatigue necessarily grows.

One of the least known and most straining forms of overtime, for which Christmas is responsible, occurs in the auditing department of the great stores. One of the largest establishments in New York City, typical of the best stores, closes its doors to shoppers throughout the winter at six o'clock. But the girls who serve behind the counters may leave every night at their regular hour though girls upstairs in the clerical department are kept until nine o'clock in the evening during more than two months, that is, from December 1 until February. They usually receive no extra pay for the three extra daily hours of work, but have an allowance of 35 cents each evening for supper money.

In theory, the requirement of overtime is supposed to be balanced by the slack period which often follows. A short period of over-exertion is assumed to be compensated by a subsequent let-up. But the slack period which often follows overtime does not give the supposed opportunity for leisure and recuperation. It is itself a season of deprivation. For slack work means slack pay, with a consequent loss rather than gain in opportunities for recuperation.

But deeper than this objection to the alternation of

overwork and idleness, is the physiological objection. During overtime, leisure and rest are cut down at the very same time that heavier and longer demands are made upon the human organism. It is practically inevitable that the metabolic balance should be thrown out of gear. Regular seasonal overtime in such occupations as those cited above, leaves the worker with too great a physiological deficit. There is no rebound, or an infinitely slow one when our elastic capacities have been too tensely stretched. It takes much more time, rest, repair than the working girl can possibly afford to make good such metabolic losses. Compensation —off-time—comes too late. As we know instinctively, and as we have seen diagrammatically proved in the laboratory, the essential thing in rest is the *time at which it comes*. Rest postponed is rest more-than-proportionally deprived of virtue. Fatigue let run is a debt to be paid at compound interest. Maggiora showed that after a doubled task, muscle requires not double but four times as long a rest for recuperation, and a similar need for more-than-proportionally increased rest after excessive work is true also of our other tissues, and of our organism in its totality.

No one need therefore be surprised to learn that after a period of overtime work, a marked growth of many minor ailments has been found where there has been medical examination of working girls and women. A recent report of the British Chief Inspector of Factories quotes a striking example of this.* In six large tobacco factories, physicians appointed by the firms reported an increase of from one-third to one-half in the number of workers coming to them for treatment after continuous overtime work. No special diseases were found but, as might be expected, aggravated cases of the ordinary ailments, such as indigestion, anæmia, heavy colds in winter, gastric disorders in summer. This was in a trade considered not in itself unhealthy by the physicians quoted, and where overtime was limited by the

* British Sessional Papers, Vol. X, Appendix II, 1907, pp. 253–254.

British law so that the total amount of work done could not exceed ten and one-half hours in one day.

This is only one example of many which might be quoted. Year after year the British factory inspectors have registered their disapproval of overtime on physical grounds, and have denounced its physical effects. "Nothing short of a public scandal," "inexcusable," "outrageous," are some of the epithets repeatedly used. In France, the "veillée" or evening overtime work, especially in dressmaking establishments, comes in for the same denunciation. A German physician, Dr. Emil Roth, of Potsdam, expresses himself similarly in an address which combines scientific thoroughness with a first hand knowledge of industry. His observation inclines him to believe that the strain of seasonal overwork upon the health of working women in stores and factories is *never* compensated, but encroaches steadily upon the worker's total health and endurance, permanently lowering their levels.*

* Roth, Dr. Emil: Ermüdung durch Berufsarbeit. Op. cit., p. 610.

IV

SOME SPECIFIC STUDIES OF PHYSICAL OVER-STRAIN IN INDUSTRY

THUS a rapid glance at some actual conditions in diverse occupations such as the telephone service, the great woman-employing needle and textile and shoe trades, and the canneries, throws some light upon the new strain of industry. In all these occupations work has increased its demands upon human energies. We turn next to learn some of the physical effects upon the workers, so far as these have been observed and recorded.

As concerns the past, we have abundant testimony on the fruits of overwork, not only regarding those who have themselves been bound to exacting tasks, but regarding their children and the communities in which their lives were spent. This kind of testimony, to which we shall often have occasion to refer in this study, is found in the accumulated official and unofficial reports of the inspectors and physicians who have had daily to observe the conditions of labor at first hand, and whose unconscious unanimity gives to their evidence, as we have pointed out, a strangely heightened power. The individual observer may exaggerate or minimize or strain the facts. But no one can read without a deep sense of its total truth, the reiterated evidence of generations of such observers, in many countries, writing independently but agreeing fundamentally in their observations and diagnoses.*

There is a peculiar significance in this kind of testimony. It is the accumulated experience of mankind and has an authority due to its very iterations. This is the power and

* See Part II of this volume.

the moving appeal of history, that it gives us, as fiction rarely can, precisely the cumulative experiences, the persistent realities of our common lot. A truth that has been a hundred years in the forging is, in so far forth, just so much the truer. It is not a mathematical formula, proved once for all and immutable. The truths of history gain in meaning and power under changed guises, coming down to the children of a later age with a fuller and more significant content. This is as true of industrial history as of any other; and hence the industrial experience of the past should enable us more intelligently to estimate our own difficulties and performances.

1. INFANT MORTALITY

According to the testimony of many observers, the industrial overstrain of women has commonly reacted in three visible ways: in a heightened infant mortality, a lowered birth rate, and an impaired second generation. We can readily see that many factors besides overwork contribute to the greater mortality of infants among the working class. Probably improper feeding holds the first place amongst causes, and overcrowding, with all its train of ills such as foul air, dirt, and darkness, is an important item. But the relation, direct and indirect, between women's industrial work and a high death rate among infants is well-established. Few exact and detailed studies of this relationship have been made in our country, but it has been pointed out that infant mortality is highest in industrial communities where mainly women are employed in factories. Thus an abnormally high death rate of infants is asserted to exist in two cotton mill towns of New England,—Fall River, Massachusetts, and Biddeford, Maine.*

The latest government statistics also show the abnormally high infant mortality in textile towns. In 1910, in selected

* Prevention of Infant Mortality. Being the papers and discussions of a Conference on Prevention of Infant Mortality, New Haven, Conn., 1909, p. 37. Under the Auspices of the American Academy of Medicine.

cities, the number of deaths of infants under one year, per 100 deaths at all ages, was as follows:*

Boston	19
Chicago	21
New York City	21
Biddeford	27
Lowell	29
Lawrence	35
Holyoke	35
Fall River	39

In 1910 the number of deaths of infants under one year, per 1000 births, in selected cities was as follows:†

New York City	125
Boston	126
Philadelphia	138
Lawrence	167
New Bedford	177
Holyoke	213
Lowell	231

More detailed studies abroad have sought to show the relation between a high mortality of young children and the industrial employment of women. The death rate of infants is said to increase in proportion to the increase in the number of women at work. Dr. Newman in his standard work‡ devotes material attention to this subject as it affects the death rate in Great Britain. He compares eight towns chosen for their low percentage of women at work and eight towns chosen for their high percentage of women engaged in the textile trades, between the ages of fifteen and thirty-five years, that is, during the ages of reproductive potentiality.

In the non-textile towns, the average yearly infant mortality during the decennium, 1896 to 1905, was 150 per 1,000 infants.

* Bureau of the Census. Department of Commerce and Labor. Bulletin 109. Mortality Statistics, 1910, p. 14. Washington, 1912.

† Ibid., p. 18.

‡ Newman, George, M.D. (Lecturer on Public Health at St. Bartholomew's Hospital, London; Medical Officer of Health of Metropolitan Borough of Finsbury): Infant Mortality, p. 105. New York, E. P. Dutton and Co., 1907.

AVERAGE INFANT MORTALITY RATE IN SOME ENGLISH NON-TEXTILE TOWNS, 1896–1905

Town	*Infant Mortality Rate, 1896–1905*	Percentage of Occupied Women, ages 15 to 35.	
		Total	*Married or Widowed*
Sunderland	166	55.1	2.8
Swansen	160	59.4	5.0
Lincoln	157	63.3	3.2
South Shields	155	53.8	3.0
Newton	153	63.6	2.6
Cardiff	147	62.6	3.8
Barrow-in-Furness	144	57.9	2.9
Burton	119	60.5	2.0
Average	150	59.5	3.1

In the textile towns, on the other hand, the average infant mortality was 182 per 1,000 infants, rising as high as 208.*

INFANT MORTALITY RATE IN SOME ENGLISH TEXTILE TOWNS, 1896–1905

Town	*Infant Mortality Rate, 1896–1905*	Percentage of Occupied Women, ages 15 to 35	
		Total	*Married or Widowed*
Burnley	208	90.9	59.7
Preston	208	84.4	50.5
Blackburn	183	91.8	63.9
Nottingham	180	84.6	27.5
Leicester	175	87.6	41.6
Oldham	170	87.3	33.4
Bolton	166	87.4	24.7
Bury	164	88.9	44.8
Average	182	88.4	43.2

* Newman, op. cit., p. 106.

From these tables it appears that the percentage of workingwomen between fifteen and thirty-five years in the high mortality textile towns was 28.9 per cent higher than in the low mortality towns; the percentage of married workingwomen was 40 per cent more than in the low mortality towns.

Another careful study extending over twenty years was made by the medical officer of health of Kearsley, a Lancashire town of about 10,000 inhabitants. The death rate of Kearsley remained stationary between 1885 and 1904, but the infant death rate rose in the same period from 143 to 229. During the same period the birth rate fell from 39 to 27 per 1,000. These striking figures are attributed to the fact that the town has developed into a manufacturing district of many mills, where large numbers of women are employed.

Again, in Preston, the increase in infant mortality was so marked between 1881 and 1900 that a committee was appointed to study the matter. While the general death rate sank from 24.73 to 20.80, the number of babies who died rose from 208 to 236 per 1,000 infants. The committee reported* that in its opinion the causes of this increase were the employment of women in mills and the consequent enforced neglect of babies at home.

Dr. Newman sums up the whole matter by saying:†

"It is the employment of women from girlhood all through married life, and through the period of child-bearing —the continual stress and strain of the work and hours and general conditions prevailing in women's labour—that is exerting its baneful influence on the individual and on the home."

If the death rate of infants is so high where women are employed in the protected British textile trade, with its ten-hour day and fifty-five and a half hour week en-

* Report on Health of Preston, 1902, pp. 10–12. (Quoted by Newman, p. 136.)

† Newman, op. cit., p. 136.

forced, we may well ask what are likely to be the effects of the stress and strain of such American industries as we have examined above, upon child bearing and infant mortality.

2. LOW BIRTH RATE

It is true that women's industrial work probably affects the infant death rate less here than abroad owing to the far smaller proportion of married women in industry. But a point of equal importance is the effect of industrial overstrain in lowering the birth rate itself. It is not only the work of women after marriage, or just before confinement, which most gravely affects childbirth. The pressure of industry has not only in innumerable cases marred, but often destroyed altogether that immemorial function of women, the center of the tenderest associations of our race. Medical authorities assert that the strain of continuous standing and overwork during girlhood, such as many young women endure in stores as well as factories, is responsible for unmistakable pelvic and uterine disease and sometimes subsequent sterility after marriage.

The most impressive evidence on this topic was brought out in England, in successive efforts to establish by law a shorter workday in mercantile establishments. The reports of select committees (several of which sat between 1886 and 1901 and heard the highest medical testimony regarding the effects of work in stores), dwell insistently upon the injuries from the long hours and the continuous standing upon the generative organs, in girlhood as well as after marriage.

From among a large number of medical statements we may cite one by Dr. Grigg, out-patient physician for the diseases of women at Westminster Hospital, senior physician to the Queen Charlotte Lying-in Hospital, and connected with the Victoria Hospital for children. This physician was questioned about the injuries of overwork to the health of girls and women employed in stores, "shop-girl assistants"

as they are called in England. He said of the prolonged hours:*

"They have a very grave effect upon the generative organs of women, entailing a great deal of suffering, and also injuring a very large body of them permanently, setting up inflammation in the pelvis in connection with these organs.

"If the matter could be gone into carefully, I think the Committee would be perfectly surprised to find what a large number of these women are rendered sterile in consequence of these prolonged hours.

"I think it must be acknowledged sterility is often due to this inflammatory mischief arising around the generative organs. I believe that it is one of the greatest evils attached to these prolonged hours. I have seen many cases in families where certain members who have pursued the calling of shop-girl assistants have been sterile, while other members of the family have borne children. I know of one case where four members of a family who were shop girls were sterile and two other girls, not shop girls, have borne children; and I have known other cases in which this has occurred. . . . I have patients come to me from all parts of London. It appears to be a most common condition."

Not only do the children of mothers at work or overstrained during girlhood die in greater numbers, but the birth rate is lower. The most detailed studies on this subject appear to have been made by Professor Ugo Broggi, who has published extensive figures on the fecundity of working women. He states† that of 172,365 Italian working women between the ages of fifteen and fifty-four, who were employed in industrial occupations, the average child-bearing co-efficient was only 45 per thousand or about one-third of the general fertility of Italian women (120 per thousand).

* British Sessional Papers, Vol. XII, 1895. Report of Select Committee on Shops (Early Closing Bill), pp. 219–220. Witness, Dr. W. Chapman Grigg.

See also Part II of this volume, pp. 135–142.

† Zeitschrift der Socialen Wissenschaft, Bd. VIII, Nr. 10, 1905. Die Fruchtbarkeit der selbstarbeitenden und den arbeitenden Ständen angehörigen Frauen, p. 663.

3. RACE DEGENERATION

Besides a high death rate and a low birth rate, subnormalities of size and weight often characterize the children born of working mothers. Thus are they handicapped at the start and the misfortunes of the parents are visited upon the next generation.

Such racial deterioration, due to the extremest overwork, was unmistakably evident in England after the first period of unchecked industrial exploitation. Between 1830 and 1840 the intolerable overwork of two generations achieved its result. The accounts of eye-witnesses, horrified by the appearance of the factory population, agree that there was a visible decline in the stature and strength as well as in the morals of the manufacturing shires.

"The factory population appear to have become a distinct race, that was known at a glance, so defined had the effects of overwork and unhealthy dwellings become upon the physical appearance and condition of the people."*

"Competition far from regulation had in half a century produced a race of pale, stunted, and emaciated creatures, irregular in their lives and dissolute in their habits. Their case appeared so desperate that for those who believed in *laissez faire*, 'the only hope,' as Harriet Martineau confessed, 'seems to be that the race will die out in two or three generations.'"†

Home life was totally lost; young children, girls, and women were all pressed into the service; the very preservation of the race was threatened.

In more recent times, the existence of racial deterioration, due in large part to overwork and exhaustion, has been interestingly corroborated by the statistics of military service. In various countries, especially where such service is compulsory, it has been found that the proportion of young

* British Sessional Papers, 1875, Vol. XVI, p. 23.
See also Part II of this volume, pp. 276–286.

† The Case for the Factory Acts. Edited by Mrs. Sidney Webb. p. 46. London, Grant Richards, 1901.

men rejected for physical unfitness is far higher in industrial communities than in others.

The great physiologist Mosso drew attention to this fact regarding the exploited *carusi* or sulphur workers of Sicily. He had been sent to the island as a young army surgeon, and he first realized there, with a shock of horror, the "ruin which the exhaustion of fatigue brings about in man" when he saw the evidences of his countrymen's degeneration in the province of Caltanisetta, in the midst of the loveliest natural scenery in the world. Such was the physical condition of these people that in the four years between 1881 and 1884, out of 3,672 sulphur workers who presented themselves at the recruiting offices, only 203 were declared fit for service.*

At about the same time, in 1886, Dr. Schuler, the eminent Swiss factory inspector, reported† to a congress of German scientists and physicians at Strassburg, that the factory work of young persons in Switzerland was attracting marked attention owing to the shocking statistics of recruiting offices. Dr. Schuler stated that in rural districts, where there were few mills, only 14.3 per cent to 18.9 per cent of the recruits were found unfit for immediate service and were temporarily rejected (that is, had their terms of service postponed for two years). In factory districts, 19.7 to 23.3 per cent of the young men were found unfit for service and were temporarily rejected. It had been assumed that the higher standard of living obtained through the increased wages of factory workers would compensate for the hardships of factory life. But these expectations were not fulfilled. Later investigations showed that in the canton of Zug, for instance, only 37 per cent of cotton mill operatives were physically fit for service, while in the same canton among farm laborers 49 per cent were fit, and among artisans from 47

* Mosso, op. cit. English translation, pp. 158–159.

† Deutsche Vierteljahresschrift für öffentliche Gesundheitspflege, Vol. XVIII, 1880, pp. 134–135. 58. Kongress der Deutschen Naturforscher und Ärzte. Schuler, Dr. F.: Die Überbürdung der Arbeiterinnen und Kinder in Fabriken.

to 83 per cent were fit. In another canton, Thurgau, 34 to 39 per cent of factory workers were rejected as against 12 to 23 per cent of non-factory workers.

A more recent study of German workingmen gives similar figures. It is stated by a German physician,* on the authority of a local magistrate who had long been studying the subject, that in a district where the manufacturing of nails had long been carried on, only 26 per cent of the workers liable for military service had been found physically fit. In another district, where buckles were extensively manufactured, only 21 per cent of the young men were fit. These very unfavorable figures are said to be due to long hours and great monotony of work requiring the constant repetition of mechanical movements. "The avoidance of such dangers to the future defense of the country," says Dr. Ascher, "lies in shorter hours of work, and exercise as a preventive of some of these physical defects."

The report of the French factory inspectors in 1900 on the question of night work also dwells upon the physical deterioration observed at the recruiting offices. They state that in industrial centers the proportion of rejections on account of physical unfitness has been as high as 50 per cent while in the country it is only about 25 per cent.†

Doubtless many incidents of city life such as overcrowding and unsanitary housing help to swell the numbers of

* Handbuch der Arbeiterwohlfahrt. Edited by Dr. Otto Dammer. Bd. I. Ascher, Dr.: Beschädigungen der Arbeiter bei der Arbeit, p. 494. Stuttgart, Enke, 1902.

† Rapports présentés à M. le Ministre de Commerce, de l'Industrie, des Postes et des Télégraphes, par les Inspecteurs du Travail. La Question de l'Interdiction du Travail de Nuit, p. 73. Paris, Imprimerie Nationale, 1900.

See also, Report of the Eighth International Congress of Hygiene and Demography, Vol. VII, Section VII, Budapest, 1894. Donath, Dr. Julius (Univ. of Budapest): Der Physische Rückgang der Bevölkerung in den Modernen Culturstaaten, mit besonderer Rücksicht auf Oesterreich-Ungarn.

Tenth International Congress of Hygiene and Demography, Paris, 1900. Vaillant, M. Edouard, (M. R. C. S. England): Législation et Réglementation du Travail au point de Vue de l'Hygiène.

British Sessional Papers, 1904, Vol. XXXII. Report of the Inter-Departmental Committee on Physical Deterioration, Vols. I, II, and III.

physically degenerate workingmen disclosed by the military statistics. But the most careful students of the subject appear to lay chief stress upon the "increasing intensity of production and industrial over-pressure" as the most prominent cause of physical deterioration among the candidates examined.

4. LACK OF INFORMATION IN THE UNITED STATES

Our brief survey of some great modern industries has shown that they are increasing their demands upon human energies. The effect upon the workers is bound to be accordingly complicated. What are those effects today? Have we reliable evidence on the results of the speed, complexity, and monotony in industry which we have been considering? It is undeniable that there is a baffling lack of exact knowledge on this point in the United States. Working people who have become ill or worn out at their trades do not congregate in resorts or places where they can be recognized as victims of overpressure. They are dispersed, lost in the masses of our population. When some of them emerge, from a longer or shorter struggle for existence, into public sight,—seeking employment or aid from relief societies, in hospitals or clinics, or more tragically, in the criminal courts,—the original cause of their breakdown in health and efficiency is often entirely obscure. Even the trade unions have, as yet, kept little track of the physical condition of their members. On the whole, all that we can learn from union workers are individual stories of breakdown and overstrain. The new interest of the printers in the disease which is thinning their ranks, tuberculosis, and the results of their short campaign show what a force the unions may sometime be in conserving health. But as yet they have few exact or constructive data.

The social settlements and social workers have not much more. Something, it is true, we can learn as to the effect of industrial strain, from the personal observations of persons

who are in friendly relations with their poorer neighbors. They see the early age at which the once vigorous immigrant father begins to slacken in the race. They see the ill effects of youthful overstrain in the feeble offspring of exhausted young mothers. They see the revolt from monotonous work in the reaction of working children against any restraints.*

But for statistical or definite proof of the causal connection between industrial overstrain and actual illnesses, we must turn to other countries, where similar if not the same conditions prevail, and where enlightened physicians have studied wage-earners who have broken down at work.

Such medical observation is at best still rare and chaotic. But in the records and experiences of the foreign sickness insurance societies real light is shed upon the subject. They confirm all that we have discussed up to this point.

5. MEDICAL STUDY OF WORKING PEOPLE IN FOREIGN INSURANCE SOCIETIES

The German workingmen's insurance system, with its sickness, accident, invalidity and old age benefits, is too vast a subject to be more than touched upon here. A suggestion of the opportunities it offers for the study of working people and their disabilities may be indicated by a single paragraph. According to Dr. Zacher (Leitfaden zur Arbeiterversicherung des Deutschen Reiches, 1906) quoted by Professor Henderson,†

". . . . . At the end of 1905 in all about 70 million pensioners (sick, injured, invalids and their dependents) had received $1,200,000,000 in benefits. The workmen have contributed less than half of the premiums, and have received $480,000,000 more than they have paid out. Property is owned to the amount of $408,000,000, of which

* Addams, Jane: The Spirit of Youth and the City Streets. New York, The Macmillan Co., 1909.

† Henderson, Charles R.: Summary of European Laws on Industrial Insurance. *Charities*, Dec. 7, 1907, p. 1196.

almost $120,000,000 have been invested in workmen's dwellings, hospitals and convalescent houses, sanitaria, baths, and similar institutions of welfare."

The sanitaria of the German State Insurance Department were founded for the treatment of insured working people who have fallen ill. Obviously, to cure the sick and restore their working capacity is more economical as well as more humane than to continue merely to pay out insurance. Accordingly, in 1889, a law was passed authorizing insurance societies to invest part of their funds in hospitals and sanitaria, to afford the best facilities for speedy recovery, and as far as possible to prevent permanent disabilities.* The first sanitarium was built in 1894 at Gütergutz for about 100 chronic male cases. Applications for treatment were so numerous that a larger sanitarium for both men and women was next erected at Beelitz, near Berlin.

Aside from the direct benefit to working people from the immediate diagnoses of their illnesses and the treatment received, the establishment of the sanitaria has been of incalculable value in stimulating a new interest in the underlying causes of illness. Hundreds of working people were gathered together for treatment. Many were found suffering from the same disorders; some diseases were found

*"Of special interest is the item of medical care. In the five years between 1900–1905 the cost of treatment rose from 5,578,300 marks ($1,394,575) to 12,158,800 marks ($3,039,700) and in 1907 the figure reached 15,186,300 marks ($3,796,575). This is one of the most admirable outgrowths of the pension system. To avoid having an unnecessarily large number of chronic invalids to support, the insurance system has developed a great preventive and restorative movement. . . .

"Thousands of cases are treated each year and a large percentage of those who ordinarily would have become permanent public charges are either fully restored to strength, or at any rate enabled to do something towards their own support. There is at present great enthusiasm for this system, and the ailing are only too eager to take advantage of the opportunities offered them, as it puts at their disposal medical treatment, rest, food, shelter, clothing, sanitary surroundings and care which otherwise would be far beyond their means." Frankel, Lee K., and Dawson, Miles W.: Workingmen's Insurance in Europe, p. 356. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1910.

See also Kober, Dr. Geo. M.: Industrial and Personal Hygiene, p. 90. Published by the President's Homes Commission, Washington, D. C., 1908.

increasing at abnormally rapid rates. Here were facts, for the first time not only accessible, but challenging the curiosity of physicians. Might the causes for such common ills lurk unrecognized in the workers' previous lives? The physicians were indeed forced to conclude that some common factors in the lives of workingmen and women must be responsible for the spread of certain diseases. What were such common factors? The question widens from the purely medical to something social and economic. Prevention is becoming each year a more insistent demand, and in the interests of prevention the nature of the worker's occupation, at which more than half of his waking life is spent, has received a new medical attention.

6. THE INCREASE OF NERVOUS DISORDERS

Now it is of unusual interest for our special inquiry, to find that these most common diseases of patients in the German insurance sanitaria (not including tuberculosis) were found to be precisely the nervous disorders springing from industrial strain and overpressure.

In a thoughtful article, two physicians formerly of the Beelitz Sanitarium write:*

"The increase of diseases of the nervous system among working people in the last decade is a fact that is now firmly established by extensive and carefully conducted statistical inquiry. This is most clearly evident in respect to the psychoses; but there is also no doubt, in the minds of the most informed authorities, that neurasthenia—which, though less menacing than insanity to the efficiency and labor capacity of the worker is still sufficiently serious in this respect—is also steadily increasing in frequency and in severity. . . . Though, for some years, not only the laity, but also the chief medical experts on neurasthenia, as Löwenfeld and Binswanger, overlooked the working classes in relation to this disease, this attitude is now radically changed. On all sides,

* Deutsche Medizinische Wochenschrift, 25. May, 1905, p. 820. Dr. P. Leubuscher u. Dr. W. Bibrowicz: Die Neurasthenie in Arbeiterkreisen.

in the clinics and physicians' offices, and by the managers of the large insurance funds, proofs of the enormous increase of neurasthenia as a cause of inability to work are being presented."

In a recent report, the physician-in-chief of the Beelitz Sanitarium says:*

"In the course of the year, 1815 men and 803 women were treated. . . .

"Of the 1815 male patients who were discharged, 1206, in round numbers almost 70 per cent, were nervous cases. While in some the exciting cause of the breakdown might be variously explained, in by far the largest proportion of it arose from overstrain of their daily labor.

"Of the female cases, more than one-seventh, or 128 of 803, were anæmic and chlorotic. Among these, one-half of all suffered from nerve strain although other complications might be present."

The serious effects upon working capacity of these nervous disorders, in comparison with other diseases, may be seen in the following figures, giving the entire number of days lost from work on account of sickness.†

COMPARATIVE NUMBER OF WORKING DAYS LOST BY PATIENTS AT BEELITZ SANITARIUM.—BY DISEASE GROUPS

Disease Groups	*Total number of working days lost from time of cessation of work to time of discharge from Sanitarium*	
	Men	*Women*
Infections	60	373
Poisonings	1,259	..
Malnutritions	2,773	7,861
Skin, Muscles, Joints, etc.	5,177	935
Nervous Disorders	44,965	25,075

Dr. Lübenau, assistant physician at Beelitz, writes in

* Verwaltungsbericht der Landesversicherungsanstalt Berlin für das Jahr 1909, p. 112. Similar statistics may be found in the reports of preceding years.

† Entire table not reproduced.

an article on "Heart Disease among the Working People of Berlin":*

"In coming to the class of cardiac neuroses it is to be remarked that nervous affections of the heart among Berlin workmen are very common, as may be inferred from the extraordinary prevalence of neurasthenia. . . . In most of these cases of simple neurasthenia, nervous affections of the heart are the rule. There is the sensation of palpitations, pain in the region of the heart, a feeling of great anxiety, and shortness of breath after exertion. Such diseases have serious importance for workers on account of cardiac complication.

"The cases described above are limited to those in which the heart symptoms of nervous origin present the dominating features and which, therefore, may be regarded purely as cases of cardiac neuroses."

Another physician, Dr. Emil Roth of Potsdam, who has been prominent in the study of diseases of working people, says:†

"How alarming the increase of anæmia and neurasthenia among working people has been in the past ten years is shown by the records of the sick benefit funds, the polyclinics, and the hospitals. Many medical and scientific authorities have emphasized the increase of neurasthenia in the working classes. The ample materials of the Berlin State Insurance Sanitarium at Beelitz have more particularly served to prove the steady increase of neurasthenia,—actually from 18 per cent in 1897 to 40 per cent in 1904. Similar figures are shown by the sanitarium at Zehlendorf, where the highest percentage of neurotic patients were handworkers and skilled workers, with whom the combination of physical and mental strain reacted destructively on the nervous system."

Doubtless such an increase in figures is due to improved diagnosis as well as to the actual growth of neurasthenia among working people. The insurance physicians have

* Zeitschrift für Klinische Medizin, Bd. 60. 1906. Aus dem Sanatorium der Landesversicherungsanstalt Berlin. Über Herzerkrankungen in der Berliner Arbeiterbevölkerung, pp. 136 and 137.

† Roth, Dr Emil: Ermüdung durch Berufsarbeit. Op. cit., pp. 613–614.

come to designate as neurasthenic, illnesses which formerly were called heart troubles, indigestion, and the like.

But whatever the exact rate of increase in nervous disorders, we are more nearly concerned in the fact of their existence today, established by the more careful, immediate diagnosis of wage-earners by the insurance physicians. The liability of working people to nervous disorders from overstrain is still so little recognized that these physicians feel constrained to state specifically that they find no differences, as to clinical appearances, between the neurasthenic workman and the neurasthenic patient of any other social class. The symptoms and conditions are the same.

They are no less assured that the nervous breakdown of these workers is to be ascribed in large part to the industrial overpressure to which they are subjected. Thus a recent authoritative American study of foreign insurance systems reports:*

"The authorities insist, that increase of sickness is genuine and is due in Germany to the stress and strain of modern industry. Hours of labor are from eight to fifteen per day. The large stores, for instance, open at 8 a. m. and close at 8 p. m., allowing one hour for luncheon. It has been ascertained that in those factories where the hours are longest, the greatest number of cases of accident and sickness occur. Many workmen continue to work even when really incapacitated, and only when the slack season comes do they take advantage of the opportunity to consult a physician. This, it is asserted, accounts for the increase of sickness during such periods."

Dr. Roth, quoted above, says on this point:†

"The psychic factor is also important in another respect. With the progressive division of labor, work has become more and more mechanical. . . . A definite share of overfatigue and its sequels, especially neurasthenia, must be ascribed to this monotony; to the absence of spontaneity or joy in work. . . . But that monotony is also of

* Frankel and Dawson, op. cit., p. 242.

† Roth, op. cit., pp. 611; 613–615.

importance in so far as it nullifies pleasure in work, thereby favoring the onset of fatigue, must also be admitted from a part of the statistics. So, according to a factory inspector, the effect of certain light work with corset steels, admitting of no break for several hours, was distinctly fatiguing; the remedy was a periodical change of work for the employees in question.

"Of greater importance is the excessive overstrain of piece-work, which indeed pays better, but at the cost of a speed and intensity of work which was formerly unknown. That these injurious effects first assail the weaker part of the working population is self-evident. My own observations, especially in textile mills, confirmed the frequency of anæmia and neurasthenia, especially among young women."

An observer at the Zehlendorf sanitarium writes in a similar vein:*

"It seems indubitable that factory work considerably outweighs other occupations in the sense that it provides the greatest number of factors tending to produce the neuroses of work in the industrial populations, and I am compelled to conclude that modern industry, continually developing as it is on more and more colossal lines, constitutes a dangerous and potent cause for a continuous increase of neurasthenia and hysteria."

Dr. Treves of Turin, who unites with physiological and psychological knowledge a keen insight into industrial conditions, sums up the whole question when he says:†

"Does what physicians call 'exhaustion' (surmenage) really exist in the working population? This question, which was not thought of in the earliest studies of neurasthenia, since neurasthenic conditions were supposed to be ailments of the liberal professions and those engaged in intense intellectual application exclusively, has today been answered by the medical profession in the affirmative; the daily ob-

* Schönhals, Paul: Über die Ursachen der Neurasthenie u. Hysterie bei Arbeitern, p. 26. Berlin, 1906. (A Study of 200 Cases in the Workingman's Sanitarium at Zehlendorf.)

† Fourteenth International Congress of Hygiene and Demography, Vol. II, Sec. IV, Berlin, 1907, pp. 626–627.

See also Part II of this volume, pp. 163–185.

servation of workers in hospital and dispensary has led to this conclusion. . . . Overstrain resulting from occupation does exist; it is also entirely possible to combat it; there is, in short, a problem of overwork. . . .

"This overstrain, which physiologists, psychologists, clinicians, and above all nerve specialists and alienists, encounter so often as to be no longer deceived by it, does not present a well-defined morbid picture; but it is a slow deviation, often obscured by its very slowness, and predisposing to illness of any nature; it is the borderland of illness."

It is extremely interesting to find a similar stress upon the occurrence of nervous disorders in the detailed testimony of the distinguished physicians called in by the Canadian Royal Commission, which investigated the telephone service in Toronto a few years ago. Many of them, in their practice, had treated telephone operators for eye strain, headache, and affections of the ears. But the chief emphasis in their testimony was laid, not upon such specific injuries to the special sense organs, but upon the detriment to the operator's total health, particularly to her nervous organization.

"The service is such a strain upon the sight, hearing, speech, and muscles of the arms and body, that it is nerve exhausting,"

testified one physician* of eighteen years' practice, associate professor of clinical medicine in Toronto University.

Another physician of thirty-one years' practice, testified† that he had attended employes suffering

"from nervous debility occasioned by the strain of that particular work upon the nervous system, which includes the senses of hearing, speaking, seeing, and using arms, causing too much strain upon the nerve center. . . . In a number of cases of young ladies whom I had known as the physician of the family before they entered into the tele-

* Dr. William B. Thistle. Report of the Royal Commission. Op. cit., p. 71.

† Dr. William Britton of the University of Toronto, and of the Medical Council. Ibid., pp. 66–67.

phone service and who were apparently healthy, after a length of service in the telephone office I had to prescribe for them for various types of nervous debility, and my advice to the majority of them was to discontinue the work. The constant listening and the keen buzzing means a state of tension of the nervous system all the time; fifteen minutes' relief would be a very slight one. I have quite often seen nervous hysteria from this nervous strain to the telephone girls."

The medical superintendent of the Toronto Asylum testified:*

"Work is automatic only to a limited extent. It requires a mental effort every time. Nervous strain is intense and would react on the physical health in a marked way after three years' service, and might pass on to the next generation in a more striking way than even in the present generation. I am basing that statement on my every day experiences with just such cases, having an experience on that kind of thing for several years."

The professor of therapeutics, and teacher in connection with the diseases of the eye and ear in Toronto University, stated:†

"The result of work would be nerve fag, and might be a nervous breakdown. . . . We know practically that changes in illumination from dark to light do irritate the optic nerve, and that is going on all the time. . . . Flashing of the light has an irritating effect and is in that way injurious. The nerves governing the extra ocular muscles which focus the eye upon the object looked upon, are the nerves where the greatest part of the strain comes. The sound kept up for hours must have an effect on the auditory nerves, and if for long hours, an injurious effect might cause deafness. The possibility of receiving shocks would add to the nerve strain, effect on vocal organs not much. The effect upon the nervous system is through the nerves of the eye and the auditory nerves; reaching is subsidiary; operating together causes the difficulty."

* Dr. Charles R. Clark. Ibid., p. 72.

† Dr. J. M. McCallum. Ibid., p. 72.

Similar statements were repeated by all the physicians who testified. They concluded that the only preventive was to regulate most carefully the hours of work so taxing to women's physical powers; and above all, to break the work by proper relief periods for rest and recuperation. A continuous stretch of work without rest, for even a comparatively short time, was unanimously condemned, precisely on the ground of the excessive nervous strain.

"It is the length of time, rather than the number of calls that I emphasize."

"It is the period that she is on duty with her faculties on the alert constantly that is more important than the volume of work done."

Such is the sentiment repeatedly expressed.

The only American publication on this subject known to the writer, are some notes by a St. Louis physician on the strikingly large percentage of neurasthenics found among 7,000 garment workers, during a period of ten years, at the St. Louis Jewish Dispensary.* This physician, without going further afield, limits his conclusions strictly to the "stubborn fact" observed: "that 20 to 30 per cent of these 7,000 garment workers applying for relief were found to be subjects of neurasthenia," meaning by that term the "clinical entity" understood among neurologists. He draws attention to two phases of their employment which seem to have a "very positive influence on the production of neurasthenia." These are the irregularity of employment in the garment trades and piece-work—both of them common incidents of industrial life upon whose sinister possibilities we have elsewhere dwelt.

* Schwab, Sidney I. (Professor of Nervous and Mental Diseases, St. Louis University): Neurasthenia Among Garment Workers. *American Labor Legislation Review*, Vol. I, No. I, p. 27. (January, 1911.)

7. GENERAL PREDISPOSITION TO DISEASE

The close causal connection between overfatigue and certain types of nervous disease must not obscure the much larger and more significant rôle of fatigue in undermining health, to which Professor Treves refers above as the "borderland of illness." Fatigue not only causes specific ills; its victims are predisposed to disease in general. It is today almost a truism that health and freedom from illness spring from a maximum power of resistance. Not absence of exposure but strength of resistance is what keeps us well. It is the peculiar misery of the exhausted that they fall victims to the first infection or minor ailment which they may happen to encounter. This is apparent in everyday life; and in the laboratory, animal experimentation tends to show that fatigue markedly diminishes the power of the blood to overcome bacteria and their toxic products.*

The danger of even indirectly spreading infectious diseases needs no emphasis. Work which exhausts, and so contributes to the spread of infections and epidemics, is clearly a public as well as a private menace. On this ground, the overstrain of thousands of workingmen and workingwomen which keeps a large part of our population in fit condition to take and spread contagions, should be considered as intolerable as any other provocation of epidemics.

But even careful observers are apt to underrate or ignore the predominating influence of overfatigue in causing the lowered vitality and the minor ailments of working people. Our analysis of exhaustion as due to the accumulation of fatigue products and an excessive drain on men's energies,

* Charrin and Roget: Archives de Physiologie normale et pathologique, 1890. No. 2, p. 273.

Wetzel, G.: Pflüger's Archiv, 1900. Bd. 82, p. 505.

Cohnstein, Dr. Wilhelm: Virchow's Archiv, 1892. Bd. 130, p. 332.

De Sandro, Domenico: Riforma Med., 1910, XXXV, pp. 841 and 871. Reviewed in the Journal of the American Medical Association, Vol. LVI, No. I, p. 46. (Jan. 7, 1911.)

Abbott, A. C., and Gildersleeve, N.: The Influence of Muscular Fatigue and of Alcohol on Certain of the Normal Defenses. Univ. of Penn. Medical Bul. Vol. 23, pp. 169–181. 1910.

will have been useless if it does not help us to realize anew how health hangs upon the metabolic balance; how vitality and resistance spring buoyant from physiologic equilibrium; and how fatally overstrain tips the scales down.

8. A NEW MEDICAL SCRUTINY OF OVERWORK

The physiological study of overwork must be sharply differentiated from the longer established study of special trade diseases. Medical interest in the special diseases of various trades is of long standing, and has been growing steadily since the Italian Ramazzini first drew attention to the diseases of working people over 200 years ago.* The literature of special trade illnesses—lead poisoning, phosphorous poisoning, arsenic poisoning, anthrax, diseases from lint, fluff, dust, humidity, extremes of temperature, and the like—is enormous, a recent partial bibliography in regard to tuberculosis alone filling almost twenty printed pages of close type.†

In every country where sickness insurance exists, the study of trade diseases is bound to grow steadily. Day by day and year by year many physicians attached to insurance societies have opportunities of observing and treating cases of industrial disease. Thus, for instance, in 1908 the largest sickness insurance society in Germany, the Local Society of Leipzig, employed under contract 410 physicians, 137 specialists, 23 dentists, 55 druggists, and 20 opticians.‡ Trade diseases, indeed, have become so important a branch of medical practice abroad that the establishment of special chairs at universities for the training of specialists in these branches has been advocated.§ Medical courses on simula-

* Ramazzini, B.: De Morbis Artificium Diatriba, Modena, 1701.

† Bulletin of the U. S. Bureau of Labor, No. 79, 1908. Hoffman, Frederick L.: Mortality from Consumption in Dusty Trades.

‡ Frankel and Dawson, op. cit., p. 258.

§ Congrès Internationale des Assurance Sociales. Rome, 1908, Session 8. Peyser, Dr. Alfred (Berlin): Die Soziale Medizin als Gegenstand des Unterrichts. Sternberg, Prof. Dr. Max (Vienna): Die Soziale Medizin als Besonderer Unterrichts Gegenstand.

tion, or the attempts of working people to counterfeit trade diseases, are even now regularly given by European professors. In March, 1910, the first clinic for the treatment of industrial diseases was dedicated in Milan.

But in all this, the emphasis upon fatigue and the causal connection between overwork and disease has until recently been slight. Now, for the first time, in the workmen's insurance system, the sinister rôle of overwork is beginning to show itself unmistakably. The medical observation of fatigue in industry, even abroad, is recent and still quite disorganized. There is abundant complaint that the vast opportunities of investigation among insured working people are not yet utilized; that the present methods of observation are inadequate, and that standards are lacking for diagnoses of illnesses and their industrial causes. But the essential fact is that a new medical scrutiny of modern work and its strain on human energies has at least begun. It centers on *fatigue as itself a danger of occupation.*

This new medical emphasis on industrial fatigue and overwork was conspicuous at the last meeting of the International Congress of Hygiene held at Berlin in 1907. Discussions of fatigue and exhaustion as dangers of occupation were given a new place of prominence.* Even earlier, this congress of physicians and scientists had devoted some attention to the subject at its meetings in Budapest, 1894, and in Paris, 1900. At its meeting in Brussels, 1903, the congress urged governments to study overfatigue as one of the most fertile sources of ill health among working people. This recommendation was quoted and repeated in hearings before the British Interdepartmental Committee on Physical Degeneration in 1904.

The Italians, among whom the laboratory studies of fatigue have been so extensively carried on, take a prominent part in this new research. They call it inclusively *Patalogia del Lavoro,* pathology of work, or the study of all those factors

* Ermüdung durch Berufsarbeit. Discussed by Dr. Z. Treves of Turin, Dr. E. Roth of Potsdam, and others.

in work which result in abnormal or pathologic consequences to the human organism. As Dr. Giglioli of Florence, himself one of the young Italians at work in this new field, says:*

"The first vague Ramazzinian conception of trade diseases has developed into the wider and more definite theory of the pathology of labor. This most important division of social medicine has developed in a very short time into a well organized and distinct study. It is not, nor does it tend to become, what is popularly called a 'specialty,' but it has the dignity of being considered the most modern branch of medical study, and has its ardent expounders, clinics, laboratories, and students.

"It is a very modern development, stimulated by the most recent scientific researches and acquisitions in hygiene, economics, and politics. Through it, new methods of study have developed, by which not only the typical trade diseases but all the factors which bear upon the health conditions of wage-earners are estimated and studied clinically and experimentally. . . .

"Modern pathology thus unites study of fatigue and nutrition with the most recent theories of predisposition to infection induced in formerly healthy organisms. It reconciles the very latest theories of neuro-pathology with the latest ideas about the neurasthenics of labor. While it does not attempt to invade the other branches of medicine, it does draw from them facts and data with which to re-enforce its own postulates on social economic methods. This most modern development may appear to some too vague and general, to others too restricted, but it is certainly gaining ground and growing continually more complete and definite."

This new emphasis is likewise shown in the able little Italian monthly called *Il Ramazzini,* from which the above is quoted. This is a journal of social medicine, started in 1907. In the admirable bibliographies of current socio-medical-literature which *Il Ramazzini* publishes for the International Commission on Trade Diseases (founded 1906),

* *Il Ramazzini.* Giornale Italiano di Medicina Sociale. Anno I. Fasc. 12. (December, 1907.) Giglioli, Dr. G. Y. (R. Istituto di Clinica Medica, Firenze): Nuovo Ricerche e Nuovo Conquiste nel Campo della Patologia e del' Igiene.

prominent place is given to the section headed "Surmenage," or exhaustion.

In the "pathology of labor" belong indeed the trade diseases with their train of temporary and chronic ills. But the first place is taken by those disturbances of metabolism, those self-generated poisons of fatigue, which are common not only to workers in so-called dangerous occupations, but to every man, woman, and child who breathes and works.

9. OPPORTUNITIES FOR SUCH STUDY IN THE UNITED STATES

In the almost total absence, in this country, of medical emphasis upon the pathogenic nature of industrial overfatigue, it is significant to read Professor Irving Fisher's note in his Report on National Vitality, prepared for the National Conservation Commission. He says:*

"The present working day is a striking example of the failure to conserve national vitality. . . . The fatigue of workmen is largely traceable to their long work day. . .

"The relatively slight impairment of efficiency due to overfatigue leads to more serious impairment. Just as minor ailments prove to have an unsuspected importance when considered as gateways to serious illness, so the inefficiency from overfatigue is vested with great significance. Obviously, if overfatigue would be reduced to a minimum, this reduction would carry with it the prevention of the major part of minor ailments, which in turn would lead to a great reduction in more serious illnesses, and this finally would lead to a great reduction in mortality. A typical succession of events is, first fatigue, then colds, then tuberculosis, then death. Prevention, to be effective, must begin at the beginning."

Back of the great scourges and acute contagions, back even of the minor ailments which often precede them, lies the lowered vitality, the unbalanced metabolism, to which, as we have seen, overwork so largely contributes. Serious discussion or consideration of this fatal sequence among

* Bulletin of the Committee of One Hundred on National Health, No. 30, pp. 45 and 47, July, 1909.

working people is rare indeed. It is touched on with peculiar insight by Dr. Edward T. Devine in his stirring presentation of a dark topic, "Misery and Its Causes."

From the point of view of social welfare, Dr. Devine holds the minor ailments responsible for far greater misery among the poor than has been realized or ministered to by the medical profession, in comparison with the great plagues and the more acutely contagious diseases.

"I suppose," he says,* "that no medical authority would think of grouping together such diseases as I have named (rheumatism, indigestion, influenza, colds, catarrh, bronchitis and constipation), as from the medical point of view they may have nothing in common; but for us they have this in common, that they increase to an enormous, though uncalculable, extent the sum total of misery which men, women and children have to bear; they prevent that enjoyment of the good things of life to which we are fully entitled for the extraordinary amount of hard work that we do, by the bounty of nature and the abundance of our inherited wealth."

It is a new thing to have such "minor" sufferings named as "altogether undervalued causes of misery." It is a new thing, too, to have their importance squarely faced, as follows:

"I challenge the medical schools and laboratories, the institutions of research and family physicians, as not having paid sufficient attention to these disabilities; but beyond this, and as a more fundamental diagnosis of the difficulty, I challenge society as having permitted here very grave maladjustments in not having appreciated the importance of ailments of this kind, and for this reason not having been willing to pay for the service of investigating their cause, their character and their cure, or for the service of treating them in time."†

Our study of fatigue would lead us to go a step farther than Dr. Devine. He is presenting, with keen and sympa-

* Devine, Edward T.: Misery and Its Causes, p. 84. New York, The Macmillan Company, 1909.

† Ibid., p. 83.

thetic insight, the causes of misery for the "out-of-health, out-of-work, out-of-friends." We are concerned primarily with the other end of the industrial scale—the overworked, the overstrained, the overwhelmed. We are regarding Work in a broad physiological sense. In the discussion which follows we shall narrow our field further to those for whom legislation is today most urgent and practicable, the working women and children in need of state protection. But at this point, in behalf of all human workers—just because they are human!—we would paraphrase Dr. Devine's words and challenge the medical schools and laboratories, the institutes of research and family physicians, as not having paid sufficient attention to industrial overstrain and the intolerably long hours of labor, which, through the actual poisons of fatigue, must be regarded as breeding and augmenting the so-called minor ailments of working people.

And beyond this, and as a more fundamental diagnosis of the difficulty (to paraphrase Dr. Devine further) we challenge society as not having appreciated the importance of industrial overwork and exhaustion, and for this reason having allowed them to persist from generation to generation without study of their effects or of the violence done to man's natural endowment—his physiologic mechanism.

Abroad, a new correlation of such scientific study and the industrial régime has at least begun. It has not yet gone as far as has the scientific scrutiny of overwork in school children. Such observation of school children—their capacities, attentions, fatigues—has in the last few years become a favorite theme of both pedagogues and physiologists. It is concerned chiefly with the fatigue of attention due to long school hours, and the reaction of such fatigue upon the child's total health. Scientific tests and measurements of fatigue in school children have accordingly been carried on for some years past with more or less success, and a vast amount of literature on the subject exists today.

For effective prevention, we need precisely a new study of undue fatigue in industry. Both for a more rational or-

ganization of business and for intelligent legislation we need definite knowledge of the effects of such industrial facts as those which we have briefly reviewed. We need to know, from systematic and continuous study, what are the actual results of speeding, and piece-work, monotony and mechanical rhythms, and the rest. The workday, as we have seen, is too long when it goes beyond physiological limits; in other words, when no adequate margin of rest is allowed for tissue repair. We need to know for the various trades, and for the various operations in those trades, what is an adequate margin of rest. We need to know whether nervous diseases are on the increase among industrial workers in this country as they are reported to be abroad. We need to transfer into the factory and workshop the investigations into fatigue which have yielded so rich a harvest in the laboratories. We need, above all, men of the highest caliber and professional standing to plan such investigations along broad inclusive lines, so as to discount what is transient and temporary, and to obtain the underlying facts, for the conservation of health and efficiency.

Many enlightened employers already provide medical supervision of the hygiene of their employes, in the interests of efficiency. These agencies could well be used for such systematic and continuous study as we have advocated. Once the importance of the subject is realized, once overstrain is recognized as *itself a danger of occupation*, study of overwork and its sequelæ must follow.

Another source of information on the effects of industrial overpressure has been hitherto unused. This is in the records of the clinics and hospitals where working people are treated. In this country we have not the opportunities afforded by the foreign insurance systems to study sick and convalescent wage-earners. But from the thousands of working men and women to whom the hospitals minister yearly, could they not learn those antecedent facts as to the strain of employment to which, as we have seen, foreign insurance physicians have been forced to turn in the interests of prevention?

The social service work established in connection with various hospitals, precisely for prevention, is a first step in this direction. The out-patient department in many hospitals follows patients into their homes in order to make sure that the benefits of hospital treatment are not immediately undone by unhygienic living. This work could well be supplemented by obtaining and keeping accurate records of the industrial as well as the medical history of patients. No better work for prevention could be done than by attempting to discover those elements in industry which contribute directly to the illnesses of thousands of workers and carry them year by year in throngs to the hospitals.

Through the nurses who visit patients in their homes and establish confidential relations with them, the machinery for such an additional inquiry is available. The medical examination and record of patients at the hospitals give their physical histories in full. An invaluable additional body of information could be secured if detailed records were systematically kept during a series of years showing the previous trade history of patients: their previous hours of work, the length of overtime work at rush seasons, their night work if any, the machinery or processes at which they were employed before illness, and many similar questions. These histories, to be accurate, would have to be corroborated by a separate industrial investigation of previous places of employment, to confirm the workers' accounts of themselves. Such an investigation could be kept within manageable limits by confining it to the year or two years previous to the workers' illness.

To learn and to accumulate the histories of patients suffering from specific trade diseases would obviously throw light upon many dangerous occupations and dangerous processes of manufacture as yet unstudied in this country. To learn and accumulate the histories of those who have been the victims of industrial overpressure would be a no less valuable contribution to the complex study of industrial fatigue. This can never be done by collecting a few cases. The

value of such an investigation would be cumulative, if it could prove, after a series of years, by large numbers of individual and well authenticated cases, the important part played by overstrain in the production of disease and ill-health among wage-earners.*

Such case study of wage-earners who have succumbed to illness has a marked advantage over the more general study of wage-earners at work. What we seek to know is precisely what is implied in the Italian phrase "the pathology of labor." Just as in medicine the study of pathology goes hand in hand with the study of physiology—the morbid as well as the normal reactions often yielding most suggestive clues—so in industry, not only the physiological but the pathological aspects must be scrutinized: the infections, anæmias, nervous disorders, pelvic derangements in women, and the rest.

It is, in the last resort, those who succumb who must determine the dangerousness of any trade. Thus, for instance, many men no doubt can and do work in caissons, without contracting the dreaded "bends." Yet the legislation which prescribes special rules of hygiene for caisson work is based on the victims, not the survivors. Hence it is essential to learn from a scientific observation of the victims of industry —possibly in hospitals and clinics as suggested above—those unhealthful and dangerous processes of industry which lead to physical disaster.

* The beginnings of such an investigation into the trade history as well as the home life of clinic patients is related in the last report of the Social Service Department of the Massachusetts General Hospital (Jan. 1, 1911–Jan. 1, 1912). Eighty working girls who had applied for medical relief during eight months, were studied.

V

ECONOMIC ASPECT OF REGULATION: FATIGUE AND OUTPUT

IN the previous chapters we have found in the laws of fatigue a scientific basis for legislation, and an explanation of the effects of overwork on *health*. We may proceed now to seek in the same physiological laws an explanation of the effects of overwork on *output and production*. To understand the economic as well as the physical effects of regulation, we must turn back to those physiological truths on which both alike are based.

We have sought to bridge the gap between laboratory and factory, and to show how work, whether it be the leg jerk of the frog in scientific experiments, or the contractions of our human muscles in industrial processes, results in chemical reactions within the workers' tissues. Now we must turn from the person of the worker to his accomplishment, from study of the performer to a scrutiny of his performance.

Just as the methods of the laboratory have yielded suggestive analogies in estimating the subjective fatigue of the worker, so they help to estimate the objective value of work accomplished. The diagrams, or curves of work, recorded upon the sooty drum at the laboratory, represent not exactly but symbolically the fluctuations of what is known in industry as output, or production. They explain why long and late hours of labor must physiologically result in lessened output.

This is the more important because regulation of the length of working hours has been so bitterly contested by those who feared that any lessening of the hours of labor meant a corresponding economic loss. From the first dawn

of protective legislation in England over a century ago to the present day, the rallying cry for the most diverse-minded opponents of legislation has been the threatened ruin of industry and manufactures. Solemn or hysterical, an honest conviction, hypocritical, pseudo-scientific, this cry has been more or less successfully invoked in every country, at every attempted advance, bringing with it all the rancors and bitternesses through which the cause of legislation has been dragged. Yet the unconscious consensus of testimony from various states and countries on the economic benefits of the short day, recorded in official and unofficial documents, is in its turn as impressive as we found the unanimity of evidence on the physical effects of the long day.

For the most part, however, all this body of information is ignored and allowed to fade into the limbo of forgotten things, in our practical efforts at legislation. We must keep reiterating that the unsolved questions and difficulties are of fundamentally the same general character today as in the past. Practically the world over, the state of the sweated trades in 1912 is "closely parallel to that of the Lancashire cotton mills in 1802." To come nearer home, factory legislation in Pennsylvania, New York, and other American states has not yet reached the stage of British textile legislation of more than sixty years ago. And most significant of all, it is still the cry that industry will be ruined by protecting the workers, which most hampers our advance.

It is the cotton lobby which throws its great influence against the workers in the cotton states, the glass lobby in the glass states, the laundrymen's association wherever legislation for laundry workers is proposed, the retail dealers' association against any relief for shop girls. Individual employers, it goes without saying, are humane and enlightened, but their official organizations and representatives have won a sinister distinction in opposing labor legislation. Such associations of employers as those named above, are found officially in the field at every session of the state legislatures. It was, for instance, the Illinois Manufacturers' Association

which officially combatted any restriction whatsoever of women's hours in Illinois, and, failing to defeat the passage of the ten-hour law in 1909, bent all their energies to have the law annulled by the courts. It was the laundrymen's associations which played the same part in Oregon in 1907, and even carried a case against the Oregon ten-hour law to the United States Supreme Court. It is the Retail Dry Goods Merchants Association of New York City which by varied means has succeeded in stifling all limitation of hours for adult women employed in department stores. It was the official Manufacturers' Association of Colorado which issued a statement to the legislature in 1911, pointing out the dangers of the proposed eight-hour law, and denying its need by recounting the contributions of Colorado manufacturers to various charities. The universal argument which has so often crowned their official efforts with success is the abject money-makers' plea, the fear of loss—"Save us lest we perish."

As the authors of the standard history of factory legislation have said, writing with what Mr. Sidney Webb calls "commendable restraint," as "historical students":*

"In the beginning, the proposal to restrict children to a working day about 30 per cent longer than strong men now think good for themselves, was greeted almost hysterically, and the ruin of trade and commercial collapse of the country were freely prophesied as the necessary result. Inquiry after inquiry, commission after commission, have demonstrated the groundlessness of these rather unmanly terrors, yet the Factory Code is still the barest minimum and scarcely ever is there a discussion in Parliament on the subject that does not reveal that the masses of information and material that exist for the full economic justification of further measures are practically unknown to all but a select few of our legislators."

1. GENERAL EXPERIENCE IN ENGLAND

As far as our immediate subject is concerned,—the relation between fatigue and output,—the testimony of history

* Hutchins, B. L., and Harrison, A.: History of Factory Legislation, p. 253. London, P. S. King and Son, 1903.

is continuous and impressive. In England, for instance, whose industrial experience is longest and most fully recorded, the cry that legislation would ruin the country united men of the most scattered beliefs and parties to oppose the Ten Hours Movement. The long file of Parliamentary Debates from 1832 onward gives vivid glimpses of the conflict that raged, while industrialism was bursting into life, after the long European wars. The Napoleonic bogie had been laid. The ports of Europe were open again to British commerce. Watt's steam engine, patented in 1769, had advanced into general use. The day of industrialism had come. Terrible as is some of the testimony in the Debates, showing the ugly domination of men's humaner instincts by greed, and the almost intolerable slowness with which nineteenth century empiricism treated each separate abuse as a single issue, unrelated to any general principles of protection, yet these debates are seldom remote or academic. They are vivid cross-sections of British history, pulsing with life.

We see the Earl of Shaftesbury, then Lord Ashley, standard-bearer of the cause, in the great debate of 1844 stung from the lofty tone habitual to him in combatting oppression. Once too often his opponents had flung the foolish taunt that he was attacking commercial interests merely as the representative of a different social class, a taunt not unknown to reformers today. "Most solemnly do I deny the charge," began Lord Ashley, and breaking into anger:

> "If you think me wicked enough, do you think me fool enough for such a hateful policy? Can any man in his senses now hesitate to believe that the permanent prosperity of the manufacturing body . . . is essential, not only to the welfare, but absolutely to the existence of the British Empire?"*

We see Bright and Hume and Cobden, leaders of the Manchester School, opposing what they called the "interference" of the government (a still familiar cry!) as certain to bring ruin upon manufacture. These men were fighting,

* Hansard's Parliamentary Debates, 3rd Series, Mar. 15, 1844.

we must remember, the battles of free trade. The struggles for the Factory Acts and for free trade were practically synchronous. The Corn Laws were repealed only a year before the final passage of the Ten Hours Bill (1847), and the political economists denounced in one breath government regulation of working hours and government monopoly of trade, on philosophic grounds of *laissez faire*.

"The people ask for freedom in their industry," cries John Bright in 1844,* "for the removal of shackles on their trade; you deny it to them and then forbid them to labor as if working less would give them more food whilst your monopoly laws make food scarce and dear. Give them liberty to work, give them the market of the world for their products."

Yet, on the whole, this opposition to the ten-hour movement did not center on abstract ideas of freedom or philosophy. It was much more practical and modern. Men did not vote on any party lines—Whigs, Tories, and Radicals were all intermingled.† As has been well said, the issue resolved itself into what we may term the optimistic argument, asserting that the alleged overwork was grossly exaggerated (again, how familiar a defense!) and the commercial argument which pleaded that the manufacturing interests would be bankrupted by the proposed restriction to ten hours.‡

This was indeed long held to be the vantage ground of the opponents of restriction,—the dire consequences which must follow the curtailment of the last two hours of the twelve-hour day.

* Hansard's Parliamentary Debates, 3rd Series. March 15, 1844.

† A wellknown passage in Greville's Memoirs describes the confusion: "I never remember so much excitement as has been caused by Ashley's Ten Hours Bill, nor a more curious political state of things, such intermingling of parties, such a confusion of opposition. . . . So much zeal, asperity, and animosity, so many reproaches hurled backwards and forwards. . . . John Russell, voting for '10 hours' after all he professed last year, has filled the world with amazement. . . . The opposition was divided, Palmerston and Lord John one way, Baring and Labouchère the other. It has been a very queer affair." Memoirs, Vol. II, pp. 236–237. Longmans, Green and Co., London, 1885.

‡ Hutchins and Harrison, op. cit., p. 88. Second Edition. 1911.

No one issue in labor legislation has been more befogged by prejudice and passion than this relative productivity of late working hours. The question arose at the very outset of the industrial era in 1837, when the economist Senior put forth his long-lived economic fallacy that profit depends on the output of the last hours of work, and that, consequently, profits would be destroyed if the eleventh or even the twelfth hour of work were curtailed.*

This superstition has died hard. No contention did more to retard the reduction of the twelve-hour day in England. It seemed plausible enough to men, in the first flush of invention and industrial expansion, who looked on human labor as a mere adjunct to the machine. For obviously, with machines every additional hour of operation means additional profit. The fixed charges of installation and operation —rent, taxes, and the like—are not increased proportionally by added hours of operation; hence the last hours were supposed to represent clear profit after expenses had been met by the earlier hours of work. It was passionately asserted that the commercial supremacy of England hung on the last one or two hours of work, which gave the profits.†

Senior's extraordinary argument was introduced verbatim in Parliament by Mr. Milner Gibson in 1844, as "sound and indisputable." If the manufacturer's profits were destroyed by cutting off the last two hours of work, he said, the laborer was in effect deprived of earning his means of subsistence. Articles and arguments for and against Senior

* Senior, Nassau: Letters on the Factory Act. London, 1837.

† "The following analysis will show that in a mill so worked (twelve hours a day and nine on Saturday, according to the Act of 1833) the whole profit is derived *from the last hour*. I will suppose a manufacturer to invest £100,000—£80,000 in his mill and machinery and £20,000 in raw material and wages. The annual return of that mill, supposing the capital to be turned once a year, and gross profits to be 15 per cent, ought to be goods worth £115,000, produced by the constant conversion and reconversion of the £20,000 circulating capital from money into goods and from goods into money in periods of rather more than two months. Of this £115,000 each of the twenty-three half-hours of work produced 5/115ths of 1/23rd. Of these 23/23rds (constituting the whole £115,000), 20, that is to say, £100,000 out of the £115,000, simply replace the capital; 1/23rd (or £5,000) out of the £115,000 makes up for the deterioration of the mill and

raged in the daily and weekly press as well as in Parliament. Even ten years later, just before the ten hours bill was to pass in 1847, we find Joseph Hume making an impassioned appeal still based on Senior against interference with "fixed capital." He concurred in the clear and satisfactory arguments of one whom "he was proud to call his friend," that

> "ten hours paid only the expenses of the 'plant' and the wages of labor, and that if work stopped at ten hours, there would be no profit on the capital invested. . . . The surplus, then, whether it was one, one and a half or two hours beyond ten hours, was the only time from which a remunerative return for capital could be made, without which it could not be expected that men would carry on business."*

But the irresistible logic of events was already beginning to overcome these specious arguments. Senior's theory was not, in the long run, borne out by practice. The human element, ignored in the theory, asserted itself practically, and the "spoiled work" which had to be thrown away, or done over again the next morning, increased rapidly during the late exhausting hours of the twelve-hour day. As early as 1843 an inquiry made for the second Children's Employment Commission by Mr. J. L. Kennedy as to the cloth print works in Lancashire, Cheshire, and Derbyshire, showed how the system of long hours resulted in deteriorated output. One firm, for instance, tried to run their mill fifteen hours per day and found that after the first month output began to fall off in both quantity and quality. By the fourth month of the trial, the spoiled work had doubled, and production had

the machinery. The remaining 2/23rds, the last two of the twenty-three half-hours of every day, produce the net profits of 10 per cent. If therefore (prices remaining the same) the factory could be kept at work thirteen hours instead of eleven and one-half, by an addition of about £2,600 to the circulating capital, the net profit would be more than doubled. On the other hand, if the hours of working were reduced by one hour per day (prices remaining the same) net profits would be destroyed; if they were reduced by an hour and a half, even gross profit would be destroyed. The circulating capital would be replaced, but there would be no fund to compensate the progressive deterioration of the fixed capital." Senior, op. cit. Quoted in Hutchins and Harrison, p. 88.

* Hansard's Parliamentary Debates, 3rd Series, Feb. 10, 1847.

fallen from 100 per cent to 90 per cent. This they attributed to the gradual exhaustion of the workers.

"The amount of spoiled work increased to such an alarming degree that the parties referred to felt themselves compelled to shorten the hours of labor to avoid loss."*

Upon reducing the hours of labor, the proportion of spoiled work promptly fell and output rose again. This was indeed Lord Shaftesbury's great argument, and the argument of Robert Owen and others of practical experience: not only that production deteriorated in amount and quality during the last two exhausting hours of the twelve-hour day, but that the workers' total efficiency, their physical and moral powers, all were gradually impaired. The shorter day, on the contrary, released them before exhaustion arrived, and in the long run tended to preserve working capacity at a higher level.

Between 1844 and 1860 more and more evidence of this kind was accumulating. By 1861, the president of the economic section of the British Association for the Advancement of Science could write of the general agreement throughout the country that

"if there has been one change which more than another has . . . placed the manufacturing enterprise of the country on a safe basis and has conferred upon us resources against the effects of foreign competition which can scarcely be overvalued, it is precisely the changes which have been brought about by the . . . efforts to establish in manufacturing occupations a sound system of legal interference with the hours of labour."†

During this period many wellknown opponents of legislation who had foretold the destruction of British industry, such as Cobden, Mr. Roebuck, the Home Secretary Sir James Graham, and others, became converted. Mr. Roe-

* British Sessional Papers, 1843, Vol. XIII, p. 72.

† Reprinted in Journal of the Statistical Society, Vol. XXIV, 1861, p. 463.

buck's recantation is so vivacious and made so great an impression at the time that it ought in part to be quoted:

"Very early in my Parliamentary career, Lord Ashley, now the Earl of Shaftesbury, introduced a bill of this description. I being an ardent political economist, as I am now, opposed the measure . . . and was very much influenced in my opposition by what the gentlemen of Lancashire said. They declared that it was the last half hour of the work performed by their operatives which made all their profits, and that if we took away that last half hour we should ruin the manufacturers of England. I listened to that statement and trembled for the manufacturers of England, but Lord Ashley persevered. Parliament passed the bill which he brought in. From that time down to the present, the factories of this country have been under state control, and I appeal to this house whether the manufacturers of England have suffered by this legislation. But the Honourable member for Manchester (John Bright) still, I find, makes the same objection. He gets up and prophesies all sorts of evil if we interfere now; but he has kept out of view the evils for the prevention of which we are now about to interfere . . . Having prevented this misery in the one case, let us interfere to prevent it in the other."*

The chief agencies by which these real results of the acts were becoming known, were the reports of the factory inspectors. It was a step of quite unappreciated importance when in 1833 the first inspectors were appointed to enforce the act. Supervision by the local justices, as first enacted, had failed. The appointment of inspectors by the central government for the express purpose of enforcement has been well called "the turning point of legislation," a step "whose importance cannot be exaggerated."† It was one of the first instances of creating a special department of the central government to administer a particular act. The inspectors were also to keep the government informed of the condition of the factory population, the degree to which the laws were

* Hansard's Parliamentary Debates, 3rd Series, Mar. 21, 1860.

† Webb, Sidney, and Cox, H.: The Eight Hours Day, p. 199. London, W. Scott, 1891.

meeting the existing evils, and the like questions. Their reports were sent in to one of the secretaries of state twice a year or oftener. Hence it came about that there gradually became available a body of unprejudiced information,—an "invaluable continuous record of industrial conditions by trained observers, free from local bias and partiality, whose business it was to renew their visits at stated periods and note what changes took place within their view."*

This has been one of the most important services of the inspection force in England and on the continent. However short they may have fallen in the actual enforcement of the laws, owing to the great odds against them,—the hostility of employers and parents, the inadequacy of the laws and their own entirely inadequate numbers,—they have, at any rate, bequeathed to us an invaluable record of the actual effects of legislation. Those who favored the extension of the Act of 1847 and the inclusion of other trades, could at least point to the written accounts of what had been accomplished in one regulated industry. As other trades were gradually included by subsequent legislation,—print works, bleacheries, lace factories, hosiery, hardware, and so forth,—the factory inspectors continued to show how manufacture in the long run profited instead of suffering by regulation.

Human nature is such, however, that immediate profits tend to outweigh future benefits, which can be proved only in the long run. Immediate profits make a much more popular appeal, and have distorted the issue, time and again, in successive campaigns for the short day, in each industrial country in turn. It was no peculiarity of the English that they so often preferred the immediate returns of the long working day, so that after more than one hundred years of legislation the Factory Code must still be called a minimum of protection. The same higgling and the same specious arguments have been effective in Germany, in France, in Belgium, in the United States, and wherever legislation on working hours has been undertaken. Only repeated demonstrations

* Hutchins and Harrison, op. cit., p. 72.

and restatements of the true economic effects of short hours, by enlightened employers, factory inspectors, economists, and laboring men have at all offset the illusory immediate profits of the long day. England has the longest and most fully recorded industrial history; but the same sequence could be traced in the other industrial countries.

2. GENERAL EXPERIENCE IN THE UNITED STATES

In the United States the seeming paradox of larger output in shorter hours was clearly stated by the now classic report of the Massachusetts Bureau of Statistics of Labor in 1881. Agitation for some sort of legislative protection for working children began as early as 1825 in Massachusetts.* The first law applying to adult women was not passed until 1874. Six years after the Massachusetts ten-hour law went into effect, a full investigation under Carroll D. Wright showed that the cost of production had not been increased, nor had wages been lowered under the Massachusetts ten-hour day, as compared with the system of eleven hours and longer in neighboring states. The worker's increased efficiency more than balanced the curtailment of working time. Massachusetts with ten hours produced "as much per man, or per loom or per spindle, equal grades being considered, as other states with eleven and more hours, and also . . . wages here rule as high, if not higher than in the states where the mills run longer time."†

Even before the passage of the Massachusetts act in 1874, experiments in single mills proved the same result. In 1867 the Atlantic Mills at Lawrence cut down their working day from ten and three-quarters to ten hours. The wages were kept the same. Cost of production increased 2¾ per cent, and the output at first was reduced 4 to 5 per cent; yet the treasurer of the company testified before the Massa-

* Labor Laws and Their Enforcement, with special reference to Massachusetts, p. 4. Edited by Susan M. Kingsbury. New York, Longmans, Green and Co., 1911.

† Report of Massachusetts Bureau of Statistics of Labor, 1881, p. 457.

chusetts Committee on Labor in 1873 that after three and a half years with no change in machinery or in wages, the output of ten hours was "fully equal" to the output of the previous ten and three-quarters hours; the immediate improvement in the workers was such that the firm considered them the "best that have been in the mill for fifteen years," and work was more continuous and less interrupted throughout the year than ever before.*

The favorable operation of the Massachusetts law, reported in 1881, led to the passage between 1885 and 1887, of similar laws in other New England states,—Rhode Island, Maine, New Hampshire, and Connecticut,—and greatly influenced the trend of legislation in other states.

During more than a generation which has elapsed since Massachusetts took the first step, the well worn argument that industry would be ruined or must leave the state, has accompanied each advance in American legislation, yet in only one case has any law limiting women's hours of work been repealed.† Almost every amendment has been by way of strengthening the laws and further reducing the workday.‡

This fact is in itself presumptive proof of the economic success of these statutes. No one can suppose that industrial communities, all in comparatively close touch with one another and able to observe how the laws were affecting "business" in neighboring states, would deliberately continue, during more than thirty-six years, to undo their own commercial welfare by legislative enactments. Common sense refutes the thought. Rather have the opponents of legislation tried year by year to minimize and ridicule the economic benefits of the shortened day; but in spite of their misrepresentation and ridicule, the truth has prevailed.

* Argument of Hon. Wm. Gray on Petitions for Ten-Hour Law before the Massachusetts Committee on Labor, Feb. 13, 1873.

† The New Jersey law of 1892 providing a ten-hour day and fifty-five-hour week for women, was held repealed by the repealing act of 1904, which reorganized the New Jersey Department of Labor.

‡ The only retrograde action has been the decisions of certain courts concerning the constitutionality of laws limiting hours of labor. These are discussed in Chap. VIII.

In a general way it has gradually become recognized that shorter hours improve health, and that improved health and efficiency under the short-hour system is the basis of higher output.* The greater zest and generally increased capacity of the short-hour worker have been contrasted with the physical and moral exhaustion of the long-hour worker.

Can we now learn something more accurate about the effects of regulation upon industry today? Can physiology interpret for us the relative productivity of long and short days, as it has clarified the new strain of manufacture and commerce? What has physiology to do with production, fatigue with output, today, since the examples of thirty and forty years ago are now valuable chiefly for their confirmation of European experience and the influence which they have had upon past legislation?

3. AN EXPERIMENTAL STUDY OF OUTPUT

Before taking up the question of output in industrial establishments, we may gain some insight from a suggestive little investigation made by an Italian physiologist, Professor G. Pieraccini of Florence.† This study of output is not at all conclusive, since it deals with a very small number of experiments and workers. It is valuable chiefly in pointing out one method for future investigations. No generalizations can be based upon a few observations, and the ever variable human factor in production makes it a vastly subtle and complex question. Indeed, in a certain factory, the mere knowledge that they were being examined caused marked variations in the output of working girls under observation. But Dr. Pieraccini's study is at least an interesting attempt to find the relative productivity of the various hours of the day in selected employments, and it may well precede our

* See Part II of this volume, pp. 339–384.

† Proceedings of the First International Congress on Industrial Diseases, Milan, 1906. Pieraccini, G. (Arcispedale di S. M. Nuova, Firenze): La Curva della Produzione Utile Esterna Raccolta Negli Operai Manuali ed Intellettuali Sul Campo del Lavoro.

discussion of such statistics as exist, on the productivity of the long and the short day in industry.

Professor Pieraccini did not use any laboratory apparatus to measure the output of his workers, but compared its actual amount and quality at different hours of the day. He studied the output of five different kinds of manual workers, namely, a copyist, six diggers, four stone-cutters, two bullet makers, two nail makers, and ten compositors. The small number of experiments reported is somewhat compensated by the similarity of their results and their general harmony with the knowledge derived from laboratory experiments.

For just as we have seen diagrammatically in the laboratory, the sequence of treppe, maximum effort, fatigue, and exhaustion, so in these experiments we see how working capacity increases during the second and third hours of work, falling as fatigue gains towards the noon hour, rising again slightly after food and rest at noon, to decline more rapidly to a minimum in the afternoon.

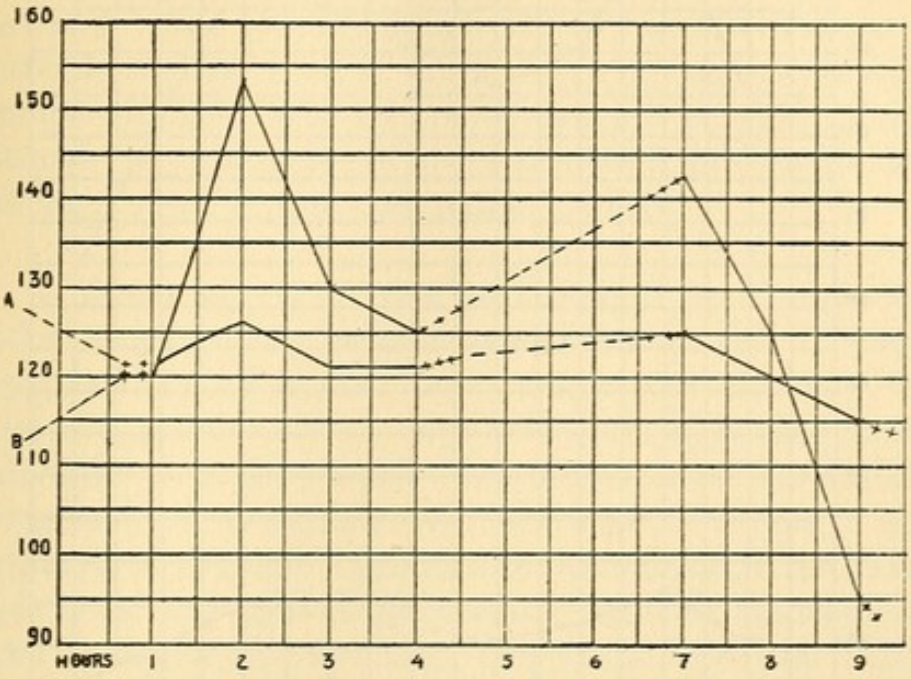
The most interesting figures are those given for the compositors or typesetters. The amount of their output was determined by the number of lines set per hour, while the number of typographical errors served to determine the quality of their work. The first experiment was made on six members of the Typographical Co-operative Society of Florence, experienced men working at piece-rates, for seven hours in the day. Their output was as follows:*

OUTPUT OF SIX TYPESETTERS WORKING AT PIECE-RATES SEVEN HOURS A DAY

Hours	*8–9*	*9–10*	*10–11*	*11–12*	*12–2*	*2–3*	*3–4*	*4–5*
Total	121	151	130	125	Rest and Lunch	142	124	96
Average	20.2	25.3	21.6	20.8	"	23.6	20.8	16

* Pieraccini, op. cit., p. 122.

Plotted, the curve is as follows:*



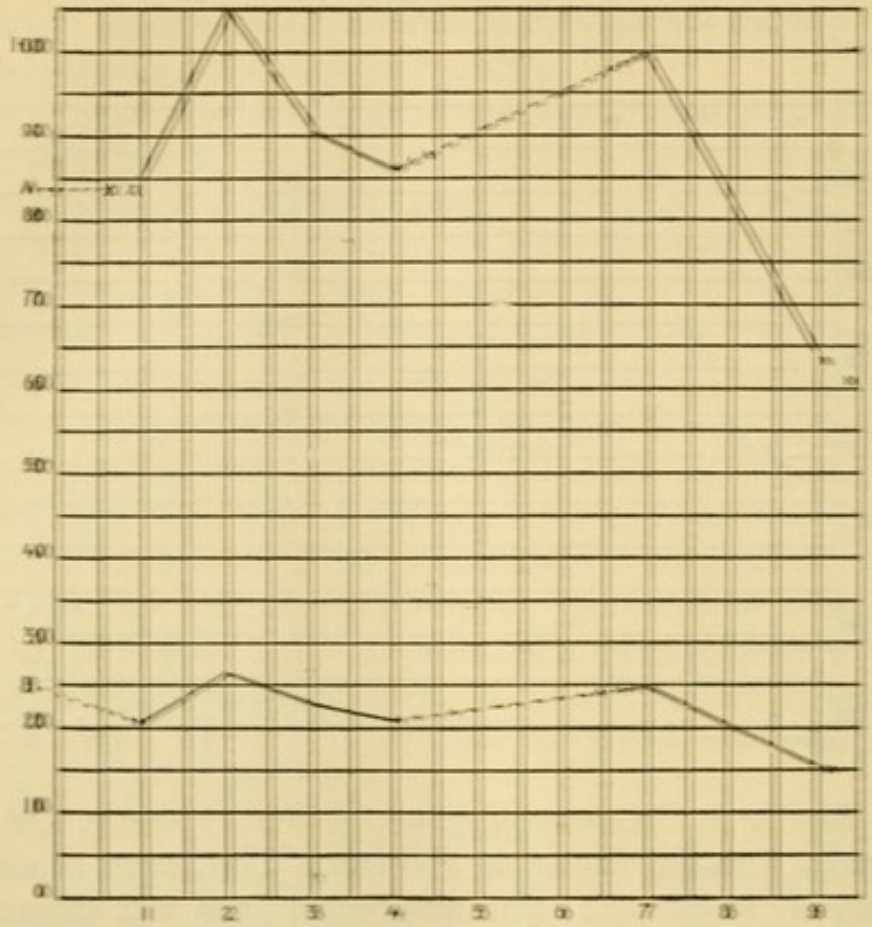
Similar is the showing made by four typesetters of the Niccolai Printing House at Florence. The errors made increase as work (i. e., the number of lines set) decreases. That is, the quality of the work falls just as the amount falls, with the increase of fatigue.

OUTPUT OF FOUR TYPESETTERS, SHOWING INCREASE OF ERRORS WITH INCREASE OF FATIGUE

Hours	*8–9*	*9–10*	*10–11*	*11–12*	*12–2*	*2–3*	*3–4*	*4–5*
No. of lines set								
Total.....	84	104	92	86	Rest	99	82	64
Average....	21	26	23	21.5	"	24.7	20.5	16
Errors								
Total	17	10	18.28	28	"	5.5	22.6	30
Average....	4.25	2.5	4.57	7	"	1.37	5.45	7.5

Plotted, the curve is as shown in the following chart.

*In this chart and the following one A=total output; B=average output.



The other experiments upon the copyists, diggers, stone cutters, nail and bullet makers, showed the same general results. The practice, or "limbering up," gained during the first hour of work makes the second and sometimes the third hour also the period of maximum production. In all cases the lowest output of the morning is reached during the hour before the noon rest. Output rises again markedly in the first hour of work after the noon rest, but it declines much more rapidly in the afternoon than in the morning. In no case does the afternoon output equal the morning's output in amount.

Inconclusive as these few figures are, and unsatisfactory in that they report total and average amounts of work instead of separate, individual amounts per worker, they at any rate point clearly to the close connection between the worker's

physical condition and his output. The rise in production in the first hour after noon marks the recuperative effect of food and rest. The lower productivity of the afternoon is the perfectly normal result of the worker's physiological fatigue, stemmed for a while by the noon break, but growing naturally through the functioning of his tissues, until quitting time and the night's rest restore the metabolic losses.

Through all the myriad variations of men's individual endowments, these general tendencies persist. Working capacity, like all human capacities, eludes perfectly fixed rules and measurements. Man's way of working is almost as individual as his thumb-print, fast or slow, steady or variable, tiring easily or tiring late, with as varying reserves of quite unmeasured strength. But all alike are subject to the physiologic laws, and this likeness which links all humankind is more fundamental, more important in our industrial inquiry, than all the peculiarities which differentiate.

So much for the underlying principles, and the very palpable connection between fatigue and output. As in sports the player's game shows whether he is "in form," "in trim," "in training," so in a sense, production is no more than a measure of the worker's fatigue or equilibrium. Work is still conditioned on the worker, in spite of all the marvels of modern machinery, planning, equipment, and the rest. And as a corollary, work, output, production, must rise or fall with the worker's physical fitness for his task. This is what we have seen repeatedly illustrated in the laboratory, and also in Professor Pieraccini's study analyzed above—a laboratory experiment transferred, as it were, into the factory.

Can we not find further confirmation in the actual operation of modern industries? Can we point to the relative productivity of the long and the short day in actual practice—their cash values in dollars and cents?

Unfortunately, exact data on this subject are meager and difficult to get. In this country few reliable and definite statistics are to be found. Many experiments in shortening

the hours of labor in various trades have yielded impressive results but have not been made public.

The increasing use of the stop-watch—a symbol of the new planning in industry, its infinitesimal accounting and record-keeping—is bound to show more and more new facts about men's diurnal efficiencies and the resultant individual and total records of output. But these studies, charts, and observations are so comparatively new (dating from approximately the last decade), and the nature of the results is held so confidential, that they have for the most part been kept private. Manufacturers are apt to hesitate or entirely refuse to publish the new saving in time, labor cost, and materials which result from new methods of organization. They regard them as business secrets, and fear competitors. Let us, then, first undertake to examine three wellknown and important foreign studies of efficiency which deal with conditions sufficiently like our own to be convincing and which throw considerable light on the economic effects of reducing the length of the workday.

4. THE EXPERIENCE OF THE SALFORD IRON WORKS AT MANCHESTER, ENGLAND

One of the most conclusive and influential of these experiments in shortening the day's work was made by the firm of Mather and Platt in 1893 at the Salford Iron Works at Manchester, England. This experiment is of particular interest because it was carried on during an entire year for the express purpose of measuring the effects of reduced hours, "to prove how far the widespread desire for shorter hours might be met without danger to the mechanical trades."*

The full complement of men at the Salford Iron Works during the trial year (March 1, 1893, to Feb. 28, 1894) was 1,200. The character of the work turned out was similar to that of the preceding six years; that is, general engineering

* Mather, Wm., M. P.: The Forty-eight Hours Week: A Year's Experiment and its Results at the Salford Iron Works, Manchester. Manchester, 1894.

work.* Since the firm was subject to keen competition in home and foreign markets, a detailed study was made of the effect of shorter hours on the cost of labor. In order to carry out the trial with scientific precision and care, extremely accurate comparisons were made by expert accountants. Mr. Mather vouches for the absolutely correct and trustworthy nature of the results, while he states that their confidential nature makes it impossible to publish all of the figures which were later given to the government officials. Previous to the trial year, the week's work was first fifty-four and then fifty-three hours, and the figures taken as standards with which to compare results are the averages, per year, of the previous six years.

The most noteworthy statement in the report is that under the forty-eight-hour week production increased.† Selling prices, moreover, were lower than in the previous years, so that during the trial year the cost of wages in proportion to "turnover" rose 0.4 per cent. Had selling prices remained the same, the cost of wages would have shown a decided decrease, instead of an increase of 0.4 per cent.

This debit against the trial year, however, Mr. Mather considers balanced by a saving of 0.4 per cent secured as a direct consequence of the shorter hours. The greater economy in consumables (gas, electric lighting, wear and tear, etc.) was closely figured and set against the increased fixed charges due to interest on plant and machinery, rent, taxes, etc. The balance of these two accounts was clearly in favor of the trial year. "By a remarkable coincidence," it showed a saving of 0.4 per cent on these items, which exactly counter-balances the debit of 0.4 per cent from the increased cost of wages.

Another item of interest to our special inquiry concerns

* This "comprised steam engines, pumping machinery, boiler work, etc.; all machinery used in those textile trades (other than spinning and weaving) for the bleaching, printing and finishing of cotton, linen, silk, and other fabrics; electrical machinery of every variety for lighting, transmission of power, electric traction, electro-depositing, electro-chemical processes, etc." Op. cit., p. 5.

† Op. cit., pp. 17 and 20. (Figures not given.)

the effect of shorter hours on piece-rates. It was assumed, at the outset, that the men on piece-work were doing their best, and that their earnings must be lessened by any reduction in hours. But though the piece-workers lost slightly during the year, their falling off diminished as the year advanced, showing a steady adaptation to the altered conditions of work. In order to judge the effects of the new system on piece-work, the year was divided into three approximately equal periods. In the first period, the surplus earned by piece-workers over day-work rates was 1.76 per cent less than the standard piece-work wages; in the second period it was 1.58 per cent less, and in the third it was 0.78 per cent less than the standard. This steadily diminishing loss made it reasonable to expect that at the end of the year the difference would entirely disappear, and that under reduced hours the piece-workers would earn exactly as much, hence produce as much, as in the longer day's work. Moreover, as the total output of the works was greater during the trial year than previously, the slight diminution in the piece-worker's production was more than compensated by increased production on the part of the day-workers.

In the light of our previous studies of fatigue and the strain upon men's energies in overwork, it is extremely significant that the management of the Salford Iron Works attributed the maintenance of full production during the trial year "solely to the *unimpaired and cheerful energy* on the part of every man and boy throughout the day."*

"We seem," says the report (and the statement is the more impressive because this investigation was not primarily concerned with the workers at all, but with the effect of shorter hours upon the output of "one of the great staple trades of the country" centering in Lancashire and Yorkshire), "we seem to have been working in harmony with a natural law, instead of against it. . . . The most economical production is attained by employing men only so long as they are at their best. When this stage is passed, there is no true economy in their continued work."†

* Italics added.

† Op. cit., pp. 25 and 26.

As one result of the "unimpaired and cheerful energy" of the workers under the forty-eight-hour system, the improvement in respect to "time lost without leave" is an important item. Under the fifty-three-hour system, the proportion of such "time lost" to the total time worked averaged 2.46 per cent, while under the new arrangement it was only 0.46 per cent. This loss of time meant, of course, a serious inroad upon production, and the greater "promptitude," "steadiness," "life and spirit about commencing work," reported by the foremen of various departments* aided in bringing about the success of the forty-eight-hour week.

Eleven years after this experiment was tried, the United States Bureau of Labor inquired of Messrs. Mather and Platt whether their works were still upon an eight-hour basis, and received a reply dated May 24, 1904, stating that "our experience since the first year in which it (the eight-hour system) was tried has fully borne out the conclusions then arrived at, and we are fully satisfied that as regards the comparison between eight and nine hours per day, the balance of advantage is in favor of the shorter period."†

An interesting sequel to the success of the forty-eight-hour week at the Salford Iron Works was Mr. Mather's determination, as a matter of public duty, to lay the results before the heads of various government departments. The then secretary of state for war, Mr. Campbell-Bannerman, the first lord of the admiralty, Earl Spencer, and the postmaster general, Mr. Arnold Morley, invited Mr. Mather to explain the workings of the forty-eight-hour week to the chiefs of construction from the Woolwich Arsenal Works, and to the officials of the dockyards and the post office.

Subsequently, in 1894, the hours of labor of about 43,000 work people in government factories and workshops were reduced to an average of forty-eight hours in the week.‡ Of

* Op. cit., p. 79.

† Bulletin of the New York State Department of Labor. No. 25, June, 1905, p. 240.

‡ British Board of Trade Labor Gazette, July, 1905.

these, 18,641 workers in war office establishments had their working time shortened by five and three-quarters hours per week.*

In 1905, eleven years later, the war office stated that when the forty-eight-hour week was first introduced, the results of experiments tried out in private factories had led them to expect a saving in time through the greater promptness of men in stopping and re-starting work, a greater regularity of attendance, and an improvement in the men's physical condition, with a consequent increase in working capacity. The communication states that

"these anticipations have been justified and it is clear that no extra cost has been incurred by the public on account of the reduction of hours, nor has the output of work been diminished. On the other hand, the majority of the workmen being on piece-work, the average weekly earnings per man have not been sensibly altered, although piece-work prices have not been increased. The day-workers received an increased hourly rate of pay to make their earnings per week of forty-eight hours equal to those per week of fifty-four hours. It was not found necessary to increase the number of day-workers."

So much for the economic results of the shorter week in the army establishments. The testimony from the admiralty is less specific and definite. In 1894, 24,263 workers in the royal dockyards, the royal naval ordnance department, and H. M. victualling yard had their hours reduced to forty-eight in the week. In 1905 the admiralty stated that the cost of production at the dockyards where most of the workers affected by the change were employed, compared favorably with the cost previous to the introduction of the forty-eight-hour week. But they were unable to state to what extent the cost had been affected by the reduction in hours, on account of improvements in machinery, changes in the methods

*This includes the Ordnance Factories, Ordnance Store Dept., Inspection Dept., Small Arms Inspection Dept., and Royal Army Clothing Dept.

of conveying stores within the dockyards, increases of pay in certain trades, and the like.

Such, then, was the result of one specific inquiry, fragmentary as it is, at the Salford Works, into the economic effects of the shorter workday. The later fruits of the experiment in shortening the hours of many thousand workers in government employ, give it an importance beyond its own narrower limits.

The Salford Iron Works and the government departments which followed its lead, settled on the forty-eight-hour week as the most profitable working period. Here we should state that, in this study of fatigue, we do not hold a brief for the eight-hour day, or for a day of any specified number of hours. Physiologically considered, even the eight-hour day is too long a period of work in some dangerous occupations. Sir Thomas Oliver, the leading expert on industrial poisoning, has recently reported that "a change from six- to eight-hour shifts of employment was in a Scotch factory found to be the only explanation of an outbreak of plumbism in a works which had hitherto been free."* Moreover, the eight-hour day, involving with the noon hour and time taken in traveling to and from home usually ten or eleven hours' employment, does not leave too great a margin of leisure for any persons who are to be citizens of value to the state.

But for the moment we are not concerned with the claims of this or that specified number of working hours. We aim merely to answer the questions we have set ourselves in this chapter: What has physiology to do with production, fatigue with output? Can we learn the relative productivity of the long and the short day in operation—their market value? The Salford Iron Works and the reduced hours of 43,000 workers in English government employment have given us our first reply. For the next, we turn to a careful Belgian investigation of efficiency.

* Bulletin of the United States Bureau of Labor, No. 95, July, 1911. Oliver, Sir Thomas, M.D., F. R. C. P.: Industrial Lead Poisoning in Europe, p. 9.

5. THE EXPERIENCE OF THE ENGIS CHEMICAL WORKS NEAR LIÉGE, BELGIUM

In the year 1888 a joint stock company was formed in the Province of Liége, by a group of Belgian manufacturers of chemical products. The name of the company was La Société Anonyme des Produits Chimiques d'Engis. Its objects were two-fold: the reduction of zinc blend, and the simultaneous transformation of the liberated gases into sulphuric acid. The company's plant was located near a zinc works, and was designed to replace the latter's open air furnaces for the reduction of the blend, by a new system of muffled ovens. The old means of reduction (known as Freiburg ovens) allowed large volumes of anhydride of sulphur to escape, a gas peculiarly destructive to vegetation. The Engis Company installed the new system to save the payment of heavy damages to the vicinity and the waste of the gases liberated in the roasting process.

Originally, under the old system, work was carried on in twenty-four-hour shifts. Workmen were required to remain at their ovens from 6 a. m. to 6 a. m. on alternating days. Work was intermittent, and during the twenty-four hours on duty each man had time-off at irregular intervals, amounting to about seven hours in the twenty-four. This organization of work was naturally found intolerable, leading to inefficiency, exhaustion, and drunkenness among the workmen.

When the new stock company was formed, a twelve-hour workday was introduced. Each week the day shifts and night shifts alternated, thus providing a twenty-four-hour workday and a twenty-four-hour day of rest on alternate Sundays. But this schedule of work was also found unsatisfactory and inhumane, and after four years a fundamental change was determined upon. L. G. Fromont, the engineer who founded the Engis works and was its manager for more than a dozen years, has described in detail the final reorganization of his labor force from a two-shift to a three-

shift basis.* This meant the reduction of the workday from ten to eight hours—a change owing not to the demands of labor, but to M. Fromont's observation of the exhaustion (surmenage) of his workmen.

The special interest of this account lies in its statistical exactness and detail. Manifestly, in a dangerous occupation involving poisonous gases and extremest heat, the danger to health arises chiefly from the character of the work. But the statistics of output, wages, sick benefits, etc., under the twelve-hour and the eight-hour day show convincingly the part played by the reduction of hours.

The constant deficits of the sick benefit fund had become alarming. A mutual association had been formed at the first foundation of the company. It not only paid for medical attendance and drugs, but also a part of the salaries of sick workmen during non-employment. Accidents were not charged to this fund, as the company had from the beginning itself insured its workers against such hazards. But alarming as were the deficits of the sick benefit fund, the management was even more concerned by the manifest and daily increasing physical debility of their workers. (Nous fûmes bien plus alarmé encore de devoir constater, chaque jour, la décroissance manifeste de la résistance et de la vaillance de nos hommes.) During the heat of the summer a permanent relief shift was found necessary, to assist or relieve men overcome by exhaustion at the furnaces and incapable of continuing their work.

The chemical works had had considerable difficulty in recruiting their force. They needed the strongest and most robust of workmen. But in that part of Belgium where the Engis plant was situated, the traditional strong man's trade was brickmaking. It was a trade bred in the bone of the countryside. During the inclemency of winter, the brickmakers would betake themselves to other work in mines or

* Fromont, L. G.: Une Expérience Industrielle de Réduction de la Journée de Travail. Instituts Solvay. Brussels et Leipzig, Misch et Thron, 1906.

mills; but with the first harbingers of spring (dès que les premières hirondelles ont faits leur apparition) they were seized with a longing for their own trade (la nostalgie du métier) and despite promises and good intentions, they were off to work in the sun and open air.

Notwithstanding their superior strength, therefore, the Engis Company was compelled to accept workers of inferior physique but of steadier working habits than the brickmakers. When after four years their labor force showed unmistakable signs of failing and breakage, the company considered the feasibility of importing a sturdier race of foreign workmen. But unlike less scrupulous employers, the suggestion did not meet with favor amongst them. It seemed to the management unjust to their well-intentioned laborers, as well as an unintelligent effort to dodge the difficulty. The true solution, M. Fromont felt, lay in imitating the almost incredible feats of science (des vertigineux progrès de la science) which have transformed into servants of the human will the most formidable energies and forces of destruction. The company's difficulties could not be solved by systematically locking out the natural labor supply (le rejet systématique de la main-d'oeuvre qui s'offrait à nous), but by attempting to modify the hardships of the trade (en essayant d'assouplir aux circonstances, les exigences de notre industrie).

It was for this purpose that the three-shift system was introduced and the workday curtailed to eight hours.

Professor Ernest Mahaim of the University of Liége, a prominent Belgian economist, summarizes the results of the changes as follows:

"In the eight-hour day, representing seven and one-half hours of actual work, the same workman at the same ovens, with the same implements and raw material, produced as much as previously in twelve hours, representing ten hours of actual work."

How, now, were these results ascertained? They are described by M. Fromont with scientific accuracy and con-

ciseness in a series of extremely interesting charts (see pages 150–154), first communicated in 1897 to the Belgian Chemical Society and the Association of Engineers of the Liége School.* The probable effect of the reduction of hours upon output, wages, etc., was first plotted in advance, and then compared with the actual effects of the shortened day.

The interest of the experiment, says M. Fromont, was all the greater because the results of the change could be graphically and exactly demonstrated. The output was of a kind which could be measured by weight, and the same unit of measurement showed the variation of wages, since they were fixed by the amount of metal extracted.

Under the old régime the furnaces were in operation twenty hours in the twenty-four and empty four hours, while under the new they were in operation twenty-two and one-half hours and empty only one and one-half hours. A gain of two and one-half hours' time in twenty-four, or 10.5 per cent, was thus achieved. In seven and one-half hours' work the increase was therefore

$$\frac{10.5 \times 7.5}{100} = 0.7875 \text{ hours} = 48 \text{ minutes.}$$

What increase of output per man might now be expected as a result of this gain in working time?

While the work was carried on in two shifts, the men were on the premises twelve hours, representing ten hours of actual work. Their daily output per man was 1000 kilos of roasted ore or 100 kilos per hour. Under the new system, the men were on the premises eight hours, representing seven and one-half hours of actual work. At the old rate of production their output would thus be 750 kilos per day. But as we have seen, the three-shift system had resulted in a gain of two and one-half hours' work in the twenty-four hours. Hence it was estimated that during the twenty-four hours a proportional increase of output might be expected of

$$2.5 \times 100 = 250 \text{ kilos.}$$

* Bulletin de l'Association des Ingénieurs sortis de l'Ecole de Liége. Séance du 11 juillet, 1897.

Dividing this total gain among the shifts gives

$$\frac{250}{3} = 83 \text{ kilos increase for each shift.}$$

Hence each shift's work was estimated at $750 + 83 = 833$ kilos per seven and one-half hour day of actual work, or

$$\frac{833}{7.5} = 111.1 \text{ kilos per hour.}$$

In another way a similar estimate was reached. The new three-shift system had resulted in increasing the shaking-down of the furnaces by 20 per cent. In reducing the ore, any increase of shaking-down favors oxidation and the reduction of the blend. Hence a proportional increase of 20 per cent in the extraction of metal was to be expected.

The amount of extracted metal had under the old system been 2,000 kilos per day. The daily increase was therefore estimated at

$$\frac{2.000 \times 20}{100} = 400 \text{ kilos.}$$

Again dividing this estimated daily increase among the three shifts gives

$$\frac{400}{3} = 134 \text{ kilos per shift.}$$

Hence each shift might be expected to produce $750 + 134 = 884$ kilos of roasted mineral. Taking the round number of 890 kilos, this would give

$$\frac{890}{7.5} = 118 \text{ kilos per hour.}$$

From these and similar calculations it was determined that 830 kilos could easily be reached as the daily minimum, and that 890 kilos might reasonably be expected.

Such were the expectations and estimates of the management. The inauguration of the new system was difficult. It was bitterly opposed by the workers. They saw in the reduction of hours only a certain curtailment of production and lowered wages. The estimated increases were received with scornful (le plus méprisant) scepticism. At their previous wage of .40 francs per hour, the men were convinced

that they would receive only $7.5 \times 40 = 3$ francs per day. The most energetic measures, together with incessant and patient persuasions, were needed to overcome the workers' misconceptions and ill-will (eurent finalement raison du mauvais vouloir des ouvriers). They finally yielded to the evidence of fact. For little by little, under the new system, the daily output increased and the management's estimates were not only realized, but surpassed. In less than six months after the experiment was inaugurated, the workers had *equalled* in seven and one-half hours the previous output of ten hours, and the daily wage for eight hours' work equalled the wage previously earned in ten hours.

Charts I and II (page 150) show the estimated and actual results of the shortened workday. The dotted lines represent the estimates, the solid lines the actual achievements. Since the output of seven and one-half hours *equalled* the output of ten hours, or 1000 kilos, instead of 890 kilos as expected, we obtain in Chart I the curve $R\ M$, instead of the estimated drop RN. The curve of earnings $R'M'$ in Chart II is identical, wages being paid by the amount of ore extracted, or at 4 francs per thousand kilos. In both output and earnings the increase over estimates accomplished in the eight-hour day was 12.4 per cent.*

Under the old system, the alternation of day and night shifts required a double workday of twenty hours by each shift on alternate Sundays. The output of this double day had never equalled twice the output of the ordinary ten-hour day or 2000 kilos, but always fell to 1600 kilos.

Under the new system, the long Sunday fell to the lot of each shift only once in three weeks instead of every fortnight, and the double day was fourteen and three-quarters hours instead of twenty. It was computed in advance that the workers would accomplish twice their daily output of 890

* Fromont, op. cit., p. 78.

$$\left.\begin{array}{ll} \text{As regards output} & \frac{110 \times 100}{890} \\ \text{As regards wages} & \frac{44 \times 100}{356} \end{array}\right\} = 12.4 \text{ per cent.}$$

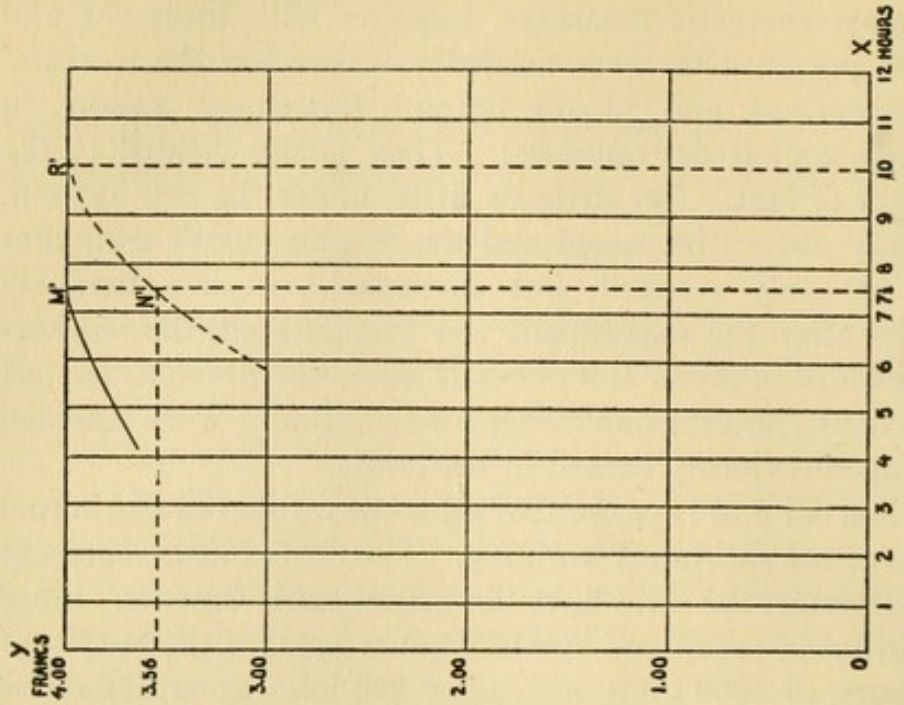


Chart II

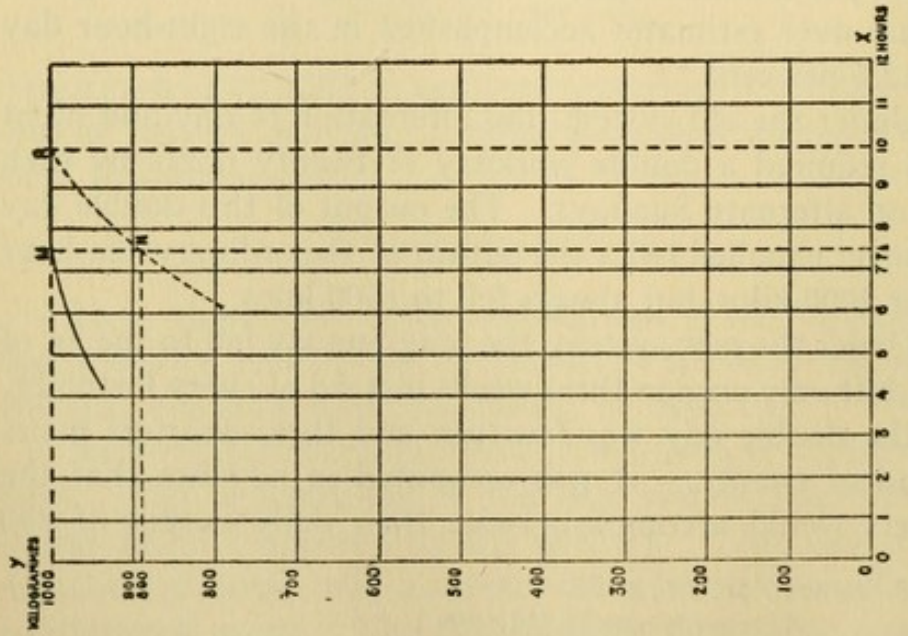


Chart I

kilos, or 1780 kilos, on the long Sunday, and accordingly would earn 7.12 francs. As a matter of fact they increased their output on Sunday just as on other days, reaching 2000 kilos and earning 8 francs.

Hence in Charts III and IV (page 152) we obtain the curves $S\,P$ and $S'\,P'$, instead of the estimated curves $S\,Q$ and $S'\,Q'$. These curves show an increase of 25 per cent, in both output and earnings, over the previous results of the twelve-hour day.*

The increase of output and wages *per hour*, compared to what had been expected in advance, is even more striking. Instead of producing 118 kilos per hour, the men accomplished 133 kilos, giving the curve $H\,K$ and H' and K' instead of $H\,L$ and $H'\,L'$ in the next two charts. (Charts V and VI, page 153.) These effects of the eight-hour day were 12.7 per cent greater than had been estimated, and 33.33 per cent greater than the output of the twelve-hour day.†

Another interesting chart shows the effect of the shortened workday upon the mutual sick benefit fund.‡ As we have seen, accidents were not charged to this account; the number of contributors remained about the same. Hence the progressive increase of receipts over expenditures seemed to M. Fromont proof of the beneficial and undeniable (heureuse et incontestable) influence of the eight-hour day.

The abscissas of the chart represent the years elapsed since the foundation of the company. The ordinates represent the annual excess of receipts over expenditures. The curve *npqroabcdefghiklm* shows the fluctuations of receipts

* Op. cit., p. 78.

$$\left.\begin{array}{ll}\text{As regards output} & \dfrac{400\times 100}{1600}\\ \text{As regards wages} & \dfrac{160\times 100}{640}\end{array}\right\} = 25 \text{ per cent.}$$

† Op. cit., p. 79.

$$\left.\begin{array}{ll}\text{As regards production} & \dfrac{33.33\times 100}{100}\\ \text{As regards wages} & \dfrac{133.33\times 108}{400}\end{array}\right\} = 33.33 \text{ per cent.}$$

‡ Op. cit., p. 82. See Chart VII, page 154.

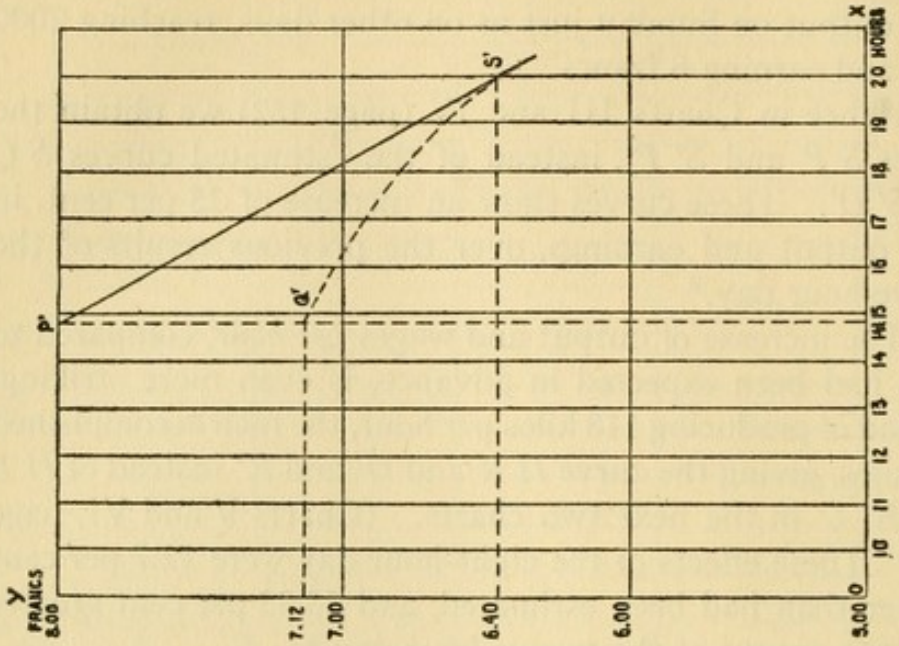


Chart IV

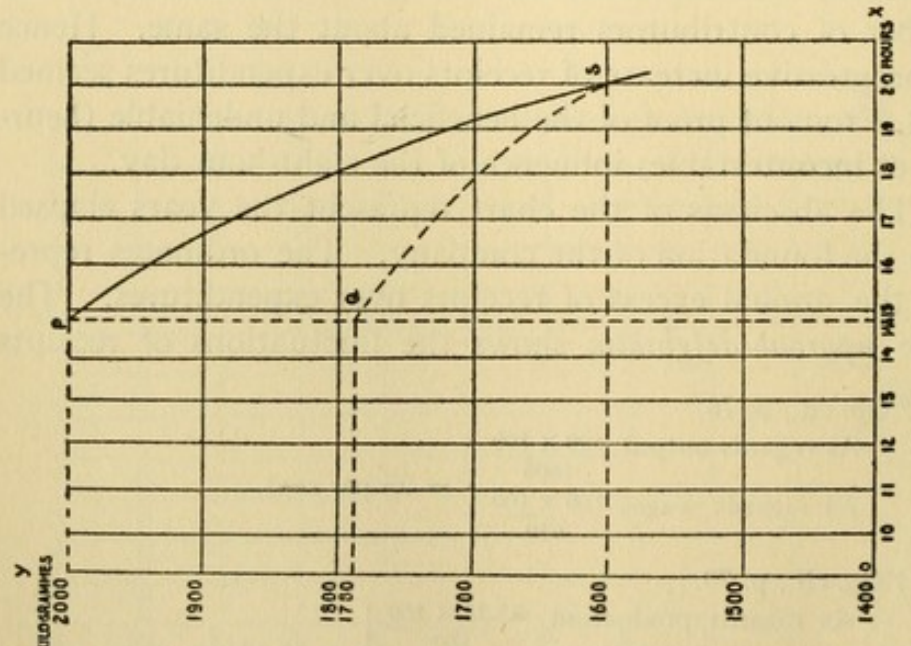


Chart III

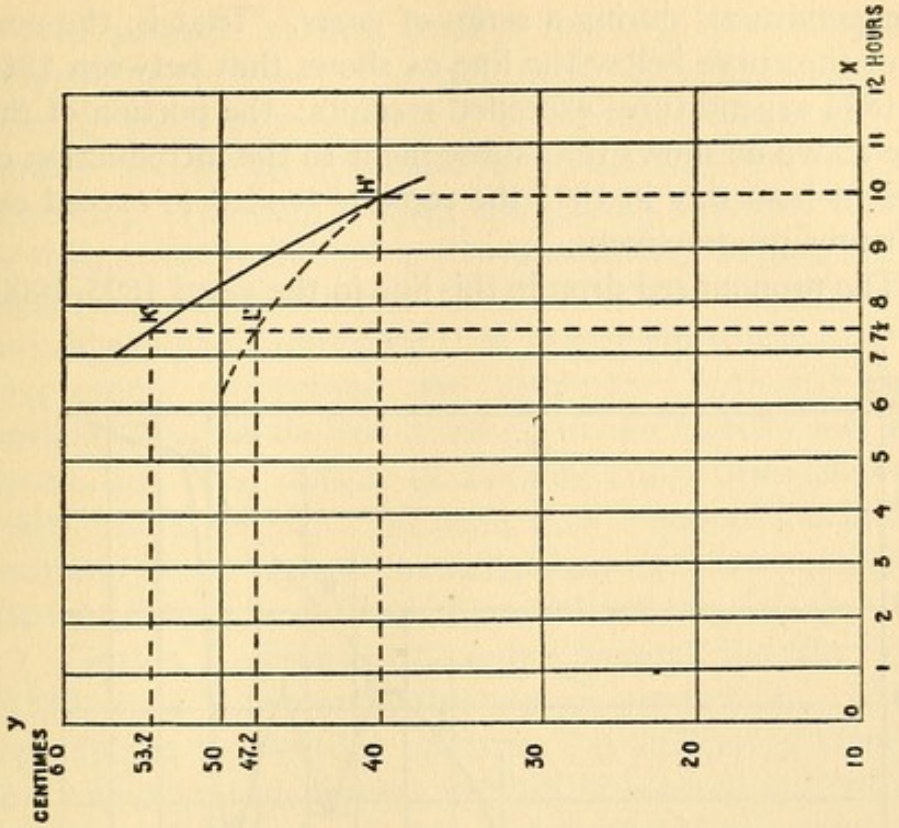


Chart VI

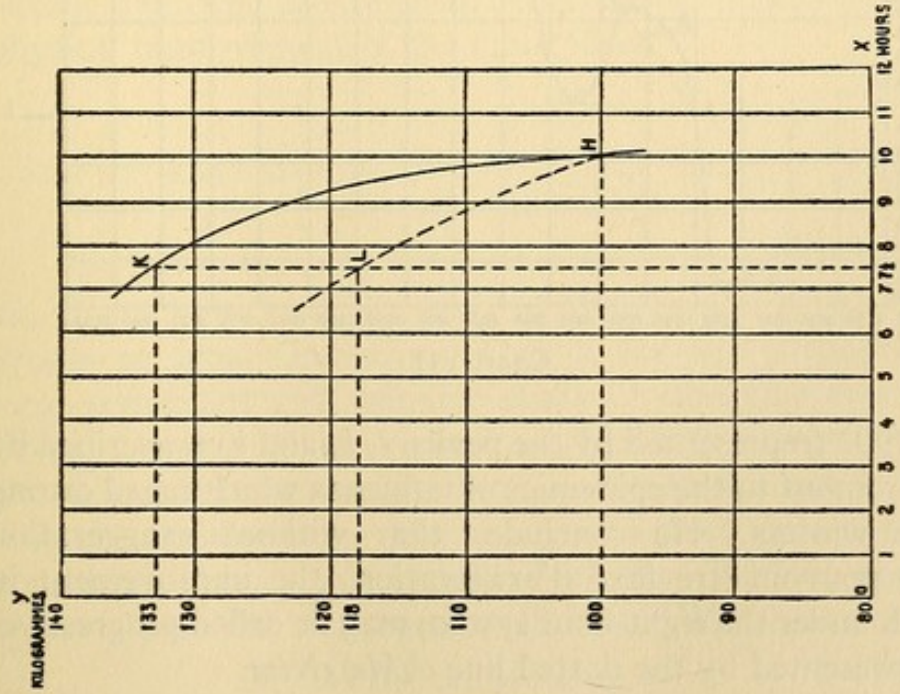


Chart V

and expenditures during a series of years. That is, the portion of the curve below the line *ox* shows that between 1889 and 1892 expenditures exceeded receipts; the portion of the curve above *ox* shows that subsequent to the introduction of the eight-hour day in 1893 the receipts tended to exceed expenditures progressively.

The pronounced drop in this line in the years 1895, 1900,

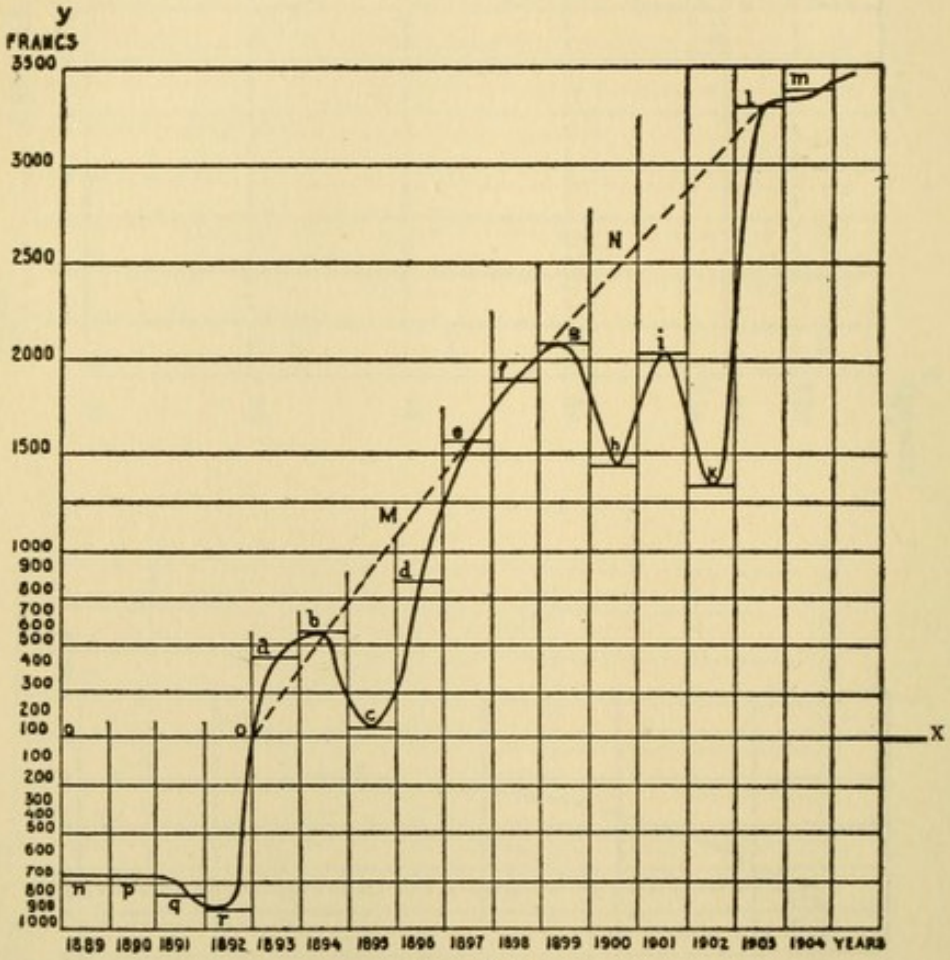


Chart VII

and 1902 (represented by the peaks, *c*, *h*, and *k*) is ascribed by M. Fromont to the epidemics of influenza which raged during those winters. He concludes that without exaggeration (sans pouvoir être taxé d'exageration) the improvement in health under the eight-hour system may be called progressive, as represented by the dotted line *obMefgNlm*.

In addition to this graphic chart, M. Fromont bears eloquent testimony to the new spirit of sobriety and self-respect which accompanied the shortened workday. Previously the strong stimulant of drink was found a daily necessity. The men's wives themselves provided it in the mornings (les malheureuses inconscientes) hoping to help their husbands to "repair themselves," in the picturesque language of the countryside ("se refaire des forces," suivant l'expression pittoresque des ouvriers). With the shorter workday the clandestine drinking in the factory was abandoned, and even outside of working hours drunkenness almost totally ceased. The men also acquired the habit of invariably washing and changing their clothes before leaving the factory—signs of a new personal self-respect.

Finally, M. Fromont describes in detail the effect of the reduction of hours upon the cost of production. Without reproducing his detailed statistics,* it suffices to state here that the overhead charges per ton of roasted ore fell 33.33 per cent. The total cost of production fell 20 per cent. Thus in the new organization of work technical perfection was not sacrificed nor neglected. The amount and quality of the output improved progressively, together with the moral and physical improvement of the labor force.

6. THE EXPERIENCE OF THE ZEISS OPTICAL WORKS AT JENA, GERMANY

We have purposely left to the last, for our fullest analysis, Ernst Abbé's classic study of the famous Zeiss Optical Works at Jena, Germany. This is, for our purposes, the most significant and valuable study of efficiency ever published, because Abbé, himself a physicist, university professor, and inventor of first rank, and the owner of a world-famous manufacturing plant, found himself driven to the conclusion almost naïvely stated by Mr. Mather when he wrote about the shortened workday: "We seem to have

* Op. cit., pp. 87–96.

been working in harmony with a natural law, instead of against it."

Abbé's social contributions were unique. They have received scant notice in this country, but abroad they are famous. Since his death in 1905, scarcely a serious review or scientific journal in Germany has failed to publish an appreciation of him (als Sozial Politiker); of his social schemes as well as his inventions in applied optics; and of his creation and endowment of the great Carl Zeiss Foundation at Jena, a model industrial organization.

Here we must confine ourselves to Abbé's remarkable study of industrial efficiency, set forth in two lectures before the Society for Political Economy of Jena in 1901.* Abbé died before he had opportunity to complete the more thorough (gründlich) study of efficiency which he had planned. He was certain that no thinking person (kein Denkender) could fail to be convinced by the relentless logic which links efficiency and the length of the workday. In the two lectures which he has left on the subject the reader is constantly impressed with this logical treatment of the argument. It is based on no *a priori* judgments, but deduced step by step, by a trained scientist, from thirty years' observations of a great industrial plant.

Abbé was born in 1840, the son of a hard working Saxon spinner. At Jena and Göttingen he managed to study the sciences, chiefly mathematics and physics. Later he became *docent* at Jena, and in 1870 was appointed full professor. He continued to lecture on physics and astronomy and to direct the astronomical observatory until his retirement in 1889.

Twenty years or more before he retired from the University, Abbé had become interested in, and had devoted his best efforts to problems of applied optics in the works of Carl Zeiss at Jena, where the construction of microscopes,

* Gesammelte Abhandlungen von Ernst Abbé, Bd. III, 1906. Die Volkswirtschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages, 2 Vorträge gehalten in der Staatswissenschaftlichen Gesellschaft zu Jena, 1901.

telescopes, and other lenses was being technically perfected. In 1875 Abbé entered the firm of C. Zeiss, and after the latter's death in 1888 conducted the business alone until 1896, when he handed over the management to his carefully constituted Carl Zeiss Foundation, remaining one of the directors until ill health forced him to retire a year or two before his death.

These bare facts of Abbé's career indicate how he was equipped to deal with the—to him—astonishing results in the efficiency of his workmen, when the workday at the Zeiss Works was abruptly changed in 1900 from nine to eight hours, a reduction of 10 per cent at one stroke.

When Abbé entered the Zeiss firm in 1870, the workday had been twelve hours long. It was gradually reduced, reaching nine hours in 1891. Nine years later it was further shortened to eight hours, for the same purpose as at the Salford Iron Works described above; that is, to discover the effect on output. The trial at the Zeiss Works was also limited to one year.

Abbé was familiar with the British experiments in reducing the length of the workday, and had been particularly impressed by the experience of the Woolwich Arsenal in changing from nine to eight hours without loss or decrease in output. The general similarity and consensus of English experience on the benefits of the short day to output, organization, and invention seemed to Abbé presumptive evidence of its truth. But he realized that specific statistical proofs of increased efficiency under the eight-hour régime were still needed, and he published the careful records and statistics of the Zeiss Works precisely to corroborate more exactly the general principles empirically learned in British mills and factories.

The effects of the change from nine to eight hours were measured by comparing the earnings of piece-workers during the year before and the year after the change. In order to make the comparison as accurate as possible and to eliminate chance variations, great care was taken to omit all workers

whose output might have been affected by special individual causes. The comparison was limited to workers who had been in the firm's employ four years, and who were over twenty-two years old. All workers were ruled out who had lost more than 300 hours during the year on account of sickness or other reasons. About 20 others were not counted because their health seemed below par. This left 233 workmen whose work during the trial year could fairly be compared with the year before and could be expected to show the effect of the reduction of hours. Thanks to the careful system of accounting, showing for years back the daily individual earnings of men at piece- and time-work, the following figures were available.*

COMPARISON OF HOURLY EARNINGS OF 233 PIECE-WORKERS IN THE ZEISS OPTICAL WORKS.

In the last year of the Nine-Hour System (April 1, 1899–April 1, 1900) and in the first year of the Eight-hour System (April 1, 1900–April 1, 1901)

Year	*Total number Piece-work Hours*	*Earnings (in Marks)*	*Earnings per Hr. (in Pf)*	*Ratio of Increase*
1899–1900	559,169 Average per man 2400	345,899	61.9	
1900–1901	509,599 Average per man 2187	366,484	71.9	100: 116.2

Now if the men, in eight hours, had earned exactly the same as in nine hours, piece prices remaining the same, then hourly earnings would have had to increase in the ratio of 8 : 9 or 100 : 112.5. But as a matter of fact, the hourly earnings increased in the ratio of 100 : 116.2. During the trial year, therefore, wages were *more* than equal to those of the previous year. There was an increase, as shown above, of 3 per cent. This means that in eight hours the daily out-

* Op. cit., p. 246.

put was one-thirtieth more than in nine hours. In other words, during the trial year 30 men did the work that 31 men had done previously. Each man did ten days' more work during the year of shorter hours.

This increase in efficiency was not confined to any one class of workers, nor was it particularly influenced by the ages of the workers. The following table shows the ages of the 233 workers under discussion, and how nearly uniform was their increase in efficiency in the shorter day.

INCREASE IN EFFICIENCY UNDER THE EIGHT-HOUR DAY OF 233 PIECE-WORKERS AT THE ZEISS OPTICAL WORKS.— CLASSIFIED BY AGES

(Ages were reckoned from April 1, 1900. Length of service reckoned according to years spent in the firm's employ after the eighteenth birthday)

Ages	*No. of Workmen*	*Average Ages*	*Average Length Service*	Average Piece-Rate Earnings per Hour in Pf.		*Ratio of Increase*
				9 Hr. Day	*8 Hr. Day*	
22–25	34	23.5	5.5	55.3	65.2	100 : 117.9
25–30	69	27.3	7.9	62.2	72.6	100 : 116.7
30–35	69	32.2	10.1	65.1	74.8	100 : 114.9
35–40	40	37.7	12.7	60.6	70.2	100 : 115.8
Over 40. . . .	21	45.3	15.3	63.3	74.3	100 : 117.4
Total. . . .	233	31.6*	9.6†	61.9	71.9	100 : 116.2

* Maximum 53, minimum 22 years. † Maximum 33, minimum 4 years.

A second classification divides the 233 workers in question according to their special kinds of work. It shows that the efficiency of all increased in about the same proportion, though the work ranged from the most delicate and highly skilled technical processes to the ordinary operations of wood-turning, polishing, etc.

INCREASE IN EFFICIENCY OF THE 233 WORKERS.—CLASSIFIED BY OCCUPATION

Occupation	*No. of Persons*	*Average Age*	*Average Length Service: Years*	Earnings per Hour in Pf.		*Ratio of Increase*
				9 Hr. Day	*8 Hr. Day*	
Optical Operations:						
1. Lense-setters: Fine hand work	21	31.1	12.7	72.8	84.9	100 : 116.6
2. Microscope grinders, etc.	20	33.2	13.8	79.1	86.5	100 : 109.4
3. Other hand grinders and centerers, entirely hand work	59	26.1	7.5	60.4	70.5	100 : 116.7
4. Machine grinders, entirely machine work	19	32.1	5.8	52.2	62.0	100 : 118.8
Mechanical and Auxiliary Work:						
5. Adjusting rooms, entirely hand work	22	31.7	8.2	65.5	76.7	100 : 117.1
6. Mounting rooms, chiefly hand work	20	36.9	11.6	66.6	78.5	100 : 117.9
7. Turning and milling, entirely machine work	23	35.2	11.1	57.6	68.0	100 : 118.1
8. Polishers and lacquerers, entirely hand work	17	34.7	11.2	53.8	63.3	100 : 117.7
*9. Engraving, entirely hand work	5	27.2	6.8	56.1	66.9	100 : 119.3
10. Molders, entirely hand work	6	36.2	9.7	56.4	64.8	100 : 114.9
11. Carpenters, part hand, part machine	15	35.2	10.5	52.3	62.9	100 : 120.3
12. Case makers, chiefly hand work	6	30.4	6.4	55.7	62.8	100 : 112.7
	233	31.6	9.6	61.9	71.9	100 : 116.2

The most interesting fact that emerges from this table is that the largest increase in efficiency occurred in the coarser kinds of work. Groups 4, 7, and 11, which comprise almost entirely machine workers, showed the greatest improvement. Only one small group of 20 workers, highly skilled hand grind-

ers, did not produce or earn as much in eight hours as in nine. They failed by 3 per cent.

One more table of figures, and we can turn to the argument which Abbé based upon his statistics. He sought for corroboration of the astonishing fact that eight hours' work not only equalled but exceeded nine hours' work, and he found it in a perfectly objective standard of measurement; that is, the amount of power used during the four weeks before and four weeks after the introduction of the eight-hour day.

The 650 different machines in the Zeiss Works were driven by one central dynamo (not connected with the lighting). The amount of power used was determined by hourly readings of a wattmeter. In regard to the expenditure of power, Abbé makes a distinction between the actual amount *used*, when it is transmitted and the machines are in operation (der eigentliche Nutzeffect), and the so-called "waste" of power, when the plant is "running dead," as it is called; that is, when power is turned on and available but the machines are not in use,—as just before work begins, etc. (der sogenannte Leergang).

The wattmeter readings showed that during the last four weeks of the nine-hour system, the average amount of power transmitted per hour was 49.2 kilowatts. By a special contrivance it was shown that during this time, the hourly "waste of power" (the plant "running dead") was about half the total use, that is, 26 k. w. Thus the actual amount of power used averaged 23.2 k. w. per hour. After the eight-hour day was introduced the amount of power transmitted rose from 49.2 k. w. to 52 k. w. per hour. The actual amount used rose from 23.2 k. w. to 26.0 k. w. per hour; that is, in the ratio of 100 : 112. This shows that eight hours' work just equalled the previous nine hours' work, since, as we have seen before, for our mathematical basis, 8 : 9 = 110 : 112.5.

But in effect, in many of the operations, the output not only equalled but exceeded that of the previous nine-hour

régime; and the wattmeter readings proved this also. For the majority of the machines in the works (three-fourths of them) were not wholly automatic. They were machines which the workers used like tools, using more or less power according to their intensity of application, by shortening pauses between operations, pressing more or less heavily in grinding and polishing, and in similar ways.

Hence the increased amount of power used in the eight-hour day, as shown by the hourly readings, was to be ascribed not to *all* the machines, but to three-quarters of the machines only. The ratio of increase for these, where the men regulated the amount of power used, was larger than the given figure of 100 : 112 which included *all* the machines. For three-quarters of the machines, the ratio of increase was higher; that is, as 100 : 116. In other words, they exceeded in eight hours by 3 per cent the output of the nine-hour day, confirming the conclusion previously proved by the earnings of the piece-workers.

Such being the evidence of cold statistics, the man of science in Abbé began to search for the causes. He examined the external conditions of work during the trial year and the year before. They had not markedly varied. The demand for Zeiss products and the consequent pressure at the works had been the same. There had been no extremes of heat or cold in the seasons, which, as he found, sometimes affect the output of highly skilled mechanics. In fact, the workers had for the most part been unconscious of their increased intensity of work. Many would not believe that they had produced more in eight hours than in nine until shown the proof. The figures showing the weekly amount of power used confirmed what Abbé learned direct from the men. Some had begun to work with feverish intensity when the new day was introduced, but had given it up in disgust after the first week, finding the effort exhausting. During the second week the output of these workers had consequently fallen below the nine-hour day; but by the third or fourth week they had recovered their normal pace, and unknown to

themselves, were equalling and surpassing the work of the longer day.

Abbé concluded that the adaptation of the worker to the shorter day, his intensity of application, was largely automatic, and did not depend primarily on his good or ill will. This was proved also by the firm's previous experience with overtime. Under the nine-hour régime, the men had been required to work one hour overtime at seasons of pressure. But it had been found that their efficiency did not keep up for any length of time. It fell off in about two weeks, in spite of the men's evident desire to earn the 25 per cent higher wages of overtime. One November Abbé himself had tried the experiment, when the men were eager to earn more just before Christmas. But the result was the same. The output of overtime deteriorated in one week, and by the third or fourth week it was practically nil.

Deeper than good or ill will, then, must lie the causes for men's variation of efficiency in the long and the short day. Some common factors must explain it, common to men as widely diverse in capacities and nationalities as the machine-shop workers and miners of Northumberland and Durham and the Thuringian lense grinders and mechanics.

These common factors Abbé found in precisely the two causes to which we have devoted so much attention: the laws governing man's physiologic nature, and the new strain of industry.

We need not repeat here Abbé's admirable physiological analysis. He showed how the vague subjective conception of fatigue and repair rests upon objective measurable metabolic changes within the human body; and he concluded that the workman whose daily deficits, however small, are allowed to stand from day to day, cannot in the end escape bankruptcy.

Some of Abbé's keenest remarks deal with the simplest facts—facts so simple that every one has always known them, and has lost sight of their significance through very familiarity. But the keen mind can still pluck out the inner significance of words and facts that have become mere "polished

surfaces" of commonplace for the rest of us. Thus Abbé showed how, owing to the minute sub-division of modern labor, the workman incurs a certain amount of perfectly passive fatigue, irrespective of his actual production. The modern worker performs only one repeated operation or the fragment of an operation in the construction of a whole. He sits or stands hour after hour in exactly the same unchanged attitudes, unvaryingly subjected to the same noise, and the same need of attention (to guard himself and others) when he works with moving machinery. These things would be extremely fatiguing, even if no work were to be performed, and in the ten-hour day the workman has to endure daily two hours more of such purely passive fatigue, without thereby accomplishing any more work than in the eight-hour day. It is as unreasonable, says Abbé, as though the employer said to his workmen: "You may finish your work in eight hours, but then you must remain two hours longer, standing or sitting, in the same limited attitudes, hearing the same roar, exerting the same effort of attention, but doing no work."

Moreover, since the metabolic equilibrium is regained only by rest and recuperation, the length of working hours is of critical importance. The rate of recuperation depends clearly upon many variables—age, state of health, state of mind, food, and the like. But the short day gives, at least, the best chances of repair to those parts of the organism most exerted in work, and while after ten hours' work there are but fourteen left for all the other purposes of life, after eight hours' work there are sixteen left.

Finally, as to the greater intensity of work in the shortened day. Abbé explained it also in physiological terms. Good will or ill will does not, in the end, affect the matter. Within certain limits the workman adapts himself automatically to the shortened day by increasing his speed and his effort, without noticeably increasing his exertions, just as one can walk a mile somewhat faster or somewhat slower without appreciable difference. The short workday makes

this closer application possible without injury to the organism, by allowing the worker more time off for tissue repair between working days, and by eliminating so much of the "passive fatigue" which we have discussed above. Every one has a maximum or optimum of production, when he accomplishes most in the shortest time, and the reduction of hours is followed by increased efficiency up to the point where the greater speed and intensity, automatically acquired, overpasses physiological limits. When the worker's natural adaptation to the shorter day is not sufficient, so that pressure and effort must spur him to accomplish too large a task in too short a time, the benefits of reduced hours are lost. For the excessive intensity of effort costs the worker more than is repaired by the longer space of time allowed off for recuperation.

Just where each man's maximum lies, when he can accomplish most in the shortest time without injury to himself, Abbé thought essentially a matter of special investigation. But he concluded, from his own extended observations and from the experience of others in Germany and England, that for about three-fourths of the industrial workers of Germany nine hours was too long a day in which to reach their maximum and eight hours not too short to reach it. He therefore recommended a program still commonly held radical—the gradual reduction of the workday not to nine but to eight hours for German industries, in the interests of economic development and of greater national efficiency.

Abbé made this recommendation before the era of Germany's greatest industrial successes, before the Germans had, as an expert on industrial efficiency writes,* "advanced their industrial condition, which twenty years ago was a jest, to the first place in Europe if not in the world" by realizing "the supreme importance of efficiency as an economic factor." But ten years ago Abbé had a keen eye for Germany's then growing rivalry with British industries, and he foresaw that

* Gantt, H. L.: Work, Wages and Profits, page 179. Published by *The Engineering Magazine*, New York, 1910.

the secret of ultimate success lay in the development of greater national efficiency. Germany's most valuable capital seemed to him the intelligence and initiative of her working people, a buried treasure. And he urged the development of that capital,—the enfranchisement of the capacities of the nation,—by all the resources of science and education. He felt certain that a wiser organization of industry should allow the workers a wider margin of leisure and time for development away from the inevitably deadening monotony of minutely sub-divided labor.

Germany had been spared, he said, the worst consequences of unregulated industrial expansion. The ten-hour agitation in England, preceding and following the bill of 1847, which fixed a normal day for women and children in textile mills and thereby reduced the hours of men in the same mills, kindled a light which had illuminated all Europe (der Widerschein des Lichtes—in England—hat ganz Europa erleuchtet). Abbé himself had seen the reflection of that light in the early 50's. For as a young child, he had seen his father, an old man at thirty-eight, working sixteen hours a day in a Thuringian spinning mill. The British Ten Hours Bill first greeted by employers as the death knell of industry, and as the signal for British capital to migrate to other lands (a fable how often resurrected since that date!) soon showed its true results. German mills, including the one in which Abbé's father worked, soon followed the English precedent and gradually reduced their hours from sixteen to eleven per day.

Thus Abbé knew of his own experience what the shortened day meant to the laborer and his family. He always looked upon industrial problems as a son of the people, as well as an owner and capitalist (mit dem Auge des Arbeitsohnes, dem nicht unter der Hand Unternehmer—und Kapitalistenaugen wachsen wollten).* And his many-sided experience crystallized into a belief that to develop Germany's flesh and blood capital, one of the most important needs was

* Abbé, op. cit., p. 4.

to compress work into as few hours as possible without overstrain or impaired efficiency, so as to widen the ranges of leisure and development.

7. THE TREND TOWARD SHORTER HOURS IN THE UNITED STATES

We have concentrated our attention upon these three examples of reduced hours—English, Belgian and German—because they are specific and are to some degree substantiated by detailed statistics. A host of other less specific examples might be cited from a wide range of industries in which working hours have been successfully shortened without financial disaster. The testimony of employers and manufacturers, showing how efficiency has risen and output flourished when the workday has been reduced to nine and even to eight hours, may be found detailed in various volumes devoted to this topic.* These include industries employing men alone, and industries employing women alone, and those which employ both sexes; industries mechanical, textile, and chemical; trades as diverse as mining and the manufacture of jams; shoe making and ship building; hardware, glass, bottle making and cigar making; printing and the structural trades.

We do not here refer at length to Australasia's half century of success with the short workday. In 1856 the eight-hour day was introduced in the Australian building trades by trade union agreements. Since that time the movement has widened and steadily grown, until now it embraces practically all but the manual workers in clothing and other domestic industries. But a small and distant colony is, as regards trade and commerce, in too isolated a position to be of much practical concern in our discussion. The Aus-

* Some of the best popular books on this subject are: Webb, Sidney, and Cox, H.: The Eight Hours Day. London, W. Scott, 1891. Hadfield and Gibbons: A Shorter Working Day. London, Methuen and Co., 1892. Rae, John: Eight Hours for Work. London, Macmillan and Co., 1894. Weber, Adna T.: The Eight Hours Movement. In Report of the New York Bureau of Labor Statistics, 1900.

tralian industries which affect the world market are chiefly agricultural and stock raising. Hence the Australian eight-hour day has had little significance in world competition. The experience of Australasia in maintaining a workday shorter than the rest of the world is in itself a chapter of deep interest, but we cannot generalize from these facts as we can from facts and figures of a society more nearly akin to our own.

We are, indeed, so largely thrown back upon facts and figures from other countries because our own are the most meager and least satisfactory of any industrial nation. No American studies of output have been published which can compare with the three which we have analyzed above.*

The chief confirmation which our country affords of the point we have been examining in detail,—the effect upon output of the shortened workday,—is the actual movement of industry in the direction of shorter hours, a movement not merely *in posse*, but for some time past *in esse*, existent.

We have already pointed out that during the past thirty-six years there has been a continuous, although very slow, movement towards shorter working hours for women, secured through legislation in their behalf. There has been also a slow but certain march towards shorter hours in men's employments, especially where strong organizations of working men deal collectively with their employers through trade agreements. But here we face an extraordinary paradox! For while working men are bargaining for and obtaining the eight-hour day in many of the great trades throughout the country, women and the laws in their behalf limp in the rear, still for the most part aiming at a ten-hour working day. Eight hours for men, ten hours for women and girls,—an ironic commentary on the cast of our society.

* For an interesting reference to a successful American experiment in reducing the workday see The Steel Workers by John A. Fitch, p. 180. (The Pittsburgh Survey. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1911.) In 1904, the Sharon Steel Hoop Co., at Sharon, Pa., reduced the hours of about 150 men engaged in the finishing mills from ten to eight hours. The tonnage turned out is said to have remained the same, and the general opinion in Sharon was in all ways favorable to the shorter day.

In this instance the discrimination against women is particularly paradoxical, because for many years the only effective reduction of men's hours of work came through the laws reducing women's hours. Men who worked in textile mills with women, shared all the benefits of the long ten-hour agitation in England and America. They were and are automatically dismissed with the women at the close of the ten-hour day. This automatic though tacit inclusion of the men has been recognized since the beginnings of legislation, and at various times the laws for women were most hotly opposed by those who resented that workingmen were obtaining indirectly, "skulking behind the petticoats," a protection which they could not secure openly for themselves.*

Yet in the great trades which during the past twenty-five years have reduced the workday to nine or to eight hours,—such as the cigar makers, the carpenters and builders, the printers, granite cutters and brewers,—few if any women share the benefit.

If the short day were the enemy of production, as its opponents assert, and actually led to a lowered output in the long run, the progress towards an eight-hour day in the great men's trades would long since have broken down. No trade could persist and grow which was permanently carried on at a loss. The trend towards the shortened workday has been retarded by the mistakes of trade unions as well as by the greed of employers; but it is a fact and proceeds today only because, whether recognized or not, it is in harmony with the elemental facts which have emerged from our study; because economic efficiency rises and falls with the worker's physical efficiency, and whatever contributes to the latter tends to raise the former.

The United States Industrial Commission appointed by Congress in 1898, which sat for almost four years hearing evidence from 700 witnesses on capital, labor, agriculture, and immigration, devoted considerable attention in its final

* Webb, Sidney, and Cox, H.: The Eight Hours Day, p. 20.

report* to the economic effects of reducing the workday. It is certain, says the report, that any program for reducing the intensity of exertion must fail.

"The entire tendency of industry is in the direction of an increased exertion. . . . This being true, there is but one alternative if the working population is to be protected in its health and trade longevity, namely, a reduction of the hours of labor."

The commission found that:

"In all cases where reductions have been brought about there have been strenuous objections and alarming predictions, but after a very brief period of trial these objections have disappeared, except where lack of uniformity remains a ground of complaint; and employer and employe, with this exception, alike have agreed upon the advantages of the change." †

The best example of the effects of shorter hours on output deals with bituminous coal mining. A table was compiled from the report of the United States Geological Survey and from the Illinois Commissioners of Labor showing the production of bituminous coal for the six years 1895 to 1900.

The eight-hour day was introduced in the bituminous fields during the latter three months of 1897. From this table we see that, during the two years 1895 and 1896 under the ten-hour system, the average output for the country at large for each working man per day was 2.9 and 2.72 tons; while in 1897, during the latter three months of which the eight-hour day prevailed, the average output per man rose to 3.03 tons per day, and during 1898, 1899, and 1900 (three years of the eight-hour day, in the majority of the coal mines) the average output ranged from 2.98 to 3.09 tons. Each year of the eight-hour day shows for the country as a whole a larger output per day for each workman than the highest output of the ten-hour day.

* Final Report of the Industrial Commission, 1902. Vol. XIX, p. 764.

† Ibid., p. 774.

PRODUCTION OF BITUMINOUS COAL IN THE UNITED STATES, 1895–1900*

Year	Output, Short tons	Average days active	Average number employed	Total days worked	Average output per day, Short tons	Per cent mined by machines
			Country at Large			
1894	118,820,405	171	244,603	41,827,113	2.84	..
1895	135,118,193	194	239,962	46,232,628	2.90	..
1896	137,640,276	192	244,171	46,808,832	2.72	19.17
1897	147,609,985	196	247,817	48,572,132	3.03	16.19
1898	166,592,023	211	255,717	53,956,287	3.09	20.39
1899	193,321,987	234	271,027	63,420,318	3.05	23.00
1900	212,513,912	234	304,975	71,364,150	2.98	25.15
			Ohio			
1894	11,909,856	136	27,105	3,686,280	3.24	..
1895	13,355,806	176	24,644	4,337,344	3.08	..
1896	12,875,202	161	25,500	4,105,500	3.13	26.16
1897	12,196,942	148	26,410	3,908,680	3.12	31.51
1898	14,516,867	169	26,986	4,560,634	3.18	35.76
1899	16,500,270	200	26,038	5,207,600	3.17	41.35
1900	18,988,150	215	27,628	5,940,020	3.19	46.53
			Pennsylvania			
1894	39,912,463	165	75,010	12,376,650	3.22	..
1895	50,217,228	206	71,130	14,652,780	3.43	..
1896	49,557,453	206	72,625	14,960,750	3.31	12.29
1897	54,417,974	205	77,272	15,840,760	3.44	16.40
1898	65,165,133	229	79,611	18,230,919	3.57	25.34
1899	74,150,175	245	82,812	20,288,940	2.66	29.67
1900	79,842,326	242	92,692	22,431,464	3.56	33.65
			Illinois			
1894	16,429,032	183.1	35,398	6,481,527	2.53	..
1895	17,026,429	182.2	35,539	6,475,315	2.63	..
1896	18,995,160	186.0	34,069	6,336,915	3.00	19.57
1897	19,365,847	185.5	31,084	5,766,260	3.36	19.66
1898	17,885,327	174.7	32,223	5,629,518	3.17	18.36
1899	22,497,067	205.7	34,031	7,000,324	3.21	24.90
1900	24,147,771	214.0	36,233	7,753,921	3.11	19.73

The table also shows the increase in the use of machinery in coal mining. But it must not be assumed that the increased use of machinery is responsible for the larger daily

* Op. cit., pp. 770–771.

output of coal for each workman. In one state, Illinois, the proportion of coal mined by machines remained fairly constant; yet, comparing the two years of the ten-hour system, 1895 and 1896, with the three eight-hour years, 1898, 1899, and 1900, it can be seen that the output for each workday has increased considerably. The ten-hour years have an average output per day for each employe of 2.53 to 3 tons; while under the eight-hour system the three years, 1898 to 1900, show an average of 3.11 to 3.21 tons. This, says the report:

". . . must be ascribed solely to the increased energy and promptness of the workman, since, as already stated, the proportion of coal mined by machinery in that state has remained constant. . . . These tables bring statistical evidence to support the testimony of witnesses before the Industrial Commission that in the industry of coal mining the shorter working day has increased the efficiency of both the workmen and the management."

An interesting point brought out by the commission is the incentive to invention and greater economy on the part of the employes under the short-hour system. When working hours are diminished, the loss in time tends to be at least in part compensated, almost automatically, by time and labor saving methods of production, as well as by increased energy on the part of the workers. Doubtless it is true that a good machine often will not run faster in eight hours than in ten hours, but new machines and new devices are continually invented to improve upon the old. As the commission pointedly says:

"While a particular machine will not go faster in eight hours than in ten hours, the substitute for that machine, which the eight-hour day presses upon the employer to adopt, will go faster. Less hours in this way have an indirect as well as a direct compensating effect. Not only do they make it possible for the workman to keep up his intensity of personal exertion during each hour of the day and to work more days at a high rate of speed, but they cause the employer to

economize his labor at every point and to improve its quality by better selection."

Moreover, it must be borne in mind that some of the most useful and time saving inventions and adaptations of machinery have not come from scientific laboratories. They have been invented by American mechanics themselves in the course of their work—work whose intensity was not so great as to destroy all the initiative and nervous vitality which has been in the past associated with the American mechanic and workman. The shortened workday, therefore, in this connection, has a double advantage. On the one hand, it offers a premium on labor saving devices to compensate for the actual curtailment of working time. On the other hand, it preserves in the workman that handiness and mental alertness from which have sprung many of the minor labor saving devices which we like to consider typically American.

The commission concludes that:

"A reduction in hours has never lessened the working people's ability to compete in the markets of the world. States with shorter workdays actually manufacture their product at a lower cost than states with longer workdays."

Conceivably, hours might be reduced to the point where increased cost of production would over-balance the gains to health and efficiency. On this point the commission holds:

"If it were a question of reducing hours to absurdly low limits, nothing could be said in favor of the movement; but where—as is actually the case—the goal set up by the working people is the eight-hour day, and there is no proposition and no way for a five- or a six-hour day, the arguments for reduction need no qualification from the standpoint of the workers and little from that of employers."*

One final point needs to be considered in connection with the output of the shortened day; that is, the effect of regula-

* Op. cit., p. 773.

tion upon wages. Upon this point little can be dogmatically asserted. When we consider the rise and fall of wages in a large sense, and throughout a long period, a great variety of factors intervene. The causes of business depression and business prosperity are themselves obscure and often arise from sources incredibly remote and fantastic. Drought, poor crops, pestilence, wars—both of arms and men, or of tariffs—often the mere fear of these, and things less tangible, such as "loss of confidence," set the solid business world, like a flimsy fabric, aquiver; a sentiment can again quiet it. With such extreme instability of values, wages are naturally bound up; cuts or increases respond to the business fluctuations, and it would be idle to ascribe the fall and rise of wages to one isolated phenomenon, such as the limitation of working hours.

And yet, amid this flux of things, two uncontroverted facts stand out clearly: first, that the best wages are paid in the most strictly regulated trades. Where the limitation of hours is most defined and best enforced, wages are invariably highest. The unregulated trades, with the longest hours, are the most sweated and underpaid. Second, while we cannot assert that the operation of factory laws has been the direct cause of higher wages, there is no doubt that the sequel of shorter hours has almost invariably been a rise in wages, even after a temporary loss.* Output, as we have seen, has been maintained and increased in the shortened hours. The main cause for this has been the increased efficiency of the workers, and this is the explanation also of the seeming paradox of twelve hours' pay for ten hours' work, and ten hours' pay for eight hours' work.

* See Part II of this volume, pp. 395–407.

VI

REGULARITY OF EMPLOYMENT: FATIGUE AND OVERTIME WORK

1. OVERTIME AS A SEPARATE ISSUE

THE discussion of overtime is something to be sharply differentiated from the general question of reducing the length of the workday. It is true that when overtime is added to the day's work, making it nine to twelve hours or longer as the case may be, all the arguments that apply against the long day apply against overtime as well. It is bad because it results in too *long* a stretch of working hours, with all that implies for subject and object, worker and work.

How, indeed, could it be otherwise? For whether the last exhausting hours of the day be called "overtime," or are a regular part of the day's work, the practical results of such protracted hours must be the same.

But overtime means something more than an over-long period of work. It means irregular work; it means evening work after and in addition to day work, often without previous notice to the employe; it means in many trades that worst sequence, overwork followed by out-of-work, a "rush" season of too much work with the slack season of no work and destitution close behind it. Hence in discussing overtime, besides the evident injuries to health and output, a number of other fundamental points need to be taken into account and realized. Is overtime inevitable and uncontrollable? How can it be replaced or avoided? This discussion is the more important because the really large issues involved in overtime, seemingly so subordinate and technical a question, are, as we have pointed out, so often totally misunderstood

or ignored. These large issues we will attempt to outline under two heads: first, the relation between overtime and greater continuity or regularity of employment; and second (in Chapter VIII), the relation between overtime and the crux of all legislation, enforcement.

First, however, as to the evident likenesses between overtime and the long day in general. On the physiological side, we have seen that overtime, like other forms of overwork, injures health because, in one word, it strains. It postpones rest beyond the point when rest can normally accomplish its office of repair. "Too late," is nature's answer to the slack period or let-up after an overtime bout in factory or store, and grievous are nature's revenges for the postponement of our metabolic debts. Through the overstrain of that mysterious agency which, as we have seen, "directs, controls, and harmonizes the work of the parts of the organic machine"—our ramified nervous system—any or every organ may retain the semblance of perfect health and may yet refuse to function. Nervous dyspepsia, nervous palpitation of the heart, nervous eyestrain, and such functional ills are well recognized products of some form of "over-doing," as we call it among the well-to-do. Among working people, the same disorders and their causes have, in this country, received scant notice. These are what overtime work invites and brings with it, requiring during over-long hours increasing stimuli for wearied muscles from already tired nerve centers.

On the economic side, too, overtime work, like all overwork, results in deteriorated quantity and quality of output. In the long run, the enlightened employer is obliged to conclude that overtime does not pay. To this day, "spoiled work" is as marked a result of overtime as it was of the late working hours famous in the first English struggles for legislation.*

Such an occupation as dressmaking illustrates the deterioration due to overtime work. Here the caprice and in-

* See Part II of this volume, pp. 433–440.

considerateness of customers have been in large part responsible for the universally outrageous duration of overtime, which is common in the creation of women's wearing apparel in every country. Year after year, the French and British factory inspectors have enlarged on the essentially wasteful, uneconomical character of overtime in destroying the efficiency of the workers. After a comparatively short period of pressure, output not only becomes inferior, but progressively so. Each week's work bids fair to be progressively poorer than that of the previous week.

Another reason why output falls off during overtime is due to the irregular habits which it fosters. It is hardly surprising that workers should come to work late the next morning after evening overtime, and that the reaction after a spurt should lead to "loafing" and inferior production in consequence.*

2. OVERTIME AND REGULARITY

So much for the evident similarity of results, physical and economic, between overtime and the long day. We turn next to the distinctive characteristic of overtime, its irregularity and the supposed necessity for longer working hours at certain times or seasons of the year. Indeed, in a certain sense, overtime is a survival of the long day, a stray left over from the time when any legislative regulation of working hours was considered intolerable. First, men held that the working day could not be regulated at all without financial disaster. Then, when it was shortened, and industry still throve, the same kind of argument insisted, and still insists, that the law must allow concessions, privileges for certain occupations which, according to the employers, can not be compressed within the specified limit of hours.

The provision for overtime work proceeds on the theory that at certain times and seasons employers cannot manage or meet their obligations under their regular schedule of

* See Part II, pp. 440–444.

hours, but must be free to call upon their employes for extra work. This theory has obtained in almost every industrial country that has restricted the hours of labor by law: the regulation of overtime has been one of the most vexed chapters.

In innumerable trades it has been assumed that the demands of customers, reasonable or unreasonable, and the necessities of the season, avoidable or not, can be met in no other way than by lengthening the day's work for a longer or shorter period of time.

3. EFFORTS TO EQUALIZE SEASONS

But to lengthen the day's work is in fact not the last word on the subject. In many industries the most enlightened employers have found that overtime work is essentially inefficient, that excessive irregularities in work are as demoralizing to business as they are physically damaging to the workers. It has proved possible to replace overtime, in large part, by spreading work more uniformly over the entire year, instead of concentrating it into short periods of intense overwork. Untold effort and money have been spent to equalize more nearly the week's and month's business. Thus, for instance, the now prevalent January "white sale" of the department stores was devised some years ago by a prominent New England firm, to attract customers during the stagnant period after the Christmas "rush." It was not written in the eternal fitness of things that the purchase of new linens should be associated with the first month of the year. But such is the psychological force of advertising, that the shopping public has become educated up to the January "white sale" throughout the country, and now no well-conducted store is without an artistic display of damasks, table linen, bed linen, and women's white underwear, as soon as the new year opens. When the heavy spring trade starts later in the year, the sale of white goods is, for the most part, over. Indeed, this effort to equalize seasons has been carried to such

lengths that the January "white sale," invented as a stop-gap between seasons, has itself become a "rush" period.

This example is only one of many such efforts which might be cited. It has been found profitable by merchants to make the week's as well as the month's business approximately equal. In many cities, the custom of making Monday a day of special "bargains" and "green trading stamps" has likewise been implanted in the public mind, for the sake of attracting customers on a previously dull day, and more nearly equalizing the business of the week.

But the more important and more radical movements of this order have been carried out in manufacture rather than in commerce. The most farsighted manufacturers have shown how work can be more uniformly spread over the entire year, instead of allowing it to be crowded into short "rush" periods followed by stagnation.

By way of concrete illustration, the reorganization of two great New England establishments, for the precise purpose of more nearly equalizing seasons, may be briefly described.

The first of these is one of the largest shoe factories in the United States. The shoe trade was, and in many instances still is, a seasonal industry. Manufacturers wait for the spring and fall orders, slack periods alternating with seasonal rushes of work. The firm in question decided that this system was too great a strain upon their equipment; that it was wasteful and unnecessary. They determined to continue at work during the slack season by opening up new lines, requiring customers to send in their orders earlier, and by similar devices. Customers were notified that in order to have orders filled they must be received by certain fixed dates. Once received, the order is like a promissory note which will be met by the manufacturer at the given time. The dates for receiving and delivering orders are fixed in rotation, arranged so that each month's work is approximately equal. The scheme has been worked out in minutest detail, and since it has been put into practice this establishment has completely abolished overtime, as well as a slack season.

Uniform, continuous work has not only relieved the alternations of idleness and overwork; it has, financially, paid.

Similar has been the experience of one of the important manufacturers of jewelry cases in the United States. Case and box making is likewise a seasonal trade. The plethora of boxes needed for the Christmas trade—fine jewelry cases, candy boxes, boxes of innumerable shapes, sizes, and qualities—is usually not ordered by retailers until late in the year. A congestion of work results for the box makers in October and November. The manufacturer of cases whom we are considering and who supplies a large proportion of the fine jewelry cases used in the East, decided likewise, a few years ago, to equalize his year more nearly if possible. He, also, reorganized his business for the sake of obtaining that regularity of work which, once established, benefits employer and customer as much as employe. He has, indeed, met with so successful a response from his customers, that their orders are projected months in advance, being given sometimes as early as January for the following Christmas.

4. THE ADAPTATION OF CUSTOMERS

These examples of successful attempts to equalize seasons for purely business reasons illustrate also how the public adapts itself to changes of habit in purchasing. We are too apt to look upon custom, use and wont, *what is*, as entirely static things, impervious to change. In fact, however, habits are not as tyrannical or clod-like as they appear, and in communities as well as in individuals the power of new ideas works its astounding transformations.

The possibility of altering a well-entrenched habit on the part of the public was interestingly illustrated in Illinois a few years ago, when the passage of the ten-hour law for women prohibited overtime in laundries. Laundries have always required from their employes longer and more injurious overtime than perhaps any other industrial establishments in which women are employed. The schedule of

working hours in laundries is very irregular. Not only in the United States but also in Great Britain and in Germany the long and irregular day's work in laundries has been repeatedly investigated and found unmistakably dangerous to health. The scrupulous cleanliness and abundance of clean linen on which our generation prides itself has been dearly provided, unknown to the wearers.

Work in laundries usually begins late on Mondays, is slack on Saturdays, and on the remaining days of the week runs up to a wholly indefensible number of hours. Women have been found employed in laundries as much as seventeen consecutive hours.* The alleged necessity for this overwork has been the need of completing large orders from restaurants, steamship companies, and barber shops, as well as private families, in the quickest possible time. When the Illinois ten-hour law for women in factories and laundries went into effect in 1909, notices were posted by certain large steam laundries in various public places announcing that, on account of the new law, they would not be able to deliver laundry work on any Saturday unless it were received by the previous Wednesday noon. Previously linen had been accepted as late as Friday for delivery on the following day. Such a stand as the laundries assumed towards their customers doubtless means that the establishments which have previously insisted upon the almost immediate return of their linen will be obliged to lay in a larger stock. Nor does there appear to be any legitimate reason why the difficulty should not be met in this way, rather than by the indefensible overwork of thousands of girls and women in the hot and exhausting laundry occupations.

The recorded experience of the British factory inspectors during the past twenty years in enforcing the law (in the textile and other well-organized trades where overtime is prohibited) shows unmistakably how the demands of customers yield to the requirements of a fixed legal working day. When

* Report of the Consumers' League of the City of New York for the year 1909, p. 24. Published March, 1910.

customers are obliged to place orders sufficiently in advance to enable them to be filled without overtime work, this habit soon tends to become automatic.*

5. THE POLICY OF PERSUASION BY CONSUMERS

The experience of the laundries shows not only how customers adapt themselves to necessity and the requirements of a fixed rule, but how the prohibition of overtime tends to create a greater regularity and uniformity of hours. Before the passage of the law of 1909, the Illinois laundry owners had presumably not considered the possibility of abolishing overtime and had certainly not attempted to require a more reasonable margin of time for delivery.

Since the beginning of modern industry, a vicious circle has tended to exist between the customer's (wholesale or retail) habit of waiting until the last minute before giving orders, and the employer's acceptance of orders at such late dates, regardless of the cost to his personnel and equipment. Either party could forcibly break this circle if either would take a determined stand—the customer by giving orders in time and refusing to accept them unless finished in season; the employer on his side refusing to accept orders received too late. Neither customers nor employers, however, are apt to take the initiative in this way until really urgent need arises.

But when an outside authority—the law—representing the sentiment of the whole community, limits the length of the workday, both employers and customers are protected—the former against unreasonable requirements of their clientèle, the latter against wearing, eating, or otherwise consuming articles the manner of whose manufacture or sale they condemn.

It is true that consumers have in their own hands a considerable power of demanding changes from the manufacturers and merchants with whom they deal. It is plainly

*See Part II of this volume, pp. 407–411; 528–531.

to the latter's advantage to meet the desires, even the whims of their patrons; yet the consumer's power of obtaining what commodities he desires, in an infinite variety, has been little used to secure working conditions of which he can thoroughly approve for the workers by whom he is clothed, fed, and otherwise provided with the material equipments of life. Even when the consumer awakes to a desire to mend conditions, the method of securing improvements from employers as favors, is sharply differentiated from the method of legislation, which secures them as rights.

So, for instance, at Christmas time it has long been supposed that the employment of thousands, even hundreds of thousands, of young women is unavoidable each evening in the large cities, to wait upon a throng of shoppers and sightseers. So firmly fixed in the public mind has this belief been that in New York state, for example, the law which protects young women between sixteen and twenty-one years in stores, from more than sixty hours' work in one week, is suspended during the Christmas "rush," when most needed.

During the past twenty-one years an association of customers or consumers in New York City has consecutively endeavored to persuade the merchants with whom they deal to close their establishments in the evenings during the last half of December, in default of a law prohibiting Christmas overtime.* This policy of persuasion has led a growing number of the best establishments to close early, without financial disaster.† It proved that the supposed necessity of keeping these young women clerks at work in the evening after an exhausting day'swork, is after all not inherent. For when customers are not able to postpone their shopping for gifts until a few nights before Christmas, they find it possible, for the most part, to attend to it between eight in the morning

* Reports of the Consumers' League of the City of New York, 1891 to 1911.

† In 1911, from among 40 of the best known stores in New York City, all but 14 closed at 6 or 7 o'clock in the evening. Only four stores remained open more than three nights before Christmas.

and six at night. But the time and effort required to prove this has been out of proportion to the results attained; it has shown likewise that the early closing movement to be successful, must be sustained by a specific law.

6. THE LEGAL PROHIBITION OF OVERTIME

Hence the Consumers' Leagues, which under a national organization have spread into 17 different states, are devoting their efforts more and more to securing specific laws for the protection of working women and children. Justice and expediency demand that a uniform rule shall protect the progressive and check the backward employers in stores and other commercial establishments as well as in manufacture. Wherever the indiscriminately long seasonal employment of women has been forbidden by law, even the backward employers have found it possible to mend such irregularities, in some degree if not wholly, by foresight and management. A more equal and uniform distribution of work throughout the year has followed. This seems to be the uniform experience of countries whose industrial experience is recorded in the reports of their factory inspectors. British, French, German reports coincide in yearly comments* that legislation which fixes a "normal day" has been the best incentive towards greater regularity of employment, planned in advance to meet the legal requirement as to hours. In 1902, and again in 1903, the Committee of the British Association for the Advancement of Science, appointed to investigate the economic effect of legislation regulating women's labor, took occasion to emphasize the influence of legislation on regularity of employment, stating that the British acts had led to spreading work more uniformly over the week, month, and year, and that without the acts it "seems certain" that there would have been less uniformity.†

*See Part II of this volume, pp. 444–463.

† British Association for the Advancement of Science, 1902. Women's Labour, 2nd Report, pp. 293–295; 1903, 3rd Report, pp. 340–341.

On the other hand, in trades where overtime has been tolerated, the pressure towards long and irregular hours—"spurting"—has been almost irresistible. As one of the British inspectors somewhat naïvely puts it:

"I am afraid that foresight and arrangement will never be exercised while the mischievous expedient of overtime is made so easy."*

It is indeed so much easier, so much more in line with natural human inertia, simply to lengthen the workday by a few hours, and to keep the workers who are on hand, rather than to plan laboriously in advance to meet emergencies, that overtime takes on the appearance of an absolute necessity.

No industry illustrates this more clearly than the canning trade, to whose quite unrecognized physical hardships we have drawn attention in a previous chapter. In few industries, on the whole, have employers made less consistent efforts to reduce overtime. At the same time they are insisting to legislatures and the public that overtime work is an inherent necessity in the canneries.

In the federal investigation, as we have seen, women were found employed in the canneries up to ninety hours in the week, while the canners maintain that without such intolerable exploitation their industry could not exist, when a seasonal glut of raw materials overtakes them. But the truth is that there are more than two horns to this dilemma. For while the canners are so depleting their workers, on the plea of unavoidable necessity, they are at the same time often found neglecting the most elementary means of meeting the admitted difficulties of their industry, and of providing themselves with a sufficient number of workers at times of glut. In the summer of 1907, as was known to the writer, some women were employed in one New York cannery up to eighty-five hours in one week, while side by side with them other women were employed twenty-five hours and less. At some canneries no devices more effective than ringing the

* British Sessional Papers. Vol. XVII, p. 90. 1893.

factory bell were used to summon workers living within hearing distance, when unexpectedly heavy pea deliveries were received late in the afternoon, and workers who responded to the summons were kept working until after midnight—sufficient proof that the canners have simply rested upon their alleged "necessity" for overtime, and have spent upon the organization of the working force little of the ingenuity and intelligence which have been devoted to the technique of canning. It is not credible that in a trade where technical mechanical processes have been brought to such perfection, the difficulties of management can not be better solved.

The latest government investigation of canneries in Maryland and California, dwells upon this "entire absence of working-time records, and almost uniform lack of records of any description for the piece-workers."*

"Without such records," as the report says, "it is impossible for employers to make any progress in distributing the strain of excess work over the whole force, for there is nothing but the memory or personal interest of the foremen to mark the working time of each employe. . . .

"It is singular that employers who direct other phases of their business along lines indicated by carefully kept accounts should attempt to regulate the supply of so large a part of their labor without the help of adequate records."†

Indeed, once overtime is tolerated on the plea of necessity, it is almost impossible to draw the line where necessity

* Bulletin of the United States Bureau of Labor, No. 96, Sept., 1911. Hours and Earnings of Women Workers in Maryland and California, pp. 399–400.

† Interesting confirmation of this disorganization of the labor force was given at the public hearing on the ten-hour bill for women, at Annapolis, Maryland, on February 14, 1912.

"Mr. Soper (counsel for the canners): No record is kept of the names of these people, is there?

Mr. Numsen (a canner): Absolutely none.

Mr. Soper: If you were to go to the canners and ask some of them to show you their books, they cannot show, to save their souls, how many hours any particular person worked in their factory; not because they want to conceal it, but because of the exigency of the situation which does not permit of the record; therefore, nobody can tell exactly the amount of time that is put in by any particular person." (Stenographic record of hearing, pp. 27 and 40.)

begins and ends. The canners maintain that overtime is unavoidable on account of the perishable nature of their raw produce. But what possible defense is the perishability of fruits and vegetables for such a common practice as the employment of women at night at labeling jars and cans?

The federal report on canneries states that in California some of the "long drives,"—reaching a maximum of twelve to fifteen hours a day or seventy-two to ninety-eight hours in one week,—are worked by labelers and stampers, who handle the product "after it is canned, hermetically sealed, cooked, and no longer perishable."*

What justification is the perishability of the products for requiring overtime work at making fruit and berry baskets? Fruits and berries are perishable, but no perversity could so describe the baskets. Yet in one state at least (Delaware) the canners have actually had enacted into law special permission to work young children of any age, for any number of hours, at berry and fruit basket making, as well as at the technical processes of canning. Anyone can see that there is no shadow of excuse for such exploitation. It is due to the sheer license which flourishes in such employment as the canneries and the sweated trades, where the employer is free to use his employes to the limits of their physical strength.

It is indeed true that far greater difficulties attend a regular schedule of hours in the canneries than in other factories. Once a glut of produce reaches the canneries it must be used at once, within a very short period. Experts allow five to twenty-four hours for holding peas before canning, about twenty-four hours for beans, and so on,† though the possibilities of cold storage have not yet been explored. The canners cannot stay the hand of Nature or prevent the sudden ripening of crops. But they can learn and provide in advance for these alleged "emergencies" to an extent quite unapproached at present in most states.

* Bulletin of the United States Bureau of Labor, No. 96, p. 395.

† Annual Report of the Bureau of Factory Inspection. New York State Department of Labor, 1908, pp. 393, 394.

It was on this ground that the Supreme Court of Massachusetts, a few years ago, refused to accept the plea of necessity for violation of the Sunday law by the owner of cranberry bogs in Plymouth County.* The court's decision is so clear and goes so directly to the root of the difficulties in limiting the day's work as well as in enforcing the Sunday rest that it should, at least in part, be quoted.

The owner of the bogs contended that he could not harvest his crop without working on Sunday; that Sunday work was not unlawful, if it was a matter of necessity; and that he was justified in working on Sunday if, "owing to the size of the crop, the difficulty of procuring or housing labor, the prospect of frost, or the danger of the fruit getting overripe and other circumstances, he had reason to believe that the crop might be injured or lost if he did not gather it on the Lord's Day."

On cross examination in the lower court, it was shown that if the employer had procured enough men—only one-sixth more—"he could have done the same work in six days that he was doing in seven." It was also shown that while the crop was three times greater than it had ever been before, the owner knew at the end of July that he should probably have such a crop and that he should have to employ a great many more men to take care of it in September. It was shown that his employes lived in shanties owned by him, that he could not accommodate any more men, and had not made any effort to do so. He began to employ between three and four hundred men towards the middle of September.

The judge in the lower court instructed the jury that the employment of these men on Sunday was not, under the circumstances, "work of necessity within the meaning of the statute." In upholding the decision of the lower court, the Supreme Court of Massachusetts further emphasized the fact that this work was not one of necessity, and refused to consider as emergencies, facts which might have been provided for in advance.

* Commonwealth v. Edwin M. White. 190 Mass. 578.

"Without going over the evidence in detail," said the court, "it is sufficient to say that here there was no extraordinary, sudden and unexpected emergency. The crop was large, it is true, but that it was likely to be large had been known for weeks. The weather was only what might have been expected. The substance of the testimony was simply that in gathering the crop it was somewhat less expensive and more convenient to work seven days in the week rather than six. That is not enough. Such testimony falls far short of showing 'necessity' within the meaning of the statute."

After all, these so-called "emergencies" in the canneries are essentially the same (although of far higher degree) as those which may arise in all businesses. With the fickleness of modern fashions, and their extraordinarily sudden changes, the market for most commodities is precarious. All the articles of men's as well as women's clothing—garments, hat-wear, foot-wear, ornaments, jewelry, the furniture of our houses, the service upon our tables, sports (like bicycling, a few years ago, and motoring today), the very songs of the music halls, echoing in the streets and in the innumerable musical instruments whose manufacture develops from year to year—all these things are subject to changes in fashion more violent than a former generation could dream of. Articles in demand in January are out-of-date by June. Last year's models are antiquated. The whirligig of time never before brought such revenges. And in consequence all these commodities are practically "seasonal," in the sense that they are of value at a given moment or season, like fruits, berries, and vegetables ripe in field or orchard. And like the fruits, too, after their moments of prime, they are useless, over-ripe.

Are we then driven to conclude that all these manufactures must have special concessions and privileges of overtime allowed by law, such as the canners maintain that they must have? No. In this country we have, with single exceptions, recorded in our legislation (and are now facing the problem of enforcing) our contention that, so far as

working women and children are affected, the seasonal necessities must be provided for by good management within reasonable working hours; that, in a word, production must be limited to conserve the workers' health and welfare, which is the health and welfare of the nation.

That such a contention is not unreasonable the best practice in all industries tends to prove. The appeal is always from Philip drunk to Philip sober: from the alleged impossibilities to the actual facts. Even in canning, the extent of overtime varies greatly in different establishments, and this variation, as a recent New York labor report points out,

"is of itself highly significant. For if one firm has very little overtime while another has a great deal, . . . the question naturally arises whether the overtime actually occurring in the latter is not due to the methods of management of that firm, rather than to conditions necessarily inherent in the industry.

"Positively it can be said that the very fact that some firms get along with little or no overtime, seems to throw upon those with more overtime the burden of proving the necessity for such overtime."*

Overproduction,—the attempt of manufacturers to contract for more than their equipment can legitimately accomplish,—is well known the world over, and, as a policy, defeats its own ends. It is like unintelligent farming, which tries to get from the soil more than it can bear, and leaves it impoverished after too abundant bearing. The soil, in time, can be revivified, if nourished and allowed to lie fallow. But after over-production, what working people can afford to lie fallow, even were the revival of their powers thereby assured? As the British factory inspector, already quoted, intelligently remarks:

"There will always be some people who do not know how to refuse orders, however little they may be prepared to execute them, and who expect their work people to help them out of the difficulty by working excessive hours."

* Annual Report of the Bureau of Factory Inspection. New York State Department of Labor, 1908, p. 363.

It is precisely to save workingwomen from the dilemma of either working such excessive hours, or of suffering dismissal, that the police power of states has interfered with "private" businesses and has sanctioned legislation which regulates the length of the workday. That legislation is still most defective in tacitly or specifically allowing overtime.

Our conclusion would, therefore, be that the alleged necessity for overtime, and the consequent irregularity of work, is not an inherent necessity. If the testimony of experience counts for anything, it goes to prove that in fields where overtime and irregularity were long thought indispensable, a better organization has spread work more uniformly through the year, and has in large part done away with overtime. It shows also that the caprice of customers, to which the necessity for overtime is often ascribed, can also be regulated to a degree as yet unapproached in many industries. Finally, both for customers and employers, the best incentive to regularity has been the legal regulation of working hours—a regulation which is most effective where it is most specific and exact.

VII

THE NEW SCIENCE OF MANAGEMENT: ITS RELATION TO HUMAN ENERGIES

IN the preceding chapter, the detailed planning of output in advance of performance, in two progressive New England establishments, was related to point out the permanence of employment and avoidance of overtime thereby effected.*

These results or, more truly, by-products were achieved by means of the new system which, under the name of scientific management, industrial efficiency, and the like, is slowly spreading through the world. We have already touched in passing upon several incidents of this new order, such as the increased use of the stop-watch in gauging men's efficiencies. Abbé's studies of individual working capacity also tended in the direction of scientific management. But the system itself is something immensely larger than any of the factors which compose it. It is a philosophy, not a new routine; or more exactly, it is a new synthesis of many elements previously tested and untested. Its results have intoxicated the imagination. "I cannot prophesy the end, there is no end. . . . I am learning my trades all over again," testified a prominent contractor in regard to the system, before the Interstate Commerce Commission.† Scientific management is said to differ from the ordinary systems of production "much as production by machinery differs from production by hand; and the revolution . . . which must result from the introduction of scientific management is com-

* See pages 178–179.

† Brandeis, Louis D.: Before the Interstate Commerce Commission, Docket No. 3400. Brief on behalf of the Traffic Committee of Commercial Organizations of Atlantic Seaboard, 1911, pp. 21 and 33.

parable only to that involved in the transition from hand to machine production."

These are prodigious assertions seriously made. Of the philosophy and practice which underlie them we can consider here only the most distinctive notes, which are most closely allied to the subjects which we have treated up to this point.

1. DIFFERENCES BETWEEN ORDINARY SPEEDING-UP AND THE NEW SYSTEM

Some concrete examples of increased efficiency under scientific management are as follows:

> "(a) When applied to the simple operation of loading by hand a railroad car with pig iron, the performance of the individual worker increased from 12½ to 47 tons a day.
>
> "(b) When applied to shoveling coal, it doubled or trebled the performance of the shoveler.
>
> "(c) When applied to machine shop work, it developed in certain operations increases in production, ranging from 400 to 1800 per cent.
>
> "(d) When applied to bricklaying, the day's accomplishment rose from 1000 to 2700 bricks. (Gilbreth: Record, p. 3410.)
>
> "(e) When applied in the manufacture of machinery, 75 men in the machine shop with 20 in the planning department do two to three times as much work as 105 men in the machine shop did under the old methods. (Hathaway: Record, p. 3059.)
>
> "(f) When applied in the manufacture of cotton goods, it increased the output 100 per cent. (Scheel: Record, p. 3377.)"*

"One of the folders on light work (in a cloth finishing establishment), a wonderfully skilful young woman, who had folded 155 pieces a day before, now folded 887."†

* Brandeis, op. cit., pp. 38–39.

† See Scientific Management as Applied to Women's Work, in Clark, S. A., and Wyatt, Edith: Making Both Ends Meet, p. 242. New York, The Macmillan Co., 1911.

The question at once arises: How do these extraordinary increases of output differ from the ordinary speeding up and pace-making which we have seen to be common in industry, and prime factors in its overstrain? It is entirely natural that, at first sight, the almost incredible heightening of human capacity which scientific management achieves should be viewed with extreme suspicion. Instinctively we ask how this is accomplished, and what are its effects upon the workers.

In both ordinary management and under the new system, it is the stimulus of reward which calls forth the extra exertions of the workers. Indeed, scientific management has evolved stimuli of far greater psychological power than any known before, in its finely adjusted rates and proportions of pay.

But the diversified pay systems are merely subordinate mechanisms. Scientific management differs from other systems not in degree, but in kind. Ordinary management leaves the workers in any industry to learn and pursue their trades by imitation from their fellows, by tradition and the rule of thumb. Scientific management assumes the responsibility of teaching the workman a predetermined task and keeping him adequately provided to accomplish this task.

In this apparently simple assumption lie the germs of a wholly new system of production. The responsibilities assumed by scientific management involve a new conception of every business. It replaces empiricism by predetermination of results; the haphazard of the mechanic by the engineer's application of scientific laws. Each process of work is analyzed into its ultimate units. Each smallest step of the process is compared with an ideal standard of performance, and allowance being made for practical conditions, an attainable commercial standard is set for each unit of work and for the whole work reassembled in its entirety.*

This brief formula contains the gist of a long series of complicated operations. It presupposes the scientific selection of workmen for their tasks; an analytical time study of

* Brandeis, op. cit., p. 17.

each unit of work; records of the accomplishment of not only each individual but of each machine and of the material used; the standardizing of all tools, machines, and equipment, and similar contrivances for obtaining in advance exact knowledge of "what work is to be done, how it shall be done, when it shall be done, and what it shall cost." Some concrete examples will make this clearer.

Let us consider first one which has been most widely quoted and which deals with one of the simplest forms of human labor,—loading a freight car. Frederick W. Taylor,—best known in the scientific world as the author of the "Art of Cutting Metals," a profound work resulting from twenty-six years of investigation,—is also the originator of the new study of efficiency. He has given an intensely interesting account of the first application of the new system at the Bethlehem Steel Works.*

"The opening of the Spanish War found some 80,000 tons of pig iron placed in small piles in an open field adjoining the works. Prices for pig iron had been so low that it could not be sold at a profit, and it therefore had been stored. With the opening of the Spanish War, the price of pig iron rose, and this large accumulation of iron was sold. This gave us a good opportunity to show the workmen, as well as the owners and managers of the works, on a fairly large scale the advantages of task work over the old-fashioned day work and piece work, in doing a very elementary class of work.

"The Bethlehem Steel Company had had five blast furnaces the product of which had been handled by a pig-iron gang for many years. This gang, at this time, consisted of about 75 men. They were good, average pig-iron handlers, were under an excellent foreman who himself had been a pig-iron handler, and the work was done, on the whole, about as fast and as cheaply as it was anywhere else at that time.

"A railroad switch was run out into the field, right along the edge of the piles of pig iron. An inclined plank was placed against the side of a car, and each man picked up from his pile a pig of iron weighing about 92 pounds, walked up the inclined plank and dropped it on the end of the car.

* Taylor, Frederick W.: Principles of Scientific Management, pp. 41 and 42. New York, Harper and Brothers, 1911.

"We found that this gang were loading on the average about 12½ long tons per man per day. We were surprised to find, after studying the matter, that a first-class pig-iron handler ought to handle between 47 and 48 long tons per day, instead of 12½ tons. This task seemed to us so very large that we were obliged to go over our work several times before we were absolutely sure that we were right."

How, now, had this result been come at? Mr. Taylor had long sought to discover, and had spent years in attempting to measure "the tiring effects of heavy labor" upon a first-class man. His object was to find an exact mechanical measurement of daily work. He sought to learn what fraction of a horse-power a man was able to exert in one day, translated into foot pounds of work.* Records of previous experiments by physiologists and engineers were found too meager to base any laws upon. Accordingly, in 1881, while Mr. Taylor was employed in the Midvale Steel Works, he began the series of experiments which ultimately yielded the desired result and led the way for the system which bears his name.

Two first-class laborers were selected and were given various tasks. Each motion was timed by a stop-watch. Useless and awkward motions were eliminated or replaced by correct movements. But no relation was discovered between the tiring effects of various kinds of heavy work and the foot pounds of energy exerted.

"On some kinds of work the man would be tired out when doing perhaps not more than one-eighth of a horse-power, while in others he would be tired to no greater extent by doing half a horse-power of work. We failed, therefore, to find any law which was an accurate guide to the maximum day's work for a first-class workman."†

It was not until some years later, after a second and third elaborate series of observations and measurements, that

* One foot-pound = the amount of energy required to raise one pound to a height of one foot. One horse-power = 33,000 foot-pounds per minute.

† Taylor, op. cit., p. 55.

the law sought was found. "And it is so simple in its nature," says Mr. Taylor, "that it is truly remarkable that it should not have been discovered and clearly understood years before." From our physiological point of view, it is peculiarly interesting to find this law of mechanical work simply an extension and mathematical working out of the basic principle which has emerged from our study of fatigue: *That rest must adequately balance exertion.* Translated into the language of mechanical labor, this requires that a man should be under load for only a definite percentage of the day, and must be entirely free from load at frequent intervals.

"For example, when pig iron is being handled (each pig weighing 92 pounds), a first-class workman can only be under load 43 per cent of the day. He must be entirely free from load during 57 per cent of the day. And as the load becomes lighter, the percentage of the day under which the man can remain under load increases. So that, if the workman is handling half-pig, weighing 46 pounds, he can then be under load 58 per cent of the day, and only has to rest during 42 per cent."*

The process of adjustment is continuous, and as the load grows lighter the workman can remain under load, without undue fatigue, during a larger and larger percentage of the day.

This formula was obtained by Mr. C. G. Barth's mathematical studies, in which each element of the work was graphically represented by plotting curves, to give a bird's-eye view of the data and records accumulated.

But to explain the formula thus evolved, we must revert again to the familiar language and conceptions of physiology. As Mr. Taylor puts it:

"Throughout the time that the man is under a heavy load, the tissues of his arm muscles are in process of degeneration, and frequent periods of rest are required in order that the blood may have a chance to restore these tissues to their normal condition."†

* Taylor, op. cit., pp. 57 and 58. † Ibid., p. 58.

No constant relation was found between the foot pounds of energy exerted and the tiring effect of various kinds of heavy muscular work, because no horse-power whatever is exerted by the man who stands still under load, however intense his efforts. His arm muscles are under the same severe tension whether he is moving or not, but that tension had not been registered.

Such were the results of the long-continued observations and studies which preceded the efficiency engineer's estimate of 47 long tons instead of 12½, as the proper day's work for pig-iron handlers. His practical task was now to select workmen specially fitted for this type of work; his next to train them to accomplish it. Mr. Taylor's account of this process in relation to the new management is again of intense interest:

"Schmidt started to work, and all day long and at regular intervals, was told by the man who stood over him with a watch, 'Now, pick up a pig and walk. Now sit down and rest. Now walk—now rest,' etc. He worked when he was told to work, and rested when he was told to rest, and at half past five in the afternoon had his 47½ tons loaded on the car. And he practically never failed to work at this pace and do the task that was set him during the three years that the writer was at Bethlehem."*

Gradually other men were chosen and trained to handle pig iron at the rate of 47½ tons per day, receiving $1.85 instead of the ruling rate of $1.15 per day, until all of the pig iron was handled at this high rate and the gang received 60 per cent higher wages than other workmen around them.

In this instance it is perfectly clear that such an extraordinary heightening of human working capacity could not possibly have resulted from the mere incentive of a high wage. It resulted from the application of the laws of exact science learned after years of investigation. The high wage was nothing more than an inducement for the workman to change

* Taylor, op. cit., p. 47.

his ordinary habits and become the pupil of a new system. As Mr. Taylor rightly says:

"If Schmidt had been allowed to attack the pile of 47 tons of pig iron without the guidance or direction of a man who understood the art, or science, of handling pig iron, in his desire to earn his high wages he would probably have tired himself out by 11 or 12 o'clock in the day. He would have kept so steadily at work that his muscles would not have had the proper periods of rest absolutely needed for recuperation, and he would have been completely exhausted early in the day. By having a man, however, who understood this law, stand over him and direct his work, day after day, until he acquired the habit of resting at proper intervals, he was able to work at an even gait all day long, without unduly tiring himself."*

Here we have the system of scientific management at its best. It justifies the seemingly extraordinary claim that "the whole realm of science is brought to the aid of the humblest workman."

Schmidt was the gainer in wages, the company and the community in the amount of work done. With workers of finer intelligence and reactions, the self-respect and exhilaration which spring from achievement are as great as the increased wage. In this instance the prodigious increase in working capacity was in direct proportion to the physiological potentialities of the workman. Any one can see the difference between the ordinary methods of "speeding up" and this speed achieved by the efficiency engineer. He also sets up speed as one of his ends. He aims for speed not only to increase quantity of work, as with the pig-iron handlers, but regards it also as a function of quality.†

Now just in proportion as this function of speed is developed, *subject to the capacities of the human agent,* instead

* Taylor, op. cit., p. 59.

† "In the last process of stamping tickets and ticketing (in a cloth finishing establishment) the girls work without one superfluous motion, with a deftness very attractive to see; and both here and at book folding justified the claim made by Scientific Management that speed is a function of quality." Clark and Wyatt, op. cit., p. 244.

of as a *driver* of those capacities, it counts as a gain. Just so soon as the function of speed is disassociated from its effects on the worker, we revert to the old system of pace-making and speeding.

Such a reversion was seen in the case of the Bethlehem Steel Works. When the ownership of the works passed into the hands of Charles M. Schwab in 1901, the efficiency engineers were dismissed. But the machinery of their system was kept. Bonuses, premiums, and other inducements for great exertions on the part of the workers were continued, but without the spirit which had previously made these contrivances parts of a larger system, as in the case of Schmidt, the pig-iron man. The result was a return to the system of "drive," such as the world has seldom seen excelled.*

This, indeed, is one of the dangers of scientific management. Unscrupulous men can easily pervert it to their own uses. Its mechanical features, such as timing operations by a stop-watch, and the like, are easily copied, and unless they are correctly applied the workers can thereby be exploited more relentlessly than ever before.

But such perversions cannot fairly be charged against the system itself. They emphasize the dangers of this new instrument of efficiency; it may be used as a club as well as a crutch. But many invaluable stimuli are dangerous in the wrong hands. If the unscrupulous use of scientific management were all that could be charged against it, the system could defend itself easily enough. That more has been charged against it, it would be idle to deny.

More serious is the contention that the efficiency engineers themselves have failed to gauge fairly the tax of increased productivity upon the workers, and into the justice of this charge it behooves us to inquire.

* Gantt, H. G.: Work, Wages and Profits, p. 107. Published by *The Engineering Magazine*, New York, 1910.

2. BENEFITS OF THE NEW SYSTEM

We have seen that in the case of Schmidt, the pig-iron man, increased efficiency was attributed to the balance of exertion by enforced rests. In machine work, obviously, many more complicated factors intervene. Here scientific management obtains its marvelous results not only by teaching the worker the best possible way of accomplishing his task with the least time and effort, but also by removing all possible external obstacles. The management has, in advance, perfected his equipment and sees that it is always in perfect order and that the worker is regularly supplied with material in perfect order and condition.

In reorganizing the weaving room of a cotton mill, for instance,* the efficiency engineer spent a month in studying and timing the looms and the most expert weavers. He learned exactly how much time it was necessary for the loom to be stopped each day to remove and replace the bobbins, etc., and what proportion of time it should actually be weaving, when all unnecessary delays and obstacles were removed. After starting the first workers on their predetermined tasks, he found himself still dissatisfied with the condition of the looms and the way in which the warps and filling were supplied. The new system was again delayed eleven days until all external delays and obstacles, which might interfere with the accomplishment of the specified number of picks to be thrown by the loom, were removed. The first workers were then taught their trade anew by the most expert weaver, chosen as teacher, with the efficiency engineer to superintend and teach the teacher.

Another striking example of regularizing work under scientific management and saving the workers from avoidable delay was shown in the recent reorganization of the general machine shops of the government arsenal at Watertown, Massachusetts.† The most important manufactures in the

* Gantt, op. cit., pp. 143 ff.

† Statement of Secretary of War Stimson in regard to War Department's Experiments with Scientific Management, 1911.

arsenal are seacoast gun carriages—large structures with hundreds of parts, requiring many months for their completion. Shop methods at the different arsenals were believed to be fully abreast of the best general work in private industries of the same nature. Yet it was concluded that the general machine shop might be materially improved under scientific management. One of the chief aims has been precisely to regulate "the flow of work so that it shall be even and continuous."

"An expert in shop management was employed, and under his guidance the . . . orders for manufacture now go from the office to the shops with a much more complete arrangement and supply than formerly of drawings, specifications, lists of parts, list of material, and orders regulating the particular parts of the structure to be produced . . .

"There has been installed a planning room, equipped with personnel and appliances for the regular production of what might be called the time tables of the thousands of pieces which must travel through the various shops on their way from the stage of raw material to that of finished product, without collisions or unnecessary delays.

"The work of planning the course of component parts of the structures to be manufactured through the shops of the arsenal has been systematized, so that this course shall be regular and orderly, and the work shall at no time be held through the lack of some component which is not at hand when needed; and that no wasteful effect shall arise through congestion of work at particular machines, or the idleness of other machines or workmen, while waiting for the assignment of operations which should have been planned for them in advance."

Compared with such a régime, the crudity and chaos of ordinary systems stand out in glaring contrast. A revolution has been effected; a terrible waste has been checked, of that capital which alone is common and equal for all mortal beings: of *time*, "the daily miracle . . . the inexplicable raw material of everything." Hitherto hours, days, and weeks of employment have been habitually lost to the workers through no fault of their own, but through the sheer

incompetence of the management in performing its obligations and supplying materials and equipment fairly. No page in industry's history is more dreary and disheartening than the "time lost" by competent and willing workers, waiting, unpaid, for employment which might be fairly regularized. Indeed, the daily delays and irregularities of work involve more than the direct loss of wage and earning capacity. They are more subtly interfused into the day's work; and the psychological gain which springs from the elimination of such daily annoyance and friction is undoubtedly an important factor in heightening working capacity under scientific management.

The new organization of work has brought also a new emphasis upon the workers' physical surroundings. All those physical inconveniences which waste human strength and comfort and which are common rather than uncommon characteristics of our workshops,—such as bad air, bad light, overcrowding, dirt, and unsanitary conditions,—are all marks of inefficiency in the management. They are intolerable to the system which is based essentially on the observation and study of cause and effect. Where the ordinary management sees in the crudest so-called "welfare work" (better light, air, sanitation, and comfort) merely concessions to the labor force, the engineer sees them as indispensable parts of the equipment. They are the mere commonplaces of efficiency, without which the accomplishment of predetermined tasks cannot be expected.

Under such a system, as we have seen, the increase in production has been stupendous. Yet the picture has its reverse, which may not be ignored. The multiplied task has within it real elements of danger, and unless they are seen and neutralized at the outset, the new management may undo its benefits.

3. DANGERS OF THE NEW SYSTEM

It is clear that unless the working hours are proportionately shortened, or eased by rests, the physical or nervous

hardship inherent in any process is bound to be multiplied when the task is multiplied. This was true in the case of the weavers under scientific management, and is almost inevitable in all machine processes. Take, for another example, the case of girls who wind the bobbins for filling, in a cotton mill. They watch the thread from 18 bobbins, stopping and replacing the bobbins by throwing their weight upon foot pedals. The girls' work was concentrated by providing doffers to place the bobbins on the warp, formerly done by the girls themselves. A time study was made and the task so increased that the girls earned from $8.00 to $10.50 a week, in place of their previous salary of $7.00 to $7.50. The hours of labor were not changed. It is easy to see that the increased stamping of the pedals, necessitated by the larger task, was bound to be more exhausting than before.*

So, too, with the girl spool tenders. "In replacing the bobbins and fastening the broken threads with a tier knot the girls have to stoop down almost to the floor." Naturally, then, the increased task requires proportionally more continuous stooping.

Moreover, as we saw in discussing the strain of industry, the increased concentration of attention upon more limited and intensive tasks makes for monotony and increases effort. This, it is true, is counteracted under scientific management by the worker's new interest in earning a larger wage, conditional upon the quality as well as the quantity of a given task. Where the payment of a bonus, over and above the regular day- or piece-rate, does not lead to an undue strain of effort, it undoubtedly acts as a new and important psychological motive in arousing interest in work. And this interest, in the intricacy of our psychological powers, itself develops capacity and reduces effort.

The new order of production is thus infinitely complex in its effects upon working capacity. No offhand or general statement can gauge its true results. When, therefore, the efficiency engineer presents to us as complete answer the fact

* Clark and Wyatt, op. cit., pp. 256–257.

that the predetermined task has been accomplished and that bonuses have been earned by foreman and workers, he does not answer our demand to learn the effect upon the workers.

Mr. Gantt, for instance, in his interesting book, shows by graphic charts how the working capacity of men and girls in a variety of establishments was remarkably increased. He insists upon the benefit accruing to the workers under scientific management, not only in efficiency and wages, but in habits of industry, in self-respect and improved personal appearance. He states in general, that this improvement is more marked in girls than in men, and that under the new system the "girls invariably acquire better color and improve in health."

But with a system whose possibilities for harm as well as for good are so striking as the new efficiency, we are justified in asking for more specific data. The burden of proof is upon the new system to show that its marvelous results have been attained by legitimate means, as in the case of the carefully observed pig-iron handlers, without extra strain upon the vitality of the workers.

As applied to women, scientific management is so recent and has, as yet, affected such a comparatively small number, that it is perhaps unreasonable to expect much accumulated evidence. An open-minded and painstaking investigation into the effects of scientific management upon working women was recently made by Miss Edith Wyatt, and yielded results more or less inconclusive as to the effect on health. In three large establishments studied, the new management seems to have "resulted fortunately for the health of the workingwomen in some instances and unfortunately in others." To this impartial observer "the best omen for the conservation of the health of the women workers under Scientific Management in the cotton mill was the entire equity and candor shown by the management in facing situations unfavorable for the women workers' health, and their sincere intention of the best practicable readjustments."*

* Clark and Wyatt, op. cit., pp. 260 and 266.

What we need as regards both men and women (and the only answer which will allay the suspicions aroused by scientific management) is more knowledge as to the ultimate physical adjustment of the workers to the heightened intensity of their tasks.

This was a subject which preoccupied the attention of the man who was in some sort a forerunner of the efficiency engineer—Ernst Abbé. He, too, was a student of working capacity. He, too, sought the *optimum* in which men accomplished most in the shortest space of time. But he was concerned with the effects of heightened intensity upon the development of his workers not only as economic vessels and units of production, but as men and citizens.

Now, it is clearly self-evident that the efficiency engineer desires the permanent welfare of his employes. Permanency of the labor force is a part of efficiency, since the training of employes represents a concrete investment of money, time, and effort. Scientific management would brand as essentially inefficient such management as that in many department stores, where the army of employes shifts almost like an army of tramps. In one large and well known department store in Boston, for instance, during a single year, from among less than 1,000 regular employes, 708 left after employment averaging fourteen weeks.* Only 279 worked an entire year. Such a record, resulting largely from underpay, is a fair gauge of inefficiency. The "system of drive" also, which merely keeps replacing its workers as they are used up or worn out by overwork and unrelieved intensity of effort, is condemned by the engineers as essentially inefficient. They aim to set tasks which the workers may accomplish and "thrive under." In comparison with this, the difference in Abbé's attitude towards his workers was only a matter of emphasis. Yet, as we all know, nothing is in the end more potent or revolutionary than the intangible spirit which animates a new system and sets its tone, and of this emphasis upon the work-

* This did not include the temporary employes engaged for the Christmas season.

ers as independent social units, scientific management has still much to learn.

The practical difficulties of gauging the individual adjustments to work are undoubtedly huge. But it is the business of scientific management to approach such problems of employment in the same spirit which has solved the vexed problems of equipment.

What observation of the workers is comparable to the genius for both details and underlying principles shown in the maintenance of belting, in a railroad shop described by Mr. Harrington Emerson? The care of belting at one of the main shops had cost about $12,000 a year, or $1,000 each month.

"It was so poorly installed and supervised that there was an average of twelve breakdowns each working day, each involving more or less disorganization of the plant in its parts or as a whole. . . ."

Scientific management then entered:

"The worker in actual charge of belts, a promoted day laborer, was given standards, and took his directions from a special staff foreman, only one of whose duties was knowledge as to belts. The foreman had received his knowledge and ideals from the general chief of staff, who had made belts a special study, and this general chief of staff had been inspired and directed by a man who had made a nine years' special study of belts and who was the greatest authority in the world on the subject. The belt foreman had as much of this knowledge at his call as he could absorb, but he in turn was in immediate contact with each individual belt, with the machine it was on and with the worker using the machine. The chief of staff learned as much from the belt foreman as the belt foreman learned from the chief of staff. The belt foreman learned as much from the machinists as they learned from him. The cost of maintaining belts fell from $1,000 a month to $300 a month; the number of breakdowns declined from twelve each working day to an average of two a day, not one of them serious."*

* Emerson, Harrington: Efficiency as a Basis for Operation and Wages, p. 61. Published by *The Engineering Magazine*, New York, 1909.

Here we have the greatest authority in the world sought as consultant for the life of belting. What first class authority, nay, what specialist at all, is called in as consultant for the lives of mortal men and women singularly responsive and singularly influenced by the new and unstudied forces released by the new system of production?

4. SCIENTIFIC MANAGEMENT AND COLLECTIVE BARGAINING

The solution of these problems, connected with the determination of strains upon the workers, will probably be contingent upon the solution of another, which it is the reproach of scientific management to have left so far unsolved. This is its relation to labor organization; its failure to enlist the forces of a devotion as passionate as the instinct for self-preservation itself.

In a recent valuable paper on "Organized Labor's Attitude Toward Industrial Efficiency,"* John R. Commons observes that the conflict between unionism and scientific management is found at the point where management weakens the solidarity of the labor unions. Where, for instance, the principle of individual bargaining replaces collective bargaining, the instinctive and reasonable hostility of labor arises. It is true, as evidence showed before the Interstate Commerce Commission, that in a number of important establishments, union and non-union men have worked peaceably under the new management.† Nor is there any reason why they should not do so. The hostility of labor which resents the stop-watch of the engineer, his impersonal and unfeeling measurement of human powers in mechanical and psychological terms, is bound to yield to tact and persuasion. This is a hostility bred of sentiment, which

* *The American Economic Review*, Vol. I, No. 3. September, 1911.

† Tabor Manufacturing Company of Philadelphia; Canadian Pacific Shops at Angus, Montreal; Manhattan Press of New York; Plimpton Press of Norwood, Massachusetts, and contract work under Frank Gilbreth and others.

it is reasonable to suppose that time and education may gradually dissipate. But the unionist's desperate dread of losing his hard-won collective bargaining power (the essential basis of his solidarity) can be met only by "converting this craving for harmony and mutual support, as well as the impulse of individual ambition, into a productive asset."*

The material results of industrial efficiency are such that the new system is inevitably bound to spread and affect the fortunes of a constantly growing number of wage-earners, men and women. This is the reason why its attitude towards collective bargaining is of such vast consequence now, while the relations between the engineers and the unions are still uncrystallized and in process of formation.

The unions themselves have, on the whole, failed as yet to grasp the significance and inevitableness of the new order of production. They have confused its outward forms and economies, such as the bonuses, with the old system of "drive." They often resent, as indeed it is only human at first to resent, the enforced substitution, however desirable, of new habits for old. They have belied the system and wilfully closed their eyes to its marvelous possibilities; but in such opposition the forces of unionism are beating against a dead wall. Scientific management is bound to triumph with them or despite them. Labor has thus before it a unique opportunity, still largely unrecognized, to strengthen its cause and to gain for itself a fair share in the new benefits of science. Its bitter experience in the past, especially in relation to new inventions such as the introduction of machinery, whose benefits capital and not labor has so largely absorbed, explains in part the opposition of labor to scientific management.

The forces of repression so threaten unionism on all sides, perverting even industrial efficiency itself to their malign uses, that the leaders of the new order, free to realize its wider implications and benefits to laborer as well as to employer, are under special obligations to spend their best ef-

* Commons, op. cit., p. 472.

fort upon this, doubtless their most difficult problem. "Liberty," said a true lover of his race, "does not fail those who are determined to have it":* and the same is true of *justice.*

"The fundamental defect," as Professor Commons puts it, "is the failure to investigate first the bargaining relations and then to organize those relations in such a way that conflicts of opinion and interest will be furnished a channel for expression and compromise; and then, last of all, to work out the standards and records under the direction of and subordinate to this organization of the bargaining relations. I do not pretend to say how this shall be done. It also is a matter for investigation in each case. I only contend that the individual bargain should be eliminated as far as possible and the collective bargain substituted."†

So far as concerns the legislative restriction of working hours which our study has led us to advocate, the new efficiency is no obstacle or check, but rather an incentive.

It represents the progressive employers whom the state benefits together with their employes, in checking the less efficient and unscrupulous competitors. Excessive hours, like overtime and under pay, are marks, often unrecognized, of inefficiency. That scientific management itself has shortened the workday in fair proportion to the increased productivity of its workers, no one can justly maintain. In regard to both hours and conditions the new system has still to share its marvelous gains more equitably with labor. In the present status of our industries, therefore, where the true efficiency is still exceptional, legislation to restrict the working day is still a cardinal need.

* "Libertà non tradisce i volenti."—Garibaldi.

† Commons, op. cit., p. 471.

VIII

THE ENFORCEMENT OF LABOR LAWS

WE have now reached a more technical aspect of our subject which needs close consideration—the administration of our labor laws. For in the end the whole test and crux of labor legislation—indeed its whole excuse for being—is precisely its enforceability and enforcement. We do not seek laws limiting the hours of labor for the sake of having them on the statute books, nor for any academic purposes whatever. We seek them purely for the sake of securing adequate control of the length of the workday. What then are the essential desiderata for enforcement? What assists and what hinders the factory inspectors in their difficult office of administering these statutes, particularly that statute which combats industrial fatigue by limiting the hours of labor? Our inquiry narrows itself down to this specific question. We must consider what kind of laws tend, on the whole, to get themselves best enforced.

It is in this connection that the employment of women at night and in the evening after the day's work plays so important a rôle. Overtime work may, in fact, be called the key to the whole matter of regulating the hours of labor. More than 30 American states have enacted laws prohibiting, in various degrees, the employment of women more than a specified number of hours. But only three states—Massachusetts, Indiana, and Nebraska—have set a legal closing hour after which employment is illegal. Moreover, many states, as we shall see, allow various exceptions for overtime which interfere gravely with the enforceability of their laws. The difficulties of inspection become almost insuperable.

Let us first make clear the distinction between the rigid law which prohibits overtime and night work, and the elastic law which does not.

1. THE RIGID LAW: HISTORICAL DEVELOPMENT IN MASSACHUSETTS

The rigid or non-elastic law is one which provides fixed boundaries for working hours. It protects women from working after a specified hour at night, and more than a given number of hours by the day or week. The best exemplar of this kind of law in the United States is the Massachusetts statute which prohibits the employment of women in textile mills more than ten hours in one day, or more than fifty-four hours in one week, or before six o'clock in the morning or after six o'clock in the evening.

A moment's thought will show the advantages for enforcement of laws thus rigidly framed. The law is final. Its provisions are clear cut. Employers, employes, and inspectors know without disagreement or argument what constitutes a violation. Work continued after the specified closing hour is conclusive evidence of violation. The factory inspector can see at a glance, without further machinery, whether or not employes are being illegally kept at work.

The Massachusetts textile law has not been hastily enacted. It is the fruit of almost forty years of experience. After two commissions of investigation in 1866 and 1867, the first Massachusetts law for adult women was enacted in 1874. From that date to the present day there has been slow but steady progress making the law more and more rigid and definite in its requirements, as experience proved how enforcement was hindered by the laxness of the earlier statutes. It is worth while to trace this course of legislation in Massachusetts, since the whole case for an exact and rigid law with fixed legal opening and closing hours, rests not on any theory but on the direct evidence of experience. No arguments could be more telling than the fact that our oldest industrial

state, like England before it, has had to amend its laws dealing with the hours of labor steadily in the direction of greater rigidity and exactness.

The first statute for adult women enacted in Massachusetts prohibited their employment in manufacture more than ten hours in one day and sixty hours in one week. But this law was inoperative for some years because a fine was prescribed only for its "wilful" violation—a loophole through which obviously any offender could easily escape. The law of 1874 was "practically not in operation until in 1879 when the word 'wilfully' was stricken out by chapter 207 of that year."*

The law of 1874 had also allowed two other exemptions which added greatly to the difficulties of enforcement. This was in permitting overtime after the ten-hour day, in order to make good any time lost for repairs within the same week, or in order to make one day in the week shorter.

"The time devoted to starting and stopping machinery was absurdly prolonged. Again, where a factory ran an eleven-hour day, each woman and child was required to leave for half an hour in each half day, but her neighbor tended two sets of machinery during her absence—'doubling up' this was technically called."†

In order to meet these evident defects in the operation of the law, various amendments were accordingly passed. In 1880‡ the posting of a notice was required, stating the daily hours of work; in 1886§ it was required that the notices should contain an additional statement of time allowed to stop and start machinery, and the time given for meals. Even this amendment proved too lax. In the very next year, 1887, the law was again amended|| to require the post-

* Report of the Convention of the International Association of Factory Inspectors, 1894, p. 65.

† Massachusetts Labor Legislation. S. S. Whittlesey. Supplement to the *Annals of the American Academy of Political and Social Science.* January, 1901, p. 13.

‡ Laws of 1880, chap. 194.

§ Laws of 1886, chap. 90.

|| Laws of 1887, chap. 280.

ing of the exact hours when work began and stopped and also hours when meal-time began and ended.

The practice of lengthening the day's work by "doubling up" was also attacked in 1887.* In factories where five or more women began work at the same time, it was required that meal-time should be given them at the same hours, without imposing additional work upon women who began work and had their meals later.

Another important amendment enacted in 1887 aimed to correct another evasion of the law which the inspectors had found very general.

> "The most trivial accident to the machinery which, in itself, might not have entailed an appreciable loss of time, had again and again been made the pretext for much lengthened overtime employment."†

This abuse was attacked by allowing overtime for repairs only when stoppage lasted over thirty minutes, and after a full written report had been sent to the chief inspecting official. A special fine was prescribed for false reporting.

Such were some of the successive amendments enacted to assist the enforcement of the law by making its technical requirements more rigid. More important still were successive enactments cutting down the period of hours within which the legal workday was allowed to fall.

In 1890‡ for the first time legal opening and closing hours were set for the day's work. This was a step of far-reaching importance. The absence of a fixed closing hour had previously been the most serious obstacle to the enforcement of the law. It allowed women to be employed by night as well as by day. Moreover, it made almost unenforceable the ten hours' limitation of work. So long as women might be employed until any hour of the night at will, it was practically impossible for the inspectors to detect violations. Unless they remained actually on the premises they could not

* Laws of 1887, chap. 215.

† Whittlesey, op. cit., p. 14.

‡ Laws of 1890, chap. 183.

know when work stopped. The law of 1890, therefore, provided that the ten-hour workday must fall between 6 a. m. and 10 p. m. The employment of women in manufacture was prohibited before and after those hours.

Even this limit of hours, however, proved inadequate for enforcement. So long as it was permissible to employ women ten hours at any time between six o'clock in the morning and ten o'clock at night (a period of sixteen hours), it was still exceedingly difficult to enforce the law effectually.

Moreover, a practice grew up known as "swapping." One manufacturer would employ women ten hours between six o'clock in the morning and six o'clock in the evening, and another manufacturer would employ them additional hours up to ten o'clock at night. This, of course, entirely destroyed the effect of the law. Hence, after many defeats and more than a dozen years' agitation by the trade unions and other interested persons, the so-called "overtime bill" was passed in 1907.* This provides that in Massachusetts' greatest manufacture, the textile industry, women may not be employed before six o'clock in the morning nor after six o'clock —instead of after ten o'clock—in the evening. This rigid provision, which copies the still more definite British textile act, has finally been successfully enforced.

Accompanying these successive efforts to cut down the period within which the legal workday must fall, there have been successive reductions of the legal day's and week's work. In 1883† the ten-hour day was extended to women employed in mechanical and mercantile establishments. In 1892‡ women's hours of labor in manufacturing and mechanical establishments were reduced to fifty-eight in one week. Eight years later, in 1900,§ the same reduction was made for women in mercantile establishments, excepting that retail stores were exempted from this provision during December. In 1904 the exemption was repealed|| and work was limited to

* Laws of 1907, chap. 267.
† Laws of 1883, chap. 157.
‡ Laws of 1892, chap. 357.
§ Laws of 1900, chap. 378.
|| Laws of 1904, chap. 397.

fifty-eight hours a week during the whole year. In 1908* the week's work in manufacturing and mechanical establishments was reduced to fifty-six hours.† Finally, in 1911, the weekly allowance of hours was reduced to fifty-four.‡

2. THE RIGID LAW: HISTORICAL DEVELOPMENT IN GREAT BRITAIN

In this consistent sequence, extending through a long series of years, Massachusetts has followed the earlier experience of England. We find there, extending over an even longer period, a similar movement towards shorter and more rigidly defined hours, in the interest of enforcement.

In England the necessity of having fixed opening and closing hours was recognized in the very first effective statute limiting hours of labor. This was the British act of 1833 which forbade the employment of young persons under eighteen years in textile mills between 8.30 p. m. and 5.30 a. m., or more than twelve hours in any one day. There were other regulations for young children which need not be considered here.

The British law of 1844 was the first statute in any country to limit the working hours of adult women. It extended to them the provisions of the act of 1833, thus providing for all women employed in textile mills a maximum number of working hours and a period of rest at night between specified hours. From the beginnings of legislation it was realized that the effective enforcement of any limitation of hours by day was dependent upon the establishment of a fixed closing time at night.

The act of 1847 reduced women's hours of labor in textile mills to ten hours in one day. But the advocates of restriction, led by Lord Shaftesbury, were defeated in their

* Laws of 1908, chap. 645.

† Except that in any establishment "where the employment is by seasons," the week's work may be fifty-eight hours, if the total number of hours in the year does not exceed an average of fifty-six hours a week.

‡ Laws of 1911, chap. 484.

attempt to have work at night prohibited between 6 p. m. and 6 a. m. instead of the original terminal hours. The experience of the factory inspectors showed very early, what was shown later in Massachusetts, that it was almost impossible to enforce the law effectively, so long as it was permissible to employ women at any time within a period of fifteen hours, that is, between 5.30 a. m. and 8 p. m.* It was realized that the textile law would be practically non-enforceable until a so-called "normal day" should be established. This meant that the legal workday should be required to fall between specified hours and within a fixed period of time, just equal in duration to the legal workday *plus* meal times.

Accordingly, in 1850, further legislation remedied this defect in the textile law. It provided that women might be employed ten and one-half hours in the day, and it provided also that the workday must fall in the twelve-hour periods between 6 a. m. and 6 p. m. or 7 a. m. and 7 p. m., with one and one-half hours off for meals. Under this arrangement the "normal day" between the fixed opening and closing hours exactly coincided with the ten and one-half hours of labor allowed, plus meal hours. It also made possible a twelve-hour period of rest at night.

Subsequent acts have still further reduced the length of the workday and have made the British textile law as nearly definite and exact as is humanly possible. Work must fall between 6 a. m. and 6 p. m. or 7 a. m. and 7 p. m., with two hours off for meals on week days; and on Saturdays it must fall between six o'clock in the morning and twelve o'clock at noon, or seven o'clock in the morning and one o'clock in the afternoon, with one half hour off for meals. It may not begin or end on the half hour.

* See a similar complaint by the New York Mercantile Inspector in the year 1910. "The part of Section 161 relative to the hours of labor of females from sixteen to twenty-one years of age, is one of the most difficult provisions of the law to enforce. . . . The provision calling for ten hours' work between the hours of 7 a. m. and 10 p. m., allows a period of fifteen hours per day in which to perform ten hours' work." Report of the New York State Department of Labor, 1910, p. 132.

Of the effects of these rigid provisions on both industry and labor, one of the foremost English economists writes with enthusiasm.

"How potently," says Mr. Sidney Webb, "the additional freedom which the law thus secures, to master as well as to man, has reacted on the efficiency of the industry is, at the opening of the twentieth century, one of our proudest boasts. In spite of the keenest foreign competition, the Lancashire cotton mill, in point of technical efficiency, still leads the world, and the Lancashire cotton spinner, once in the lowest depths of social degradation, now occupies, as regards the general standard of life of a whole trade, perhaps the foremost position among English wage-earners."*

Following the first textile legislation, the acts were slowly extended to take in other industries, such as print works (1845); bleaching and dyeing (1860); lace works (1861); bake houses (1863); earthen ware, lucifer matches, percussion caps and cartridge packing, paper-staining and fustian cutting (1864). Between 1867 and 1907 the acts were still further extended by taking in many other subsidiary branches of industry and the so-called "workshops," where work is done by hand.

3. THE ELASTIC LAW: HISTORICAL DEVELOPMENT IN GREAT BRITAIN

In all the various so-called "non-textile" acts which followed the original textile legislation, the same general principle was followed, providing for a maximum number of working hours by day, between fixed hours before and after which it was illegal to employ any women, and a period of rest at night. But the general laxness of the non-textile acts and the many exceptions allowed have proved as damaging to enforcement as the rigidity of the textile acts proved helpful.

The non-textile acts have nominally prohibited night-

* Hutchins, B. L., and Harrison, A.: A History of Factory Legislation. Preface by Sidney Webb, p. x. 2nd Edition revised. London, King, 1911.

work and have provided for a fixed workday; but in a large number of trades these restrictions have been deliberately brought to naught by allowing special exceptions up to a late hour of the evening.

Thus, for instance, the general act for non-textile factories provides that women may not be employed therein more than ten and one-half hours in one day, and that employment must fall in the twelve-hour periods between 6, 7, or 8 a. m. and 6, 7, or 8 p. m., with one and one-half hours allowed off for meals. But in certain trades overtime is allowed for a variety of reasons, such as press of work at certain seasons, or when the material to be manufactured may be spoiled by weather. In such trades women may be employed twelve hours in one day and as late as 10 p. m.; that is, employment is supposed to fall within the fourteen-hour periods between 6, 7, or 8 a. m. and 8, 9, or 10 p. m., with two hours allowed off for meals.

The experience gained in the enforcement of the textile law was ignored. The laxness, or margin of supplementary hours allowed for evening overtime in the non-textile laws, has long been not only a hardship to the workers but a constant obstacle to the enforcement of these more lax statutes. The legal permission to employ women until ten o'clock in the evening has led to uncontrollable illegal employment after that hour. The difficulties of enforcement have been practically insuperable. In this, inspectors and all fair-minded observers agree.*

Gradually, however, this state of affairs has been found intolerable. It has been realized that evening overtime must be curtailed and the closing hour must be set earlier, if the non-textile acts are to be made of practical benefit. Beginning with the Consolidating Act of 1878, therefore, we find the beginnings of a change in this direction. From among many, we may cite a few examples of the gradual stiffening of the non-textile acts and the restriction of overtime work.

* See Part II of this volume, pp. 464–472.

The act of 1878 allowed women to be employed overtime in non-textile factories, as described above, 48 days during the year and on five days in any week. In the act of 1895 such overtime work was reduced to 30 times during the year and permitted on only three days of the week.

Similar overtime employment has been allowed also for articles of "perishable nature." This exception includes such places of employment as fruit-preserving establishments. In the act of 1878 such employment was allowed therein 96 times during the year and on five days in the week. In 1895 such overtime was cut down to 60 times during the year, and in 1901 it was further reduced, being allowed only 50 times during the year, and on not more than three days of the week.

By a retrograde movement a special amendment had been inserted into the act of 1891, exempting from all operation of the acts, "the process of cleaning and preparing fruit so far as necessary to prevent the spoiling of the fruit on its arrival at a factory or workshop, during the months of June, July, August, and September." This wholesale exemption allowed women to be employed unlimited hours, by day or night, on certain processes in the fruit preserving establishments. Though the exemption was meant to apply only to "cleaning and preparing fruit on arrival," its effect was to nullify totally the laws governing hours of labor in those establishments. The legal permission to work unlimited hours on certain processes led inevitably to the illegal employment of women in all processes.

Of a similar consequence from the exemptions granted to the fish-curing trade, the British Chief Inspector of Factories wrote in discouragement in 1901:*

"Starting with an exemption for one process, that of 'gutting, salting, and packing,' the industry would seem to have shaken itself gradually free from control, until now we find fish that have been in salt for several weeks dealt with as

* British Sessional Papers. Vol. X, 1901. Report of the Chief Inspector of Factories and Workshops, pp. 338–339.

perishable articles. Given plenty of time and unsuitable surroundings, every article of food is to some extent perishable, and when a herring has been kept in salt for some weeks there is no reason for working on it at night except the reason that the day will bring other work, and in this seems to lie the cause of much of the late and irregular hours of the fish-curing trade. . . ."

Under the British law, however, the Home Secretary is empowered to issue "special orders," extending or restricting the overtime exemptions. After twelve years of agitation by the factory inspectors and others against the abuses of overtime work and the impossibility of enforcing these useless statutes in fruit-preserving establishments, a special order was issued by the Home Secretary in 1907. This was in line with all previous experience, which had proved that laws governing the hours of labor cannot be enforced without a fixed opening and closing hour. The order prohibited employment of women in fruit-preserving establishments between 10 p. m. and 6 a. m. This still leaves a very long workday in these establishments, but an effective step has been taken toward ultimate protection of the workers by the prohibition of night work.

Another interesting example of the gradual tendency to restrict evening overtime work and limit the workday more strictly by an early closing hour is shown in the history of British legislation regarding the laundries. Before 1895 the laundries had not been subject to the Factory Acts. In the act of that year they were included for the first time, but instead of being governed by the same hours of labor as other establishments, a different and unenforceable set of hours was prescribed for the laundries. No closing hour was set, so that the fourteen-hour workday permissible under the law might be and was worked either by day or by night. It was not until a special act was passed in 1907 that women employed in laundries obtained protection at all comparable to that of women in other occupations.

This law still permits a very long working day and work-

ing week (sixty-eight hours), and exemptions of many kinds still defeat its effective enforcement. But a beginning has been made by providing that the workday must end at 9 p.m.

In their report for 1909, the women factory inspectors noted that the number of complaints of excessive hours in laundries was steadily declining, showing how the fixed and earlier closing hour was facilitating the enforcement of the law. "It may be hoped," says the latest edition of the standard history of British factory legislation, "that the act of 1907 will be a step towards the normal day which the experience of generations in regard to other industries has shown to be in the best interests, not only of the workers, but of the trades concerned."*

A fourth employment (besides non-textile factories, fruit-preserving establishments, and laundries) in which a special laxity of hours has been legal until recently, are the flax scutch mills. In the Consolidating Factory Act of 1878 and earlier, these mills were totally exempted from all restrictions of hours by night as well as by day, provided that no children or young persons were employed therein, and provided that employment did not continue longer than six months in the year. In 1907 this special exemption was repealed and the flax scutch mills included in the scope of the textile acts, in order to bring the British laws into conformity with the terms of the Berne Convention of 1906 on night work, to which Great Britain had been a party.†

Thus the history of the factory acts in Great Britain shows as conclusively as in Massachusetts, how the laws limiting the workday have had to be consistently made more exact and more rigid, in the interest of enforcement. The process is still far from complete. Twenty years ago, Mr. Sidney Webb pointed out the anomaly in differentiating textile from non-textile laws. When the textile factories were first singled out for regulation, the cotton trade was

* Hutchins and Harrison, op. cit., p. 256.

† Bulletin of the International Labour Office. English Edition. Vol. II, No. 1, 1907. Page 38.

practically the only great industry employing women and children, and work therein was far more exacting than in any other industrial employment. But with the increase in the number of workers and intensity of work in non-textile employments, the distinction has become purely arbitrary. Its abandonment and the inclusion of non-textile occupations in the stricter statutes are only matters of time. Overtime employment of all young persons under eighteen years has been prohibited since 1895. British legislation moves "slow, how slowly," but the best opinion in England holds that "the overtime exception is doomed."

4. ELASTIC LAWS IN THE UNITED STATES

England is thus slowly emerging from a past phase of industrial experience and legislation. Overtime favors to special interests are going out. But meanwhile, in the United States they are, to some extent, coming in.

This refers particularly to one industry whose quite unrecognized physical hardships have been dwelt upon in a previous chapter. Six states (four of them within the year 1911) have enacted laws which limit women's hours of labor, but in which the canneries are totally exempted. These states are California, Maine, Michigan, Ohio, Utah, and Washington.* Unlike the British and Continental legislation, which at least attempts to fix the amount and extent of overtime allowed for perishable articles, the American laws exempt the trade *entirely* from any restriction of hours.

So, too, in Connecticut, Louisiana, and New York, mercantile establishments are by statute exempted from all restrictions upon the working hours of women during the Christmas "rush."† In these cases, women are totally de-

*Similar action has been taken in 1912 by Maryland, New Jersey, and New York.

† In Connecticut between December 17th and 25th (provided employer gives seven holidays with pay); in Louisiana during twenty days before Christmas; in New York between December 18th and 24th, applying to girls between sixteen and twenty-one years. Similar exceptions previously existing in Massachusetts and Oregon were repealed, respectively, in 1904 and 1909. A similar exemption was enacted in New Jersey in 1912.

prived of protection when it is most urgently needed. But we need not here dwell at length upon such total exemptions, since they do not affect the enforcement of laws, which we are now considering. In these cases there is no law; hence there can be no enforcement. But these exemptions are the more deplorable because they mark a departure from previous usage in America.

In the United States the slower and more cumbrous British method of legislating for one industry at a time has been replaced by a more reasonable and inclusive system. We have seen that Massachusetts requires an earlier closing hour in textile mills than in any other occupation; but in no case has an American law restricting women's hours of labor *been limited to any one special industry.* Laws governing the hours of labor in manufacture have included *all* manufacture. Broadly speaking, the American usage has been to include all industries in the laws. With the recent exception of canneries and Christmas trade, the injurious custom of granting overtime to special industries has not obtained.

But other exceptions and laxities in American laws have been as disastrous for enforcement as the overtime provisions for special trades abroad. The most flagrant of these is the almost universal absence of a fixed legal closing hour, to which we have previously referred.

It is a startling fact that only three American states (and only one of them a great manufacturing state) have prohibited women's employment at night—a form of work which, as we shall see in a subsequent chapter, all the civilized nations of Europe have striven to abolish by international treaty. Indeed, the laws of California, Illinois, Oregon, Washington, and Wisconsin specifically state that work may be so arranged as to permit the employment of women for eight or ten hours *at any time* during the day or night. Consequently, some years ago an enterprising mill owner in the state of Washington attempted to employ the same women almost twenty consecutive hours in a mill (from noon on one day to near noon on the next day, with an intermission at midnight). He

maintained that the two periods of ten hours were divided into two days' labor by the convenient line of midnight. Fortunately the commissioner of labor interpreted the law otherwise and put a stop to this particular form of exploitation.

But in all those states which limit women's employment without fixing a closing hour, night work is entirely legal and often customary. Moreover, the fixed closing hour has been found indispensable not only to check the employment of women at night, but to make possible the limitation of work by day. The two things are practically inseparable.* Hence all those states which fail to provide a legal closing hour must have maximum difficulties in enforcing their laws.

Besides the absence of a legal closing hour, other laxities in the American laws help to defeat their enforcement. Thus eight states† are satisfied to prohibit more than a fixed amount of work during the *week*, leaving the separate *days'* work on various pretexts wholly unrestricted. If work ends (or is supposed to end) early on Saturday or on any one day, the other days may be as long as the employer pleases, provided that the total week's work does not exceed the specified number of hours.

Such a statute is obviously intended to afford to working people a half holiday on some one day of the week and to compensate employers for such a half holiday by allowing employes to work longer on other days. But in practice the intent of the statute is easily evaded. In some New York mercantile establishments, for instance, the day's work is lengthened by overtime, and instead of giving a compensating half holiday the employer complies technically with

* Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par Prof. Étienne Bauer, p. viii. Jena, Fischer, 1903.

† Arizona (applying to laundries only), Connecticut, Georgia, Maine, Minnesota, New Hampshire, Rhode Island (all applying to manufacture); New York (applying to mercantile establishments for girls between sixteen and twenty-one years). In Louisiana and Pennsylvania the hours are unrestricted on Saturdays in mercantile establishments.

the statute by allowing employes to come to work a single hour later in the morning of one day!

Moreover, how enforce such a statute? Any one can see how disastrous for enforcement it must be. The particular value of the rigid textile laws of Massachusetts and England is that they are automatic and tend to be more or less self-enforcing. Precisely the opposite is true of the shifting schedule of hours. When an inspector finds women employed in the evening, he has no means of knowing whether the long day will be compensated by a shorter day later in the week, so that the total week's work may not exceed the number of hours allowed by law.

"The claim is always made," says the New York Mercantile Inspector, "when employes are found working over ten hours per day, that it is for the purpose of making a shorter day of some one day of the week. This compels the inspector to prove the total number of hours per week, and makes it much more difficult. . . . To prove the actual hours worked per day or week is almost impossible unless we secure the aid of the employe. The fear of losing their employment has deterred many employes from rendering assistance."*

It is out of the question for the inspector to return each day to see that a shorter compensating day is allowed. Without an army of inspectors and a degree of supervision such as exists nowhere in the world, it is impossible to enforce a law made up of exceptions.

This is the reason why such a statute as the New York factory law is so thoroughly unsatisfactory. This law was amended in 1907, so as to copy precisely the most lax and unworkable portions of the British non-textile factory acts. The New York factory law sets no closing hour for women.† Moreover, it allows overtime after the ten-hour day, but limits work to twelve hours. The law permits an employer to

* Report of the New York State Department of Labor, 1910, p. 132.

† The provision which prohibited employment of adult women in factories between 9 p. m. and 6 a. m. was held unconstitutional by the New York Court of Appeals in 1907. People v. Williams. 189 N. Y. 131.

work his women employes twelve hours a day on five days a week regularly during the whole year; it permits him to work them twelve hours a day on three days of the week if he does so "irregularly," that is, not as a regular rule.

Even further concessions to irregularity are made. When it is difficult to fix the weekly hours of labor in advance "owing to the nature of the work," the law permits employers to dispense with posting a printed schedule showing the required working hours for each day of the week. This posting is a mechanical device which, as we saw in discussing Massachusetts, has been found indispensable for enforcement, because the presence of persons on the premises at any other hour than those stated in the printed schedule is *prima facie* evidence of violation. Precisely when this provision is most necessary, when overtime is most sought and the difficulties of inspection are greatest, the New York law allows the posted schedule of the week's work to be omitted by permit of the commissioner of labor.

When we realize that the total number of factory inspectors in New York state is 80; that they are charged with the inspection of all the factories in the state (over 30,000 in 1910), all the stores, all the tenements licensed for home work or applying for license; that they must enforce the labor laws regarding the fencing of dangerous machinery, the ventilation and sanitary condition of workrooms, as well as those which provide for the inspection of tunnels, for the payment of wages, for the enforcement of the eight-hour law on public works, all the child labor laws, and others besides—it is apparent that a law to limit hours of labor, so full of exemptions, so little calculated to be *enforceable*, sets the inspectors a genuinely impossible task, and must remain, more or less, a dead letter.

It is true that in New York state the difficulties of administration are greater than in other states, on account of the larger field to be covered and the far greater number and variety of establishments and employes. But the conditions are not essentially different in other states.

5. TWO TESTS OF EFFICIENCY

What then is the general state of administration in the United States? Can we fix upon any general tests of efficiency? In so large and complex a field we are again forced to limit ourselves to a few definite points of discussion. From among many possible items we may choose two, as fairly good indices of intelligence and ability in administering the laws. The first of these is the character of the yearly printed report of the state labor bureau or department; the second, its means of gauging the effect of industrial occupations on the health of the workers.

(a) The Annual Report

To many persons our first item may not seem a fair test of efficiency. The yearly printed report seems a mere formality, a conventional requirement, which has resulted in libraries full of dead statistics and verbiage. But if the statistics are not dead nor the comments mere verbiage!

In Great Britain and other foreign countries the yearly report has been found an essential and effective, though indirect, aid to administration. In the first place, the report is a yearly public accounting, a yearly focus or review, which discloses the internal working of the inspection department. In a word: *it turns on the light.* It reveals the department's efficiency or inefficiency. It acts as a valuable check upon the field work, since it is based upon the inspector's daily activities. A good report presupposes and indeed necessitates an adequate system of supervision, daily reporting, and standardized record keeping by the field inspectors, and where such a system is lacking the annual report reveals it unmistakably.

Secondly, the yearly report has been found an invaluable aid to enforcement by helping to form intelligent public opinion. We are dealing here with a public office—the activity of public officials, peculiarly dependent upon the approval of the community for effective work. In communities

where people in general are interested and alert as to the welfare of working people, the laws tend to get enforced with a minimum of friction and a maximum of efficiency. It follows that publicity is one of the important weapons of efficient administration. We are not proposing that law and enforcement should wait upon the vagaries of public opinion. Public opinion is often unintelligent and reactionary, and the labor laws should be just far enough in advance of it to force up the standards of the backward and unenlightened employers. But all that makes for a wider general knowledge of the facts at issue—industrial conditions, working hours, work accidents, and the like—helps to form that enlightened public opinion without which labor laws, in a democracy, cannot in the long run be enforced.

Thirdly, the yearly factory reports have been found not only efficient aids to the administration of existing laws, but perhaps the most valuable means of securing better laws. As we have seen, successive factory laws have not been based upon theories or generalities but for the most part have followed some insistent demand for the correction of specific abuses. Abroad, the factory inspectors have been in a position to furnish such facts to legislative bodies. They have made available a fund of information gained from official investigations and experiences.

We have seen that since 1833, when the first English inspectors were appointed and were charged to report on the condition of the workers and the operation of the laws, a more or less continuous record of industrial history has come down to us. What record of industrial conditions and of the operation of our factory laws do our American factory reports yield, or will they leave to posterity?

Let any student who wishes to form an opinion on this subject read a year's files of American factory reports. It will not be possible to read a current year's file, for many of the states do not publish current reports, although their value for remedial action depends upon the freshness and genuineness of the information they furnish. By the time

our state factory reports have been printed, the information contained therein is often several years old. For instance, in 1909, the latest available Illinois report was for 1905. The report of the Massachusetts state inspectors of health for the year ending November 1, 1908, was published at the close of 1910. Eight states publish biennial reports and their news is inevitably one year late.

It is true that these delays in printing are not, in the first instance, due to the inspection force. The chief inspector or head of the labor department shifts the blame for the delay on to the state printer. Yet this delay is essentially an index of the efficiency of the labor department, and it has been shown that if sufficient pressure is brought to bear, these reports can be issued in time. This was illustrated in New York state in 1905, when an efficient commissioner of labor determined that his report should be published at the close of the year which it purported to describe. His report and recommendations to the legislature were accordingly issued on time, while the tables and statistical portions of the department's work were necessarily delayed until later. This procedure has ever since been followed in New York state, whose reports in substance, as well as time of issuance, differ commendably from most other publications of the state labor departments.

The belated publication of the American factory reports obviously destroys the three-fold function which, as we have pointed out, they should fulfill: revealing the internal organization of the inspection department, forming public opinion, and furnishing material for constructive legislation.

Moreover, the contents of these reports are, for the most part, little calculated to accomplish these purposes. No report is efficient which does not tell *at least* the following elementary facts concerning the workers:

(1) The number and occupations of men, women, boys, and girls found at work.

(2) The ages of the minors, the issuance of "working papers," and other data relating specifically to the employment of children.

(3) The times, places, and nature of violations of the law.

(4) The methods of dealing with such violations by warnings, prosecutions, or the like.

(5) The number and disposition of prosecutions actually brought to court, including the amount of money collected in fines and penalties.

(6) The nature of occupations deemed dangerous to health, the number of workers found therein, and (as far as possible) the effects of the work.

All these things must be known in order to gauge the effectiveness of the laws, and the points in which they are adequate or inadequate. Yet few state reports contain such accurate, specific, and current information. The opinions of the inspectors, for instance, on the value and workability of their respective state laws are almost totally lacking.

Only a few years ago a striking exhibition was given, not alone of the extraordinary ignorance of the chief labor official of a great state, but also of his open animus against the labor laws which he was appointed to enforce. The report of the Pennsylvania chief factory inspector for the year 1907 appeared in 1908, the year in which the United States Supreme Court rendered its famous decision in the Oregon ten-hour case, upholding the right of a state to protect its working women by limiting their hours of labor.* Shortly before that decisive judgment was to be handed down, the chief factory inspector of Pennsylvania officially declared his hostility to a similar Pennsylvania law, on the ground that it was, in his opinion, unconstitutional. "I have yet to find a single instance," he takes pains specifically to write,† "where any court of last resort has upheld" such a statute—ignorant of four earlier decisions upholding the constitutionality of

* For a full discussion of this decision see Chapter IX, page 250.

† Report of the Pennsylvania Chief Factory Inspector, 1907, pp. 10 and 11.

similar laws by the Supreme Courts of four other states, Massachusetts, Nebraska, Washington, and Oregon! The impropriety of such an official attack upon the Pennsylvania law was the more glaring because an earlier Pennsylvania act limiting women's hours of labor had been previously upheld in a strong and illuminating decision by the Superior Court of Pennsylvania.*

Owing to conditions of which the foregoing is an extreme example it has come about at any time of need that, instead of the responsible officials, private investigation, without proper powers, opportunities, or privileges of observation, has had to furnish facts and figures about labor conditions.

Thus, since the first permanent child labor committee was formed in New York City in 1903, the entire American campaign against child labor has been hampered by having to depend almost wholly upon private investigation of the facts, to secure laws protecting children from premature work. In state after state private investigators have had to learn the extent of child labor, the conditions under which children have been employed, the effects of premature work upon health and morals and industry—all those facts which the official inspectors should have been publishing as the bases of legislation. Not until the first volume of the federal investigation of working women and children was published in 1910, was there any comprehensive study of the children employed in the cotton mills. Moreover, the facts and statistics gathered by private investigation are often considered open to the charge of personal bias. Government investigation is impersonal; its reports carry greater weight because they are held to present wholly uncolored facts.

* Commonwealth v. Beatty. 15 Pa. Sup. Ct. 5, 15.

(b) The Observation of Health in Industrial Establishments

A second almost universal failure in administering labor laws concerns the observation of the health of working people, as affected by their occupations. The whole justification, legal and moral, of laws such as those limiting the hours of labor, prohibiting the employment of women and minors in certain occupations, providing sanitary regulations, seats for girls and women, and the like, is their necessity for the health and welfare of the workers. Yet so elementary has been our conception of administering these health statutes, that we have practically not yet begun to test the value of medical inspection of work places. It is true that the labor laws have not required the appointment of physicians as inspectors, except in a few instances which we will next discuss. But the lack of the most rudimentary observation of the health of the workers is a legitimate reproach to every labor department which makes any pretense of inspection.

A beginning has been made in New York state to cope with the difficult problems affecting health in industrial occupations by the appointment of one physician to act as inspector. During his first years in office the medical inspector has had to specialize chiefly on the single subject of ventilation and the obscurer pollutions of the atmosphere in factories and stores.

In Massachusetts, too, an attempt has been made to provide medical observation of the workers. In 1907 the office of state inspector of health was created under the Massachusetts state board of health, and 15 such inspectors were appointed. Besides other duties they are required to enforce various sanitary and hygienic regulations in factories, to inform themselves as to the health of minors in factories and the prevalence of tuberculosis and other diseases amongst factory workers.

Thanks to a careful and detailed system of record keeping, the reports of the Massachusetts inspectors of health, together with a previous investigation by the state board of

health, have given the first official American returns on many unhealthful processes of manufacture.*

One of the most important duties of the Massachusetts inspectors of health has been to assist the state board of health in enforcing the new and epoch-making law of 1910 concerning the employment of minors. This provides for the exclusion of minors under the age of eighteen years from any occupation or process of manufacture deemed by the board sufficiently injurious to health. Accordingly, many processes have been studied with a view to determining their effects upon young persons. For example, the manufacture of rubber goods was specially scrutinized, and some stages of the work were found unfit for minors. In rubberized clothing factories, the medical inspectors found young boys employed at work which required them to spend from one-third to one-half of their entire working time in doubled-up positions crawling underneath the "spreader" machines, breathing over-heated air vitiated by naphtha fumes. Their heads were protected from the heat of the machines by planks covered with asbestos.

Following these and similar reports from the inspectors of health, regarding the injurious nature of many different kinds of manufacture, the state board of health issued an order on July 10, 1911, declaring 24 different processes of manufacture to be injurious to the health of minors, within the meaning of the law. These processes involved exposure to poisonous or irritating dust, gases, and fumes, and the employment of minors under eighteen years of age was accordingly forbidden therein. This included such work as

* Memorial on Occupational Diseases prepared by a Committee of Experts and presented to the President of the United States, September 29, 1910. *American Labor Legislation Review*, Jan., 1911, p. 137.

Report of the Massachusetts State Board of Health upon the Sanitary Conditions of Factories, Workshops, and other establishments where persons are employed. 1907.

Report on the Work of the State Inspectors of Health, Nov. 1, 1907, to Nov. 1, 1908. From the 40th Annual Report of the Massachusetts State Board of Health.

Ibid. Nov. 1, 1908, to Nov. 1, 1909. From the 41st Annual Report of the Massachusetts State Board of Health.

that of the "spreader boys" in the rubberized clothing factories.

Another valuable service performed by the medical inspectors was inaugurated in Worcester. Beginning with one public spirited employer, the medical inspector has secured the co-operation of numerous others in combatting the growth of tuberculosis among their employes, by paying their expenses at the state sanatorium for a shorter or longer period.*

These initial services suggest how great a part the medical inspector may fill in helping to prevent deterioration of health among factory workers. But in many most important respects the Massachusetts system has been no test whatever of medical inspection. The inspectors of health are paid to give only part time to this work; many at the same time continue private practice as physicians. They have so much more work assigned to them than they can perform that in January, 1911, some medical inspectors appointed in 1907 had not yet completed a tour of their districts.†

The so-called examination of children employed in factories is especially inadequate. For instance, from among 43,270 working children reported as "inspected" during the year 1907–1908, only 521 were found ill or physically unfit for the work they were performing. This surprising percentage (scarcely more than one-tenth of 1 per cent) is explained by the method of "inspecting" minors. One inspector, for instance, reported:

"A total of 4,881 minors were examined. Of this number, 706 were inspected without conversing with them, while passing through the factory."‡

* Up to April, 1911, 34 industrial establishments signified in writing their willingness to take part in this campaign. Twenty-seven employes in all have been aided. See Bulletin of the United States Bureau of Labor, No. 96, Sept., 1911, p. 488. Hanson, Wm. C., M.D.: Attitude of Massachusetts Manufacturers Toward the Health of Their Employes.

† Report of the Commission to Investigate Inspection of Factories, Workshops, Mercantile Establishments and other buildings. Boston, January, 1911, p. 60.

‡ Report of the Work of the State Inspectors of Health, Boston, 1907, p. 86.

Efforts have recently been made to obtain places within the factory for more adequate examinations.

Moreover, the inspectors of health have nothing whatever to do with the enforcement of that statute which our study has shown to be perhaps most important: the law which protects the workers against industrial fatigue by limiting their working hours. When the office of inspector of health was created in 1907 to enforce sanitary regulations, the enforcement of all other factory laws, including the limitation of the hours of labor, was left as before to the factory inspection department of the Massachusetts district police. No co-operation has existed between the two departments. The commission appointed in 1910 to investigate the inspection of factories, etc., found that:

"The two groups of inspectors go their separate ways without assisting each other at all in the enforcement of the laws."

"The factory inspectors and the health inspectors in the same district as a rule never meet each other. Many inspectors testified to this fact before the Commission. Some of these inspectors assigned to the same district actually met for the first time at the Commission's hearing."*

Thus the appointment of physicians as additional inspectors of factories in Massachusetts has hitherto been a tentative experiment—valuable chiefly in demonstrating the wide possibilities of medical inspection.

6. SOME TECHNICAL REQUIREMENTS IN FACTORY INSPECTION

But the character of administration and inspection is receiving a new attention in many quarters. It has long been a matter of common knowledge that, in general, the caliber of the men and women who administer the labor laws in the

* Report of the Commission to Investigate Inspection of Factories, etc. Op. cit., pp. 57 and 67.

United States has been utterly inadequate for their duties. Until 1911 only three states—Massachusetts, New York, and Wisconsin—required inspectors to pass civil service examinations before appointment, and by an extraordinary exemption Massachusetts obliged preference to be given to Civil War veterans, without examination, as inspectors of the district police. This exemption is no longer observed, but in December, 1910, the veterans still numbered 12 out of 28 factory and building inspectors.*

In place of the most elementary technical fitness, chiefs of departments as well as subordinates have, for the most part, been appointed for political or personal reasons. Hence, the first needs are to make all appointments to the inspection service subject to civil service examinations of the proper character, and to assure tenure of office during good conduct, instead of allowing inspectors to be displaced at any moment by political favoritism. Other urgent needs, to improve the service, are to pay more adequate salaries than the present ones; to grade inspectors according to their ability and to promote them for good service—a system which has been begun with good effects in New York state. Such and similar changes would tend towards securing a more valuable class of inspectors.

There is ground for encouragement in the yearly increasing number of men and women of higher caliber who are becoming available for an improved service. The social aspects of labor and labor legislation newly studied in colleges and universities throughout the country, have turned the attention of many young men and women to the possibilities in this field. Special schools in New York, Boston, Chicago, Philadelphia, and St. Louis are training students each year for social work, who should be available for administrative positions in the service of the state as they are for private societies. But we need even more than this. We need inspectors equipped with technical training.

* In 1911, New Jersey enacted a law requiring civil service examinations for inspectors.

At the opposite pole from our disorganized and untrained system we find such an extremely elaborate service as that in Prussia, where there has been a regular program of training since 1897. Members of the staff, which numbers over 270, are appointed for life. They must have three years of technical study in such subjects as mechanics, mining, or chemistry, and a year and a half of probationary practice in the service. This period is followed by one and one-half years of university study in law and political science, and a written and oral examination in Berlin by an examining board instituted for this special purpose.*

Such extreme requirements are cited here merely by way of contrast. They do not appear as yet to have resulted in an ideal enforcement of labor laws in Germany, and they would clearly be impossible in this country. But it is becoming more evident each year that our service is in urgent need of inspectors of special knowledge and training.

No one but a physician can study the manifold relations of industries to health, and inspect working people (adults as well as minors) in order to learn the physical effects of industrial fatigue, dangerous occupations, unsanitary conditions and the like. The federal report on the white lead industry in the United States shows that dangerous processes regulated abroad are not only unregulated here but so carried on as to be "much more dangerous" to health than they are in Europe.† In such occupations a special limitation of working hours is called for, as well as sanitary requirements. We have seen that the most eminent physicians in Canada were opposed to more than six hours' work each day for girls in the exacting telephone service. In Germany today adult men are prohibited from being worked more than two hours at a stretch in certain dangerous processes,

* Bulletin of the United States Bureau of Labor, No. 89. July, 1910. Veditz, C. W. A., Ph.D.: Child Labor Legislation in Europe, p. 192.

† Bulletin of the United States Bureau of Labor, No. 95. July, 1911. Hamilton, Alice, M.A., M.D.: White Lead Industry in the United States, p. 190.

such as filling and emptying oxidizing chambers in lead works.*

This is indeed the prime value of the medical inspection of work places: to check industrial disease *at its source*. It not only removes to tuberculosis sanitaria and the like, workers who have acquired disease at their occupations, but it performs a more constructive service. It discovers the causes of industrial infection or overstrain in the dusty and poisonous and straining processes of manufacture; and the improvement of such conditions is more important than the cure of the sick. It protects the workers *before* they have been injuriously affected. Within the next decade scientific study should show the dangers of occupations peculiar to our country and modes of manufacture, and should indicate in what occupations the day's work must be radically reduced to conserve the workers.

Beside such medical study of industry we need other technical study as well. The ventilation and lighting of workrooms, guarding of dangerous machinery, and the forced removal of the noxious by-products of manufacture, are engineering problems directly related to the health of working people. They have hitherto been left almost wholly to the discretion of untrained lay inspectors. As might have been expected, little progress has been made in their solution. But at least these things have come to be recognized, even in America, as unsolved problems for professional study and investigation. Fixed standards of safety, sanitation, ventilation, and lighting have not yet been agreed upon, but will be perfected during the next few years, and will assist greatly in the effective protection of working people.

It is in this connection that profound interest attaches to the new scheme of administration recently devised by the state of Wisconsin. In 1911 an industrial commission was created which superseded all the former machinery of inspec-

* Bulletin of the United States Bureau of Labor, No. 95, p. 170. Factory Regulations of the Chancellor of the German Empire Regarding Lead and its Products.

tion and enforcement. It consists of three members, appointed for periods of six years each by the governor of the state. The novelty of this commission lies in its extraordinary range of power. It is not only charged to administer and enforce a list of specified statutes, such as the laws relating to child labor and school attendance, women's employment, laundries, bakeries, fire-escapes, and the like. In addition, the commission is practically enjoined to see to it that all work places shall be safe and sanitary. It is specifically empowered to ascertain, fix, and enforce standard safety devices, and all other means of protection for the "life, health, safety, and welfare" of employes in all places of employment.

No charter could be wider than this. Under its provisions the commission may appoint not only the lay factory inspectors, but experts of every technical description, to adopt and modify standards of safety commensurate with the ever changing mechanisms and processes of industry.

Such a sweeping and almost revolutionary scheme of administration obviously carries with it potentialities of abuse as well as of extraordinary value. The very breadth and looseness of the powers conferred makes their effectiveness peculiarly dependent upon the spirit which informs them. The present personnel of the commission encourages the most hopeful auguries.* But time alone can show whether, under the Wisconsin scheme, the routine difficulties of the subordinate inspectors will be lessened or increased in enforcing the standards, and in withstanding the pressure of employers for concessions and modifications in the name of their "practical needs."

However that may be, and whatever the value of leaving free and unfixed the standards of sanitation and safety, so far as concerns our special subject (the curtailment of industrial fatigue by the limitation of working hours) we need rigid statutes precisely for the sake of that enforcement which is their raison d'être. If the experience of England and

* Prof. J. A. Crownhart, chairman, Prof. John R. Commons, Mr. J. D. Beck.

Massachusetts has proved anything, it has proved that rigid laws limiting the workday have been enforceable, and that the lax laws have not.

Even when trades are differentiated and varying hours of labor must be fixed according to their degrees of injuriousness to health, such special regulations should be as nearly fixed and definite as can be settled by legislation.

Here, however, the question arises as to the rights of legislatures. Under their constitutional powers, how free are they to enact measures limiting the length of the workday? To answer this, we must next consider some recent decisions of the courts on the scope of labor legislation.

IX

LABOR LAWS AND THE COURTS

IN any discussion of the laws which limit an adult's hours of labor, we must constantly bear in mind the fact that no law is final in the United States until it has passed the review of the courts. Physicians may agree as to the urgency of curtailing the workday, legislators may enact such statutes in deference to a public demand, but unless the judges are convinced of their harmony with the federal and state constitutions, such laws are declared unconstitutional and are void.

At first sight, the question of constitutionality appears to be remote from the course of our discussion, a region of legal technicalities and abstractions into which the layman may scarcely venture, and in which such human forces as hygiene and social welfare must count as nil. But in fact the reverse is true. In the last resort, the constitutionality of these laws is determined by no other considerations than such medical and social facts as those which we have discussed at length.

1. THE POLICE POWER

In order fully to understand this relation, we must keep in remembrance the old truth that government, indeed society itself under any form of government, means restraints of one kind or another. By the inexorable law of compensation, so soon as men join in any bonds of union, they must surrender some portion of their individual liberties in return for the solidarity which protects them. The state's right to impose such restraints or regulations upon the individual is called the police power. Under this power, all our laws for the

protection of health, safety, and welfare have been enacted and sustained by the courts; laws such as the quarantine and liquor laws, those establishing hospitals and insane asylums, laws which require fire-escapes in hotels, schools, and factories, the fencing of dangerous machinery, and a host of others.

The police power is thus of widest application and has no definite limitations. Its applications have been repeatedly defined by the courts in a very large number of cases. "From the mass of decisions," says Professor Freund, one of the foremost writers on this subject, "it is possible to evolve at least two main attributes or characteristics which differentiate the police power; it aims directly to secure and promote the public welfare, and it does so by restraint and compulsion."*

Hence, in reviewing legislation the courts must decide whether any specific statute is justifiable in order to preserve the public health, safety, and welfare, or whether it infringes unduly upon personal liberties. Here we reach the core of our difficulty and the obstacle which has stood in the path of labor legislation.

2. THE "FREEDOM OF CONTRACT" THEORY

It is a fact of common knowledge that after our civil war, the fourteenth amendment of the Federal Constitution was adopted, and similar provisions in the state constitutions, declaring that "no state shall deprive any person of life, liberty, or property without due process of law."

By one of life's ironies, this wellknown phrase has been interpreted by the courts as prohibiting the protection of working people in sundry ways, on the ground that their individual rights are interfered with. Labor is property, said the judges. The laborer has the same right to sell his labor and to contract with his employer as any other property owner. Hence the laws limiting hours of labor, or regulating

* Freund, Ernst: The Police Power, p. 3. Chicago, Callaghan and Co., 1904.

labor in other ways, are in conflict with the fourteenth amendment, because they interfere with the laborer's individual property rights.

This theory of the so-called "freedom of contract" was not invoked against labor legislation until twenty years after the fourteenth amendment had been adopted for a very different purpose. In 1886, the Supreme Courts of Illinois and Pennsylvania first threw out certain labor cases as unconstitutional on this ground.*

The "freedom of contract" assumption has so vitally affected the very existence of the laws in which we are concerned, that we may well glance at the six or seven most important decisions of superior courts on the subject, handed down during the last sixteen years, between 1895 and 1911.

The fallacy of this thesis has been of late so much discussed that it need not delay us long. It is coming to be recognized that since employes do not stand upon an equality in bargaining power with their employers, the so-called "right" to contract for a day of any length is purely theoretical. The worker in fact obeys the compulsion of circumstance. No one can suppose that young women working in the box factories of Chicago, discussed in a previous chapter, need or desire to be protected in their "right" to labor overtime nine months in the year; or that women in laundries should be "free" to work fourteen hours or more during several days of the week. They have, in fact, no choice or freedom in the matter. The alternative is to work or starve. To refuse means to be dismissed. Modern industry has reduced "freedom of contract" to a paper privilege, a mere figure of rhetoric.

THE FIRST RITCHIE CASE. Yet this was precisely the ground upon which the judges of the Illinois Supreme Court in 1895 declared invalid an Illinois eight-hour law for women employed in factories. In what is known as the first Ritchie

* Freund, Ernst: Constitutional Limitations and Labor Legislation, pp. 51–71. Address before the Third Annual Meeting of the American Association for Labor Legislation, New York, December, 1909.

case,* they declared that the police power of the state did not sanction such an interference with the working hours of adult women. There was no "fair, just, and reasonable connection between such limitation and the public health, safety, or welfare proposed to be secured by it." Hence the law was declared unconstitutional; and for thirteen years, until this decision was practically over-ruled by the United States Supreme Court in 1908, it retarded the movement for the protection of working women in all our states.

THE CASE OF HOLDEN V. HARDY. Curiously enough, three years after the decision in the Ritchie case, a law limiting men's hours of labor was carried to the federal Supreme Court at Washington and was sustained.† This case involved the validity of the Utah law fixing an eight-hour day for men employed in mines and smelters. The court handed down a decision which has become almost a classic in its clear statement of the broad principles at issue. It is true that the employments regulated were clearly dangerous to health, safety, and welfare. Therefore the limitation of hours was more obviously justifiable under the police power. Indeed, the court based its favorable decision on the fact that work in mines and smelters was not like ordinary employment, but that the operative was

". . . deprived of fresh air and sunlight and is subject to the foul atmosphere and a very high temperature, or to the influence of noxious gases."

But the judges dealt not only with the hazards of these employments. They struck a loftier note which rises clear and strong above the technical argument. They were preoccupied with something larger than the single law in dispute. It was the state which figured before them—a congregate whole which was only as great as "the sum of all its parts." These parts, they said in stirring words, did not

* Ritchie v. People, 155 Ill. 98 (1895).

† Holden v. Hardy, 169 U. S. 366 (1898).

stand upon an equality with one another in the economic scale, and therein lay both the need and the justification of the state's intervention.

"But the fact that both parties are of full age, and competent to contract, does not necessarily deprive the state of the power to interfere, where the parties do not stand upon an equality, or where the public health demands that one party to the contract shall be protected against himself. The state still retains an interest in his welfare, however reckless he may be. The whole is no greater than the sum of all the parts, and when the individual health, safety, and welfare are sacrificed or neglected, the state must suffer."

It is significant, as the court pointed out also in this decision, that such cases as the one at bar have not been brought by working people eager to secure their "right" to labor any number of hours, but by the employers to whose advantage it is for them so to labor. "The argument," said the court, "would certainly come with better grace and better cogency from the other class."

These two decisions, then, set forth clearly the issue between personal liberty and the police power. In the Ritchie decision the judges set a theoretical freedom above concrete realities. In Holden v. Hardy the law appeared to be justified by its necessity.

THE LOCHNER CASE. The next case to be considered is the only other one in which the United States Supreme Court has rendered an opinion as to the validity of a law limiting the hours of adult men in private employment.* This was the New York law for bakers, restricting the hours of labor in bakeries to ten hours in one day, or sixty hours in one week, overtime being allowed for the purpose of shortening the last day of the week. In 1901 the law was attacked as unconstitutional by a master baker. It was sustained by the New York courts and then appealed to the

* Lochner v. New York, 198 U. S. 45 (1905).

Supreme Court at Washington which declared it unconstitutional.

Here we have the same court which upheld the validity of the Utah law dismissing the New York law as one of the "mere meddlesome interferences with the rights of the individual."

Where the Utah decision took a firm stand in behalf of those who did not "stand upon an equality," the decision in the Lochner case repudiates the idea that bakers are in any sense wards of the state.* The judges were again, as in the earlier Illinois case, unable to see any connection between the proposed limitation of hours and the public health and welfare. Bakeries, unlike mines and smelters, did not seem to them dangerous *enough* to regulate. Doubtless it will be genuinely surprising in the future to reflect that, in this significant case, a majority of the United States Supreme Court could find no "reasonable ground" to justify the New York bakers' law. A majority opinion of the New York Court of Appeals had dwelt upon the dangers to health arising from excessive hours in the heated, dust-laden atmosphere of the bakeries. A concurring opinion had cited medical authorities at length to show the unhealthful nature of such hours of work. Yet the reaction is more apparent than real. In substance the Lochner decision does not over-rule the court's previous sanction of the Utah law. The way was still left open for the justification of other laws limiting the workday, if the judges could be shown "that there is material danger to the public health, or to the health of the employe, if the hours of labor are not curtailed."

THE WILLIAMS CASE AND ITS CHALLENGE. Unfortunately, in the next decision we are to examine, legal technicalities again predominated in the minds of the judges over the

* In a valuable article on Legislative Restriction of Hours of Labor, Bulletin of the New York Labor Department, No. 46, March, 1911, John A. Fitch draws attention to the fact that it was Judge Peckham, who had dissented from the opinion of the court in Holden v. Hardy, who wrote the opinion in Lochner v. New York.

simple facts of industrial life, of which they were evidently unaware. Two years after the bakers' law had been upheld by New York's highest court, the same bench, in the Williams case, declared invalid a law prohibiting the employment of women in factories between 9 p. m. and 6 a. m.* This case was of deep significance for the cause of women. It was the first, and is the only decision by any court, which deals with women's night work. As we have seen, there were in 1907 only four state laws existent on the subject.† For our country has lagged conspicuously behind the rest of the world in seeking to control night work, the form of labor most fraught with possibilities of injury to the human frame, particularly to the health of women. Yet the New York Court of Appeals deliberately ignored all the broader implications of the case; all those intricate social aspects of night work, its effects upon health and the home and general welfare, which European statesmen had been studying for years, and which had culminated in the Berne International Convention on Night Work eight months previous to the Williams case—all these wider issues were not even touched upon. We seek in vain for that freer air of statesmanship and understanding which breathes from the decision of Holden v. Hardy. In the Williams case the court deliberately limited itself to considering "solely" whether work at 10:20 p. m. (as in the case at bar) was injurious enough to warrant interference with women's "freedom of contract." They were genuinely concerned because, under the existing law, no woman could be employed within the prohibited hours for any period of time "*no matter how short.*"‡

But the real issue did not center on this single narrow aspect of the matter. It stands to reason that work at 10:20 p. m. is not in itself inherently injurious. But night work, *as it exists in reality*, does not consist of such isolated theoretical employment. As we have seen, it means, in

* People v. Williams, 189 N. Y. 131 (1907).

† In New York, Massachusetts, Nebraska, and Indiana.

‡ Italics added.

practice, either overtime work prolonged into the evening after and in addition to the normal day, or employment on continuous night shifts. Both these forms of night work the judges in the Williams case expressly deplored; but in their anxiety to preserve women's "freedom" to work a theoretical short period after 9 p. m., on the assumption that such work was neither long nor overtime, they opened the way for precisely the evils which they themselves condemned! And we have had, in consequence, such formidable examples of night work as in the binderies running twenty-four hours at a stretch, quoted in a previous chapter. These have been the direct results, the corollaries of the Williams decision.

Now the writer of that decision had gone so far as to state specifically: "I find nothing in the language of the section which suggests the purpose of promoting health except as it might be inferred that for a woman to work during the forbidden hours of the night would be unhealthful." Here was an explicit challenge thrown down by the learned writer of this opinion. If, indeed, the language of the law contained nothing which suggested to the court the purpose of promoting health, clearly that purpose should have been made clear, beyond the shadow of a doubt, in the law's defense.

In defending the cases which we have reviewed up to this point, the arguments and citations of the lawyers had been almost wholly confined to the purely legal aspects of those actions. Briefs of counsel had discussed in infinite detail the power. But the point at issue had in fact wholly shifted from relation between the fourteenth amendment and the police the state's abstract right to restrict individual rights, to the practical necessity for every such restriction. The question was no longer abstract and legal, but rather in a deep sense social and medical. It followed that the purely legal defense of these laws was falling wide of the mark. It had long been unreasonable to expect that judges, trained in schools remote from factories and workshops, should be conversant with those underlying practices and conditions

which alone could justly weight the scales. The men upon the bench needed for their guidance the empirical testimony of the working woman's physician, the factory inspector, and the economist. They needed, in a word, to know the facts.

For some years previous to the Williams decision, many persons interested in labor legislation, and particularly the Consumers' League, had been following in detail the influence of successive court decisions.* In an earlier case, involving the validity of certain sections of the New York child labor law,† the writer of these pages had been called upon to furnish the presiding judge with testimony from the New York Factory Inspectors' reports, relative to the social value of such legislation.

Before the Williams case had been carried to the New York Court of Appeals,‡ the writer had made an effort to obtain some expressions of opinion from physicians, on the subject of women's employment at night, comparable with the findings of European physicians. It was hoped that some prominent medical men in New York might be induced to state their views of the physical injuries incident to industrial night work, just as in 1892 a group of distinguished and public-spirited British physicians had presented to Parliament a memorial on the injuries from overlong hours in shops, in support of Sir John Lubbock's Early Closing Bill.§

But from among ten prominent New York physicians who were approached, only two were willing to express themselves publicly. One of these was a physician grown old in

* See Kelley, Florence: Some Ethical Gains Through Legislation. New York, Macmillan, 1905. Goldmark, Josephine: The Necessary Sequel of Child Labor Laws, *Amer. Jour. of Sociology*, pp. 312–325. Nov., 1905; Workingwomen and the Laws. *Annals of the American Academy of Political and Social Science*, pp. 261–276. Sept., 1906.

† The City of New York v. Chelsea Jute Mills. 43 Misc. 266. (1904).

‡ The law had been declared unconstitutional by the Appellate Division of the New York Supreme Court, two out of five judges dissenting.

§ British Sessional Papers, 1892. Vol. XII, p. 238. Among the signers of the memorial are such wellknown names as Sir Andrew Clark, Sir Richard Quain, and 298 others. See Part II of this volume. p. 515.

service whose life-long practice had made him as familiar with the dire effects of industrial overwork as of excessive idleness. The other was a younger man whose active part in the tuberculosis campaign had brought forcibly to his notice some of the contributory causes of overstrain among working people. The striking fact in the refusal of the other physicians to share in any arraignment of the night shift or late overtime work for women, was their general remoteness from the common facts of what seemed almost like a different order of existence. The speed, the strain, and the long hours of factory life belonged to a chapter of human life wholly outside of their own crowded and specialized lives. Not one of them raised the objection that a public expression of medical opinions might be construed as an attempt to prejudice the case. They were unacquainted with the facts at first hand and, indeed, for the most part, doubted their existence.

This modest attempt, then, failed. But when, in 1907, the decision of the Court of Appeals in the Williams case explicitly stated the court's inability to see the purpose of the law, it became more than ever apparent that a new emphasis was needed in the defense of labor legislation, and we awaited the opportunity in which to put this belief into practice.

THE OREGON CASE AND A NEW LINE OF DEFENSE. Such an opportunity offered in the very same year. A laundryman was arrested for violation of the Oregon law fixing a ten-hour day for women employed in factories and laundries. The validity of the law was affirmed by the Oregon courts, and in December, 1907, an appeal was taken to the United States Supreme Court at Washington. Here, then, was an opportunity to present the real issue to the highest court in the land, concerned for the first time in its history with a statute limiting the workday of adult women. By good fortune, the active interest of a distinguished lawyer*

* Mr. Louis D. Brandeis of Boston, who has given his invaluable services unpaid in these cases.

was enlisted and he proposed to put these issues before the court in a new way. His argument and brief marked a radical departure in the defense of labor laws. It confined itself to the tangible human elements involved—health, welfare, and economic efficiency.*

In a brief of more than 100 pages, he devoted two to the legal aspects of the case, and over 100 to a new kind of testimony—mankind's experience, physical and moral, with respect to women in industry and the duration of their working hours. The document was made up from the accumulated mass of British and Continental factory inspectors' reports, commissions and *enquêtes*, as well as the observations of medical men and economists. It was well received by the court, which in its decision upheld the validity of the Oregon law. Quoting from the new empirical evidence contained in the brief, the court stated that it "took judicial cognizance of all matters of general knowledge," thus in a single phrase warranting the new emphasis upon practical data.†

The decision in the Oregon case was indeed no narrow victory. It was the most sweeping decision ever rendered by the federal Supreme Court in relation to working hours. It was not confined to the consideration of the ten-hour day or to a working day of any particular length. It left to the states the liberty to determine what working hours were wholesome and reasonable. It went far beyond the statute at issue, which dealt with the employment of women in factories and laundries, and looked towards the protection of women in other employments. In a word, the highest court of the nation rejected the fiction of the free contract as regards the working woman and declared that "her physical nature and the evil effects of overwork upon her and her future children justify legislation to protect her from the greed as well as the passion of men." The new method of defense had amply justified itself.

* Supreme Court of the United States, October Term, 1907. Curt Muller v. the State of Oregon. Brief and Argument for Defendant by Louis D. Brandeis and Josephine Goldmark.

† See Part II, p. 558.

THE SECOND RITCHIE CASE. It was again to be put into practice and again to be justified in the following year (1909), immediately after the auspicious Oregon decision had in principle reversed the earlier Ritchie decision of the Illinois Supreme Court. The way was now open for laws protecting women from overwork, and many states enacted such legislation. Among others, the Illinois legislature of 1909 provided a ten-hour day for women employed in laundries and factories. Hence, fourteen years after the first Ritchie decision, a new law was carried up to the Illinois Supreme Court for its adjudication.*

A wholly new bench of judges were sitting in the case. The widespread public curiosity throughout Illinois as to the outcome of this case, bore witness to a new recognition of the large issues at stake, not only to women in industry, but to the state. The court in sustaining the ten-hour law was not deterred as the same court had been fourteen years before by the freedom of contract theory. All that body of "general knowledge" which the federal judges had taken into cognizance, was again admitted to carry its due weight. In a single illuminating sentence the Illinois court also responded to the new emphasis upon the substantial and substantiated facts, remarking, "what we know as men we cannot profess to be ignorant of as judges."

3. THE DISTINCTIONS OF SEX

Now among these facts known to all men and presented to the court, were the ill effects of industrial speeding, strain, and the like, upon working women, *qua* women. Their physical organization, the greater morbidity of working women compared with men in the same occupations, and the dependence of future generations upon the health of women, all had been dwelt upon to justify the legal restriction of their hours. This was because the earlier decisions, overthrowing the validity of women's labor laws, had denied any

* Ritchie & Co. v. Wayman, 244 Ill. 509 (1910).

special protection to women "on the mere fact of sex." Women were citizens, hence their contractual powers could not be disturbed. Indeed the New York Court of Appeals went so far as to say in the face of civilized precedent, that "an adult woman is not to be regarded . . . in any other light than the man is regarded, when the question relates to the business pursuit, or calling."

This specious argument and the alleged impossibility of differentiating between men and women was, indeed, long an obstacle in the way of securing women's laws. Thus in England between 1874 and 1901 the factory acts were in the main opposed by an important wing of the women's rights party. Superficially viewed, the great movement to obtain for women, in all fields, rights from which they have been debarred, might appear inconsistent with the effort to protect one sex as contrasted with the other. But this is a fundamental misconception. It ignores the fact that protection of health has never been held a bar to the efficiency of men as citizens.

It has yet to be suggested, for instance, that the miners of 13 states—Arizona, California, Colorado, Idaho, Maryland, Missouri, Montana, Nevada, Oregon, Oklahoma, Utah, Washington, and Wyoming—are discriminated against, because the state restricts their working hours to eight in one day* for the explicit purpose of protecting the health of its citizens. It has yet to be suggested that the interstate railroad telegraphers are less valuable as citizens than any other men because Congress, in 1907, restricted their work to thirteen hours by day and nine hours by night. This statute and similar restrictions in many states were enacted nominally to safeguard the traveling public. But its only excuse for being is the effect of excessive hours upon the operative's efficiency. These restrictions upon men's working hours have never interfered with their value or dignity as citizens. Why then, should similar restrictions—

* Ten hours in one day in Maryland, applying to Allegany and Garrett counties.

wider and more inclusive for women—operate against their dignity or value as citizens? Their physical endowments and special functions make the protection of their health even more necessary than the protection of men's health; they need even more than men the legislative protection which, as Justice Brewer said in the Oregon case, "is designed to compensate for some of the burdens which rest upon" them.

It is true that, as we have seen, the restriction of men's hours of labor has been upheld by the courts only when the occupations sought to be regulated are manifestly dangerous to health, such as mines and smelters, or where public safety is directly concerned, as in railroading. Yet in so far as prohibition of excessive hours for men has been justified by dangers resulting to their health and efficiency, the argument for more inclusive women's laws is precisely similar.

Fortunately this view has on the whole prevailed in the United States, and the steadily growing equal suffrage societies have taken a logical stand in defense of the state's responsibilities towards working people, be they men or women.

Why, indeed, should these measures, justifiable on the broad ground of health and welfare, be in the future limited to women? The New York State Department of Labor has recently published a thoughtful review of judicial decisions dealing with the hours of labor of adult men.* The writer, John A. Fitch, has brought together the most important conservative dicta of the courts (typified by the Lochner decision overthrowing the bakers' law) and their most progressive utterances.† He concludes that while the judiciary

* Bulletin of New York State Department of Labor, No. 46. March, 1911, p. 90.

† Of such progressive utterances none are more striking than the two following paragraphs, taken, respectively, from decisions of the New York Court of Appeals and of the Superior Court of Pennsylvania:

"In the interest of public health, of public morals and of public order, a state may restrain and forbid what would otherwise be the right of a private citizen. . . . It may limit the hours of employment of adults in unhealthy work, and *it may be that it could prohibit the performance of excessive physical labor in all callings.*" (People v. Orange County Road Construction Co., 175 N. Y., 84, 87.) Italics added.

is, as a whole, on the side of conservatism, the advanced sentiments found in sundry decisions indicate "conditions other than stationary."

In upholding the validity of many Sunday laws, the courts have repeatedly declared that the cessation of labor one day in seven is essential for health, morals, and general welfare. It has not yet been made manifest to the judges that an adequate *daily* period of rest for men is as essential as the *weekly* rest period. The question arises whether laws limiting men's hours of labor might not have a more favorable outlook for being sustained by the courts "if an effort were made similar to the effort in the Oregon and Illinois women's cases, to present evidence with respect to long hours of work in industries where men are employed." Could not such evidence readily be found to justify laws prohibiting the twelve-hour shifts in continuous industries, and requiring the employment of three shifts instead of two? The outrageous duration of work in continuous industries* and the brutalizing effects of the twelve-hour day and eighty-four-hour week would make this perhaps the most timely legislation for men. Some laws embodying these principles already exist. In Montana and Pennsylvania there are eight-hour laws for hoisting engineers, in mines operated sixteen hours or more a day; and the federal law has already been referred to, which provides for interstate telegraphers a thirteen hour day in offices open only by day and a nine-hour period in offices open both day and night.

"A prohibition upon unhealthy practices, whether inherently so, or such as may become so by reason of prolonged and exacting physical exertion which is likely to result in enfeebled or diseased bodies, and thereby directly or consequently affecting the health, safety, or morals of the community, cannot, in any just sense, be deemed a taking or an appropriation of property.

"The length of time a laborer shall be subject to the exhaustive exertion or physical labor is as clearly within legislative control as is the government inspection of boilers, machinery, etc., to avoid accidents, or of the sanitary conditions of factories and the like to preserve the health of laborers." (Commonwealth v. Beatty, 15 Pa. Sup. Ct., 5, 15.)

* See p. 4.

4. THE QUESTION OF DISCRIMINATION

One further point regarding the validity of these laws needs comment in this brief chronicle. This concerns another section of the fourteenth amendment, declaring that no state shall "deny to any person within its jurisdiction equal protection of the laws." Under this, or similar provisions in state constitutions, laws regulating conditions of labor have been declared invalid, as discriminating improperly between persons or classes, thus denying equal protection of the laws.

Now it must be remembered that in their review of legislation, it is the function of the courts to determine whether the legislature had any reasonable grounds for its action; not whether the laws as enacted are inherently and in themselves good or bad, but whether the legislature was justified in its conclusions, as embodied in the laws.

Obviously, in enacting any laws limiting hours of labor, the legislature must use its discretion in choosing among various alternatives, such as the number of hours to be fixed, the persons to be protected, and other similar points. Opponents of these laws have usually raised the contention that they were unfairly discriminatory, because certain persons or classes of persons were included or left out.

In the Ritchie case, for instance, it was claimed that the law was unfair "class" legislation because it included women working in factories and laundries and not in other occupations. In a more recent case involving the Michigan ten-hour law for women* the law was attacked as "class" legislation because a different class of workers were omitted. In both these cases the courts performed a great service by upholding and reasserting the freedom of the legislatures to use their discretion as to the scope of the laws. "If all laws were held unconstitutional because they did not embrace all persons," said the Illinois court (quoting another decision), "few would stand the test." In each case the court concluded

* Withey v. Bloem, 163 Mich. 419. (1911).

that the law was not "class" legislation, although it did single out those workers who seemed to the legislature most in need of protection. The Michigan court again throws the responsibility for the scope of the law squarely upon the discretion of the legislature, quoting with approval from Cooley's Constitutional Limitations on this point, "the legislature must judge." The law cannot be called unconstitutional because "it does not apply to all callings."

This emphasis upon the freedom of the legislature should be welcome to all lovers of democracy, even though legislatures, like all human agencies, may err and prove false to their trust.

In point of fact, the Michigan ten-hour law which was sustained by the Michigan Supreme Court contains a thoroughly vicious section. It excludes from the protection of the law all women "engaged in preserving perishable goods in fruit and vegetable canning establishments." This exception was a weak concession to a powerful interest, a yielding to undue pressure. Yet only a doctrine of despair would welcome the correction of such legislative failures through the agency of the courts. The remedy lies not in destroying the legislative functions and handing over to the courts a wider jurisdiction than is their right. It lies in raising the caliber of legislators and in bringing to bear upon the legislatures the power of new ideas, which, in the long run, never fails. For this we need, primarily, a wider study and knowledge of those fundamental truths which are the bases of our protective legislation, and which these chapters have sought briefly to set forth.

X

PROHIBITION OF WOMEN'S NIGHT WORK: A PRIME NECESSITY

1. THE INTERNATIONAL CONVENTION ON NIGHT WORK

AS we have seen, in June, 1907, the New York Court of Appeals by a unanimous decision struck from the statute books of New York the law against women's night work, one of the four state laws on the subject at that date existent.* Just eight months before, in Berne, Switzerland, there had been held a memorable meeting, attended by official delegates from 14 European nations. This was the result of a quarter century's effort, a new move in labor legislation: an international convention of the Powers. The subject of the treaty chosen, according to Professor Raoul Jay, as one of the most urgent, most important, and most easily solved of labor problems, was the abolition of women's night work.

These official acts, falling within the same twelve months at opposite poles from one another, are significant of the diametrically opposed mental attitudes prevalent in the United States and in Europe, toward the same phenomenon.

Yet the employment of women at night is not one of the subjects legitimately differentiated in a democracy and under other forms of government. As we have trod the same path as our elder kin abroad in other legislation reducing the length of the workday, we shall sooner or later find ourselves obliged to follow their action in regard to the employment of women at night. But whereas abroad the prohibition of

* These states were Massachusetts, New York, Indiana, and Nebraska. A New Jersey statute enacted in 1892 which prohibited the employment of women in factories between 6 p. m. and 7 a. m. was held repealed by a general repealing act of 1904.

women's night work has gone hand in hand with the reduction of the day's work, and a legal closing hour has been found an integral part of effective laws, this issue has been for the most part ignored in the United States. The lack of a legal closing hour has hampered the law enforcement in all but three of our states.

We have seen that England prohibited night work in her first factory legislation for women in 1844. Almost a generation passed before any other European state took action. In 1864, the Swiss canton of Glaris followed England's example and forbade the employment of women at night in factories. Ten years later a declaration in the Swiss federal constitution authorized the regulation of the hours of labor of all adults. The Swiss federal law of 1877 which followed, contained a clause prohibiting women's night work. Many attempts were made later, from time to time, to obtain overtime privileges for various industries, but, wrote the eminent Swiss factory inspector Fridolin Schuler twenty-five years later, "no one ever dared to suggest the repeal of the night work law." (Ces dispositions protectrices n'ont jamais été touchées . . . personne n'osa s'attaquer au travail de nuit.)*

The prohibition of women's night work had been introduced by the same F. Schuler in 1887 to a wider audience, at the International Congress of Hygiene and Demography at Vienna. This is a body of scientists to whose work we have previously referred, who have met at regular intervals abroad, and during the past twenty years have been devoting their attention more and more to the problems of industry as well as of pure science.†

* Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par Prof. Étienne Bauer, Directeur de l'Office Internat. du Travail. Pp. 343–344. Jena, Fischer, 1903. This book contains the investigations made by the International Association for Labor Legislation into the physical, moral, and economic aspects of night work. It has been taken as a basis for this chapter.

† In this connection interest attaches to the first meeting of this Congress in the United States, which is to take place in Washington, D. C., September, 1912.

The next important body to discuss the employment of women at night was the famous International Conference on Labor called by the German Emperor, to the astonishment of Europe, in March, 1890. The Swiss federal government had been promoting international labor agreements during the eighties, and had arranged a conference to be held in Berne in May, 1890, when the Kaiser issued his rescript calling a conference in Berlin two months earlier.* The rescript was in some respects so radical that to many persons it stood for "state socialism"—a deliberate move to forestall the socialist advance. Whatever its underlying objects, the Berlin Conference resulted in no binding agreements, but among its resolutions concerning the employment of women and children, the prohibition of night work was recommended.†

During the next ten years the subject was discussed by other international meetings, and finally the International Association for Labor Legislation at its first meeting of delegates in 1901, determined to investigate the whole field: the extent and effects of women's night work in the various countries, and the actual economic results of prohibiting night work by law. A year later, following this investigation, the association appointed a commission to devise means of obtaining a general international prohibition of women's night work, and the gradual reduction of evening overtime exemptions. (Le Comité national charge une commission de rechercher les moyens d'introduire cette interdiction générale, et d'examiner comment les exceptions qui existent encore à cette interdiction pourraient être progressivement supprimées.)‡

After a year's deliberation, the commission recommended that the Federal Council of Switzerland be asked to initiate

* Hutchins and Harrison, op. cit., p. 270.

† Seven states voted affirmatively on this question: Germany, Austria, Great Britain, The Netherlands, Sweden, and Switzerland. Five states voted in the negative: Hungary, Belgium, Spain, Italy, and Portugal. Three states refused to vote: Denmark, France, and Norway.

‡ Bauer: Preface to Le Travail de Nuit des Femmes dans l'Industrie, op. cit., p. x.

an international convention forbidding women's night work in industry. The commission recommended also that a memorial be sent to all the powers, setting forth the reasons for desiring such an international convention, which should assure to women who work outside of their own homes an unbroken period of twelve hours' rest at night, certain trades and processes being exempted.

Both of these recommendations were carried out. In response to the invitation of the Swiss Federal Council there assembled at Berne, September 26, 1906, representatives of 14 European powers: Austro-Hungary, Belgium, Denmark, France, Germany, Great Britain, Italy, Luxemburg, Portugal, Spain, Sweden, Switzerland, and the Netherlands.

An international agreement was submitted to the Conference. It bound the contracting states to prohibit the industrial night work of women without distinction of age. The agreement applied to all industrial establishments employing more than 10 persons. A minimum period of eleven consecutive hours was set for the duration of the night rest, to include the time between 10 p. m. and 5 a. m. in all cases. In states where such legislation had not previously existed, the period of uninterrupted night rest might be temporarily reduced to ten instead of eleven hours, during a period of three years.*

Only two exceptions permitting night work were provided. First, in case of "force majeure," or the interruption of work by causes beyond the employer's control, often known as the "Act of God"; second, to save raw material or material in course of manufacture, liable to rapid deterioration. No other concessions were made to the seasonal industries, ever insistent for special privilege. They were not exempted from the prohibition of night work. A slight modification in their favor was permission to reduce the length of the night rest from eleven to ten hours during sixty days in the year.

*The line dividing industry from commerce and agriculture was left for each country to define.

The participating states were required to ratify this convention, to file their ratifications with the Swiss Federal Council within a specified time, and to adopt administrative measures for carrying out the terms of the agreement. It was to go into effect two years after ratification.

By January 14, 1910, all the participating states, excepting Spain and Denmark, had ratified the convention.* In accordance with a special article, the French government had notified the Swiss Council that the terms of the agreement were accepted for Algiers and Tunis. Similar notice was given by the British government for Gibraltar, the Gold Coast, North Nigeria, Uganda, Ceylon, New Zealand, Fiji Islands, Leeward Islands, and Trinidad.† Comic as it may appear at this date to legislate for the South Seas and for the Africa of romance and adventure, yet bitter experience has taught the wisdom of so legislating before industry is present.‡

Moreover, the night work treaty must be regarded as an instrument of value far beyond its own intrinsic worth. It marks a new era in labor legislation. For the first time the powers have treated on a plane with staples of commercial value, as legitimate subjects of international agreement and treaty, such hitherto neglected assets as the health and welfare of wage-earners.

The effect of the treaty in modifying previous laws may be illustrated by some of the amendments of the German Industrial Code in 1908, seventeen years after the first effective German law governing women's hours of labor had been enacted in 1891, following the International Conference of 1890. This first law had copied the British model in prohibiting work at night between specified hours, as well as prohibiting more

* Bulletin of the International Labour Office. English edition. Vol. I, 1906, p. 272. The original limit set for the ratifications was December 31, 1908; postponed to January 14, 1910.

Additional leeway of ten years before enforcement is granted the following industries: first, the manufacture of unrefined beet sugar; second, woolcombing and weaving; third, open mining operations when climatic conditions stop operations at least four months in the year.

† Ibid. Vol. VI, 1911, p. 11.

‡ Bills are pending in Spain and Denmark (March, 1912).

than a specified number of hours by day. The employment of women was forbidden between 8:30 p. m. and 5:30 a. m. and after 5:30 p. m. on Saturdays and days preceding holidays. By the amendment of December, 1908,* among other changes, the period of night rest was lengthened one hour, work being prohibited from 8 p. m. to 6 a. m. and after 5 p. m. on Saturdays. At the termination of the workday, an uninterrupted period of at least eleven hours of rest was required.

Such are the general provisions. Many exemptions for overtime may be granted, for various reasons and varying lengths of time, by the German Federal Council and by the higher or lower administrative authorities. But the amendment of 1908 reduced the range of many of these exemptions, and required the establishment of a closing hour in cases where it had not previously been required.

Thus one section of the complex German Code gives special powers to the Federal Council in regard to women's hours of labor. For instance, in industries where there is seasonal pressure of work the Federal Council may grant exemptions forty times during the year, but the daily period of work must not exceed twelve hours nor eight hours on Saturday.

Previous to 1908 there was no fixed closing hour for such exemptions. The amendment of that year specified that the period of rest following the workday must amount to at least ten consecutive hours and must include the time between 10 p. m. and 5 a. m.†

Again, in cases of exceptional accumulation of work, overtime may be granted by the lower and higher administrative authorities a fixed number of times during the year. Previous to 1908 such overtime was allowed until 10 p. m. and a workday of thirteen hours was permitted. The amend-

* German Industrial Code, Section 137. Bulletin of the International Labour Office. English edition, 1908, p. 335.

† German Industrial Code, Section 139 a. Bulletin of the International Labour Office. English edition, 1908, pp. 337 and 338.

ment of 1908 limited such overtime to twelve hours in the day, changing the closing hour from 10 to 9 p. m., and required that the daily period of rest must be not less than ten hours.*

2. THE CASE AGAINST NIGHT WORK ABROAD

The investigations which preceded the Berne Convention dealt with the physical, economic, and administrative aspects of night work. The employment of women at night was scrutinized by physicians, economists, and specialists in labor enforcement, and was found in the first place unmistakably dangerous to health. For all night work, whether it be carried on regularly in night shifts or irregularly in the evenings, has certain characteristic and unavoidable effects. Of these the most obvious are the loss of sleep and sunlight, and the hygienic argument against night work centers upon the inevitable physiological deficits due to this lack of sleep and sunlight.

We have seen, in a previous chapter, that during work the chemical products of activity increase. The internal combustion is more active. In the famous experiment of the physiologists Voit and Pettenkoffer, a man was shown to expire almost twice as much carbon dioxide during a day of work as during a day of rest. But during rest at night the processes of tissue repair are in the ascendant. This is one of the reasons why loss of sleep is so detrimental to the organism. This is also the reason why all forms of night work, inevitably resulting in loss of sleep, are in the long run bound to be injurious.

Besides loss of sleep and rest, another characteristic of both night work and evening overtime is the loss of sunlight. Sunlight appears to benefit all our bodily functions. It stimulates growth and assists in the elimination of toxic wastes. Loss of sunlight therefore reacts disastrously. Animal experimentation shows that the blood of animals

* Ibid., p. 336.

kept in the dark suffers a loss of the red coloring matter. Investigation among night workers also shows the ill effects resulting from the lack of sunshine in impoverished blood: the term "baker's anæmia" tells its own story.*

More than twenty years ago the German factory inspectors found a marked excess of in illness among night workers, as compared with day workers in similar occupations, even though the hours of labor at night were shorter than by day.† The French commission of 1890, which investigated the industrial employment of girls and women in France before the first effective French law of 1892, reported especially on the injuries to childbirth, and the high infant mortality among women employed on night shifts.‡ Physicians as well as factory inspectors of all nations agree that after a shorter or longer period, women habitually employed at night suffer from all those symptoms which betoken lowered vitality: loss of appetite, headache, anæmia, and weakness of the female functions.

Dr. L. Carozzi, in a more recent limited but intensive study of night workers in an Italian spinning mill, bears out the testimony of earlier investigators. The night workers whom he examined all showed marked signs of anæmia and general debility. He found among them a "continual sense of fatigue, of heaviness, breakage, of exhaustion—in a word a sense of chronic tire, which weighs upon the workers and undermines their lives."§

The injury to health from night work is the greater be-

* Wiener klinisch-therapeutische Wochenschrift. Vol. XIII. Nr. 27, 1906. Gardenghi, Dr. G. F. (Director of the Institute of Hygiene, Parma): Veränderungen des Blutes durch Nacht Arbeit.

Ibid., No. 28, 1906.

Proceedings of the First International Congress on Industrial Diseases. Milan, June, 1906. Bolettino, Dr. L. (Lecco): Sull' Influenza della Luce Naturale nel Lavoro, p. 100.

† Amtliche Mittheilungen aus den Jahres-Berichten der mit Beaufsichtigung der Fabriken Betrauten Beamten, 1889, p. 93.

‡ Documents Parlementaires. Chambre des Députés, 10 Juin, 1890. Annexe 649. Waddington, M. R.: Rapport fait sur le travail des enfants, des filles mineures, et des femmes, etc., p. 1088.

§ Carozzi, Dr. Luigi: I Danni del Lavoro Notturno. Lavoro. Vol. III. Milan, 1905.

cause sleep lost at night by wage-earners can rarely be made good in the daytime. In the first place, for reasons not well understood, sleep in the daytime appears to be generally less restorative than by night. It is less potent to accomplish its office of repair and refreshment.

But even if day sleep could habitually compensate for the inversion of nature's order, it is not within the wage-earner's reach. Quiet and privacy for sleep by day are unattainable luxuries. Upon returning home in the middle of the night or at dawn, the workers can snatch at most a few insufficient hours of rest. Women who work at night fare particularly ill. Those who are married cannot postpone the regular household necessities which await them in the morning, such as cooking breakfast, dressing and caring for the children, and the like. Unmarried women, too, whether they live at home or are thrown upon their own resources, can rarely avoid a certain amount of household work, which combines with the lack of quiet to make impossible adequate sleep by day after night work.

In thus destroying home life, night work militates against morals as well as against health. Clearly, no form of women's work so interferes with their domestic relations as enforced absence from home in the evenings, the only time when wage-earning families are together. Young women who work at night are deprived of all the restraining influences of home life. When the mother of a family spends the night or evening in work, disorder is almost unavoidable, and the comfort of the men as well as of the children dependent upon her ministrations, is lost.

These, then, were some of the hygienic and moral objections to night work found in actual experience abroad. The advocates for prohibition next examined its economic value. They found a consensus of opinion that wherever night work had been abolished long enough for industry to adjust itself to the change, prosperity had not suffered. This was because, in a word, night work is inferior to day work. Output deteriorates in both quality and quantity. Defects

occur more easily at night, and more easily escape detection. In weaving and in industries where colors must be distinguished, work by artificial light is never satisfactory. The profits of plants running uninterruptedly day and night are reduced by the wear and tear on equipment and the increased running expenses. But chief of all, they are reduced by the impaired efficiency of the workers. Just as after a limited period of overtime, efficiency steadily declines, so after night work the workers tend to deteriorate. Many mill owners stated to the investigators who preceded the Berne Convention that in the long run night work had proved financially unsuccessful.

Hence, as we have seen, the margins of overtime have been gradually reduced, and the laws against night work, first bitterly opposed in most countries, are being gradually accepted. The Dutch factory inspector's account of the gradual acceptance of the night-work law by the proprietors of the laundries in Holland is especially interesting.* A tempest of indignation was aroused, wrote T. H. Van Thienen, by the Dutch law of 1889, which prohibited work after 7 p. m. in laundries using motor power. It was called, as all regulation is first called, the ruin of the industry (la ruine de leur profession). To abandon the traditional modes of work, to change the hours of the arrival and delivery of linen, to interfere with the workers' irregular habits (l'habitude de se lever tard et de se mettre tard à l'ouvrage)—all this aroused the resentment of employers, accustomed to keep their establishments open until late at night. But, according to Van Thienen, most of these fears were imaginary (n'existaient que dans l'imagination), and proved to be groundless when work was reorganized so as to end at 7 p. m. as required by the statute. He reported that the law still needed careful watching (une surveillance rigoureuse) in 1903, twelve years after it had been enacted, but concluded that the results of prohibiting night work had been "extremely favorable."

*Le Travail de Nuit des Femmes dans l'Industrie. Op. cit., p. 304 ff.

This account is typical of the evidence as to the operation of night-work prohibitions, contained in the official reports of the International Labour Office. The evidence all tended to prove that the prohibition of night work, like the reduction of day work, was in the long run a benefit to industry. It contributed to raise the efficiency both of the management and of the employes.

3. NIGHT WORK IN THE UNITED STATES

In contrast now to the Berne Convention of 1906 and the legislation of European states bringing their laws into conformity with its terms, the status of women's night work in the United States is a cause for deep concern.

We have seen that the New York Court of Appeals failed to apprehend its true significance. But more unfortunate than this decision (for there is good reason to believe that the court might take a different view if the real issues were more clearly brought to its attention)—more unfortunate than the court's decision, is the widespread public indifference in regard to the practice of working women at night.

The United States was not able to take part officially in the Berne Convention, since the federal government cannot bind the individual states to enact legislation restricting hours of labor. But far from aiming at the same goal,—prohibition of night work, of their own initiative,—American states are drifting in a precisely opposite direction.

While all the civilized (and some uncivilized) nations of the world are abolishing work at night, and cutting down the margins of overtime, American states are for the first time granting special overtime privileges to one great industry—canning—and are deliberately recognizing the employment of women on night shifts. The legislature of the enlightened state of Wisconsin in 1911 enacted its first effective law limiting the working hours of adult women,* and in the same

* The early Wisconsin law of 1867 was not enforceable, since it prescribed a penalty only for employers who *compelled* women to work more than ten hours in one day.

statute it legalized an eight-hour night shift for women between 8 p. m. and 6 a. m. This provision requires that work at night be two hours less than the legal day's work, but it is none the less true that this law specifically authorizes the employment of women during that period of the night set apart by the Berne Convention as a minimum time for rest.

Connecticut passed a law similar to that of Wisconsin in 1908, and bills containing similar provisions were introduced in Maryland and New Jersey in 1912.* No other states have specifically legalized night work for women, but such work is permissible, because not prohibited, in *all other American states* excepting three—Massachusetts, Indiana, and Nebraska.

The forces which make for night work,—accepting the enactment of such legislation as in Wisconsin, defeating bills aimed to prohibit night work in other states,—may be gauged by their activities during the sessions of 1911.

Legislatures sat in 40 states. In most of these states some bill was introduced affecting women's conditions of labor. So unpopular and so little regarded was the prohibition of night work that in only two states—Delaware and New Jersey—besides the District of Columbia, were attempts made to include a legal closing hour in the proposed legislation. These three bills all failed to become laws,† and while this fact is not in itself conclusive,—for many bills failed in other states,—it is significant that these bills had admittedly no chance of passage until the closing hour had been eliminated.

In Delaware, for instance, the original bill prohibited all night work after 10 p. m. After many deliberations and efforts at persuasion the bill emerged from conference, shorn almost beyond recognition. The following places of employment had been specially allowed to employ women without restraint at night: laundries, canneries, the telephone service, restaurants, candy stores, ice cream saloons, and

* Enacted in Maryland, March, 1912.

† The Delaware bill was passed with amendments, but Gov. Pennewill failed to sign it.

stores between December 11th and 25th—all those places in which the employment of women at night is an entrenched custom. Where night work is not customary or is not at present needed, its prohibition was not opposed.

Thus the special interests which desire to employ women at night are awake and untiring; public appreciation of the issue is dead or not yet born. Hence, in the United States today, legislation restraining employers from requiring women to work at night is the most difficult to secure, though the reduction of the day's work gains ground each year.

So little has the subject been regarded that we do not even know the extent of this dangerous form of employment, sprung up almost like the armies of Cadmus, overnight. We do know that the custom of evening overtime, extending to late evening hours, is prevalent in most industries to a degree unsuspected by most persons.

Reference has already been made to the appalling duration of night work found by the federal investigators in a very limited study of binderies in New York City. Of 13 women who worked on night shifts in such establishments,the hours of four girls are specifically stated. They were employed respectively 16¾, 20¼, 22½ and 24¼ hours once and sometimes twice a week, during a long period of the year, that is, from four to almost seven months. The girl whose record of hours was most appalling worked 24¼ hours twice in 21 weeks. Her usual long day was 20¼ hours.*

Official reports of the outrageous duration of night work in laundries are also available. An inquiry into the causes of a strike of laundry employes in New York City was conducted in February, 1912, by the Bureau of Arbitration of the New York State Department of Labor. At public hearings, employes testified under oath as to their hours of labor. It appeared that work until 1 a. m. was on occasions not unknown, and that work until midnight was more often found to exist.

* Report on Condition of Woman and Child Wage-Earners in the United States. Vol. V, p. 205. Senate Document No. 645, 61st Congress, 2d Session, 1911.

The three following schedules of "long weeks" reported in the stenographic minutes of evidence,* though they need not be regarded as typical, illustrate to what extremes the night work of women in laundries is carried, when there is no legal closing hour for work.

SOME INSTANCES OF EXTREMELY LONG HOURS IN NEW YORK LAUNDRIES

Day of week	*Woman who has worked 2 years in laundries*	*Woman who has worked 5 years in laundries*	*Woman who has worked 11 years in laundries*
	A. M. P. M.	A. M. P. M.	A. M. P. M.
Monday	12 – 12	12 – 12	? – 9[a]
Tuesday	9 – 11:30	9 – 11:30	9 – 11
Wednesday	9 – 9:30	9 – 9	9 – 8
Thursday	9 – 7	9 – 7	9 – 7:30
Friday	9 – 6:30	9 – 6	9 – 6
Saturday			

[a] Sometimes until 10 p. m. or later. Latest 1 a. m.

We know also that in one great occupation—the telephone service—a host of girls and women are regularly employed at night and all night, where only a few years ago the night service was performed by men and boys. It is true that the telephone companies find it necessary to make better provision for the comfort and safety of their night workers than other employers. Rest rooms are provided, and the night shift is not exposed to the objectionable late return home, being kept on duty almost invariably from 10 p. m. to 5 or 6 o'clock in the morning. But the fundamental physiological objections to night work remain the same: the workers' lack of sleep and sunlight; their inability to make up adequate sleep by day. The shifting army of "telephone girls" keeps changing; often the service holds them

* Not yet published at date of writing. Reproduced by courtesy of the New York Commissioner of Labor.

less than two years, a trade life of extraordinary brevity*; and no one is the wiser as to the effects upon them of this exacting occupation, of which night work is a regular incident.

The recent federal investigation of wage-earning women and children gives little more than sidelights and hints as to the extent and effects of employment at night. But even these scattered data are all in accord with the facts as to health, morals, and efficiency found earlier by the European investigators.

In the investigation of the cotton textile industry, mills were found operating at night in North and South Carolina.† According to the Census‡ there were, in 1908, 293 cotton mills in North Carolina; 59 of these were covered by the investigation. Thirty-one mills operated by night, not counting two which had discontinued night shifts during the year. The number of women and children under sixteen years employed on night shifts was 848, nearly equalling the number of men, 874, employed at night. In South Carolina, the investigation covered 36 of the existing 150 cotton mills. Five mills were found operating at night; 188 women and children under sixteen years were employed, and 155 men.

The agents of the government visited workers who were employed in North Carolina cotton mills during the twelve hours from six in the evening until six in the morning. At eleven o'clock in the morning they were sitting drowsily over scant fires, too listless to seek sleep. When they did lie down, the inevitable noises in thinly partitioned wooden houses, where every sound can be heard from room to room, made sound sleep impossible. "Usually they arose at four

* The Railroad Commission of Wisconsin found that in seven large exchanges of the Wisconsin Telephone Co. in Milwaukee, 290 operators were employed on Jan. 15, 1907, with 22.72 months' average length of service; on Jan. 15, 1908, 407 operators were employed with 18.52 months' average length of service. Senate Document No. 390. Investigation of Telephone Companies, p. 51.

† Report on Condition of Woman and Child Wage-Earners in the United States, Vol. I, Cotton Textile Industry, p. 284. Senate Document No. 645, 61st Congress, 2d Session, 1910.

‡ Census Bulletin No. 97, 1908, p. 10.

or five in the afternoon and again took their seats before the fire, too weary and sluggish to think of a walk in the open air."*

Shocking abuses were found by the investigation, in connection with night work in two small mills in North Carolina. While these cases are not cited as typical, they are given "to show the extremes to which unregulated labor of women and children can go in the absence of legal regulation or of efficient means of enforcement."†

In one of these mills it was common for night workers who had worked all Friday night to continue until 3:30 o'clock on Saturday afternoon, "working approximately twenty and one-half out of twenty-one and one-half consecutive hours." The day workers were "frequently requested to return to the mill immediately after supper and work until midnight, and frequently some one was sent to the homes of employes early in the evening or at midnight to request day workers to come and work half the night. Some employes usually declined to do overtime work. Others worked alternate nights as a regular custom."

Among those who thus worked at night after and in addition to a twelve-hour day, was a family of five children, consisting of three boys, aged ten, fifteen and seventeen years, and two little girls of eleven and thirteen years. Their names were entered upon both the day roll and the night roll of the mill.

"It was found," says the report, "that during a considerable part of the eight months that this family had been at this mill, these children had worked two or three half nights each week, in addition to day work. After working from 6 a. m. to 6 p. m. with 35 minutes for dinner, they had returned to the mill usually every other night immediately after supper, and worked until midnight, when they went home for four or five hours of sleep before beginning the next day's work; or, they had been aroused at midnight and sent to the mill for the second half of the night, where they

*Senate Document, No. 645, Op. cit. Vol. I, p. 289.

† Ibid. Vol. I, pp. 290–291.

remained until six o'clock the following afternoon, except when eating breakfast and dinner. In either case, they were on duty for a working day of seventeen hours, with no rest period save for meals. Those who worked the second half of the night went home for a hurried breakfast just before 6 a. m.

"The father of the family was apparently an active, hardworking man. He expressed the opinion that night work in addition to day work was rather hard on the children, but said that he was trying to get money to buy a home. . . . No member of this family could read or write."

The government agents found the homes of many night workers as dismal and neglected as similar homes were found by investigators abroad. In several cases when both parents worked on night shifts, the children came to the mill to sleep on boxes and rolls of cotton,—pitiable drifts and strays deprived of anchorage.* Or when the mother of a family worked on a night shift and also attended to her home duties, including the weekly washing and ironing, she had to spend "one day at least . . . from 18 to 24 hours without sleeping."

Of the moral degeneration due to night work, the government report on the glass industry gives lurid instances.† Women's work in glass making is confined for the most part to the finishing department and to the lehr-room, where glassware is removed from the lehr or annealing-oven in which it has been slowly cooled after firing. In four factories, however, negro women are employed as substitutes for boys in the furnace rooms. Here, during the night shift and at dawn when work stops, are found at their worst the coarseness and immoralities resulting from the close association at night, of men and women hardened by the most exhausting and hottest labor.

If the character of these poor negro women in the glasshouses be held responsible for the excesses of the night shift and the perils of their lonely return home, what shall be said

* Ibid. Vol. I, pp. 289 and 293.

† Ibid. Vol. III. The Glass Industry, p. 177 ff.

of the similar perils and alarms of refined women employed in night restaurants, whose return home at midnight or thereabouts is compulsory? Can there be any doubt that such a necessity is unworthy of any community calling itself civilized?*

Such, then, are some of the documentary evidences, though insufficient and merely suggestive of the existing night work of women. If we turn now to our fragmentary data as to the economic value of night work, it seems also to corroborate European experience. Just as the silk mill owners of the Vosges and Rhône found weaving by artificial light unsatisfactory, so it is beginning to be found in the silk centers of America.† Just as night work was abandoned by many European employers because of its lesser productivity and the decreased efficiency of their workers, so, says a recent publication of the South Carolina Department of Agriculture, Commerce and Immigration, night work "seems to be generally regarded as a losing proposition."‡

Cotton mill owners in North Carolina who had voluntarily discontinued night work and were therefore disinterested witnesses, were unanimous in declaring to the government investigators that

"it did not pay. They asserted that, as a rule, they could induce only an inferior class of employes to work on the night shifts, with a constant lowering in the quality of product, while at the same time a higher rate of wages than usual was required to secure even this class of help; that continuous operation resulted in more than ordinary 'wear and tear' on machinery, and that there was a disposition to neglect the care of machinery when used jointly by two shifts. The manager of a mill in Georgia, which had carried on night work for a year and abandoned it, expressed the feeling tersely by saying, 'It was hard on the people and hard on the machinery.'" §

* Ibid. Vol. V. Wage-Earning Women in Stores and Factories, p. 75.

† Ibid. Vol. IV. The Silk Industry, p. 143.

‡ The Cotton Mills of South Carolina. Published by the South Carolina Department of Agriculture, Commerce, and Immigration. 1907.

§ Senate Document No. 645. Op. cit., Vol. I, p. 285.

"The indications," says the federal report, "are strong enough to warrant the conclusion that overtime runs to dangerous limits in both mercantile and manufacturing establishments, in the absence of restrictive laws not only setting definitely a limit to the hours of labor per day and per week, but *fixing the closing hours.*"*

The legal closing hour which has been found the only practicable device to check unscrupulous night work, is the most immediate need in our legislation for working women. It must be made an integral part of all laws reducing the length of the workday if they are to be enforceable and if they are to protect the workers in fact as well as in theory.

The special interests are strong enough today to obscure the issues and secure for themselves special license to invert nature's order of life for thousands of working women. Nature's revenges for the infraction of her inviolable law will teach another generation better wisdom, unless reason can in our day prevail over indifference and greed, and restore to wage-earning girls and women the night for sleep.

* Senate Document No. 645. Op. cit., Vol. V. Wage-Earning Women in Stores and Factories, p. 215. Italics added.

XI

CONCLUSION

MANY persons who have followed our argument to this point may be inclined to resent the predominating rôle assigned to overwork and fatigue. They may contend that this stress on the length of working hours is wholly irrational; that overstrain is altogether too limited a cause to assign for the breakdown of health and efficiency. "The really fundamental basis of health," these critics will say, "is contingent upon the total standard of living. The causes of breakdown cannot be isolated, but lie in the total disabilities of working people. Their dark and unsanitary homes, their overcrowding and lack of privacies, their bad food and unpalatable cooking,—all these things are more important for health than the mere number of hours spent at work. And on the industrial side, probably wages and income have a much more direct relation to health than a few hours more or less of work. In curtailing work, therefore," our critic continues, "you are further lessening productivity and income, and so are merely making the struggle for existence harder."

Some conscientious critics go even further than this and contend that leisure is mere temptation to go wrong, when people live in wretched, crowded homes, with only the street and the saloon to satisfy desire. A shortened workday, they say, gives the workers just so much more opportunity for dissipation.

Now it is, in large degree, this point of view on the part of many persons which is responsible for much of the prevalent indifference and ignorance concerning the active injuries of overwork, in industry as it exists today.

In a previous chapter we have dwelt upon the economic fallacy in this criticism, and have shown how output and wages tend to rise rather than fall with shortened working hours, so that income is in the long run increased, not curtailed.

So far as regards temperance and the whole general tone of working communities, we need not rely on theories and speculations. We need only appeal to that body of historical fact to which we have so often turned for light. As a matter of fact, what has been the effect on working people of increased leisure? How have they, on the whole, spent the added hour or hours of freedom from work?

The answer to this question is, indeed, one of the most encouraging chapters in industrial history: the response to opportunity, the rapidity with which working people have learned the uses of leisure. Where cynics prophesied mere drunken idleness and rowdyism, fairer observers found a kind of regeneration. There was no sudden millennium but wherever sufficient time has elapsed since the establishment of a more humane workday, allowing a wider margin of leisure, the workers have made extraordinary advance in physique and morals.* The gradual emergence of the English mill operatives from the physical and moral degeneration into which they had sunk in the thirties of the last century, is not exceptional but typical.† It is a humble chronicle, but full of meaning to any reader who loves the fullness of human nature. Gardening, sewing, the out-of-doors on summer evenings, evening schools in winter, time for the "endearing trivialities of home life,"—these were some of the simple, yet enduring things at which mill workers learned to spend their leisure.

Of the benefits accruing from the change, none have been greater than the increase in temperance. Nor is this surprising. No thoughtful observer can seriously ascribe to

* See Part II of this volume, pp. 290–317.

† British Sessional Papers, 1847–48, Vol. XXVI, p. 9; 1849, Vol. XXII, p. 7; 1850, Vol. XXIII, pp. 48–49; 1868–69, Vol. XIV, p. 83, etc.

man's natural depravity, the domination of liquor with all its attendant miseries. The truth is that among industrial workers the desire for drink has often sprung from sheer physical exhaustion. To a wholly unappreciated extent the sway of alcohol has been due to the worker's craving for some stimulant or support for exhausted energies.

Thus, for instance, in such places of work as the laundries, which make the heaviest demands on muscular and nervous strength, where hours are long and overtime lasts late into the night, drink is the resource of physical debility.

Sir Thomas Oliver, the eminent English expert on industrial diseases, dwells* upon this condition of affairs in England, and the same may be observed in our own country.

"Imagine the amazement of the master of a mill or weaving factory if his employes were to stop in a body for a quarter of an hour twice a day between meals to drink beer! Yet in many laundries the beer is kept on the premises for the purpose. . . . A woman who is expected on Thursdays or Fridays to be in the laundry from 8 or 8:30 in the morning till 9 or 10 or 11 at night, may claim with some show of reason that only by some kind of spur can she keep her overtired body from flagging."

On the other hand, by releasing the workers before the very exhaustion of fatigue overtakes them and inclines them to the strong stimulant of drink, the shorter workday has been a powerful influence toward greater sobriety and self-control.

No thinking person can deny that in the last resort health is determined by the total standard of living; that—besides long hours—poverty and low wages, unsanitary tenements and bad food, dirt and overcrowding, are the tangled causes of lowered vitality and illness. Nor would we minimize the physical effects of mental distress and worry among working people who are only a few months off from real destitution, when a short loss of employment may mean starvation.

* Oliver, Thomas: Dangerous Trades. p. 672. New York, E. P. Dutton and Co. London, J. Murray, 1902.

We would freely grant all that our critics can possibly say of these evils. They cannot be too strongly stated. Yet, so far as the overworked are concerned, all these causes of distress might be removed—wages, food, housing, and sanitation, all be raised to a higher level—and yet the essential cause of breakdown would be untouched so long as the "few extra hours of work" remain, as our supposed critics would call them. The shorter workday and relief from overstrain are not in themselves the cure for the ills we have considered; but they are the *sine qua non* without which no other cure is possible or conceivable. Just because a fatigued person is a poisoned person, poisoned by the accumulation of his own waste products, nothing can fundamentally cure the exhausted worker which does not eliminate the cause of such accumulated poisoning. As we have seen, after exhaustion has set in nothing but rest and repose permits the organism to expel its poisons from day to day.

In Professor Lee's impressive words:

"Mankind at present can administer no food or drug that can push the wearied cells up the metabolic grade either simultaneously with their descent or quickly after the descent has ceased. Only the assimilation and detoxication that normally come with rest, and best, rest with sleep, are capable of adequate restoration of working power."*

It would be no more unreasonable to expect to cure a lead or arsenic-poisoned worker by higher wages, good food, and a clean house while he was continuing daily to absorb the arsenic or lead which was poisoning him, than to expect better food and housing to cure any worker who is habitually accumulating within himself the chemical poisons of fatigue, generated at every breath. Nothing can cure him and restore the buoyant resistance from which alone health springs, which does not allow the actual *time off* from work, for repair and recuperation.

It is true that the psychologists tell us, and with them

* The Harvey Lectures, 1905–06, p. 179. Philadelphia, Lippincott Co., 1908.

the nerve specialists, that to a certain degree the fatigue threshold may be made to shift; that we may discipline ourselves to endurance so as to tap new levels of energy, "masked until then by the fatigue obstacle usually obeyed."

The most famous of American psychologists, who was also one of the "best practical knowers of the human soul," has written upon this phenomenon of "second wind," in an essay of characteristic insight and felicity which has sometimes been quoted as though in defense of any kind of overexertion:*

"We have to admit," says James, "the wider potential range and the habitually narrow actual use. We live subject to arrest by degrees of fatigue which we have come only from habit to obey. Most of us may learn to push the barrier farther off, and to live in perfect comfort on much higher levels of power. . . .

"Stating the thing broadly, the human individual thus lives usually far within his limits; he possesses powers of various sorts which he habitually fails to use. He energizes below his *maximum*, and he behaves below his *optimum*."

Why not assume, then, it has been argued, that the workers who are subject to industrial overpressure learn to push *their* fatigue barriers farther off and sustain the intensity of their tasks in proportion to their new-found powers?

But such an argument strangely distorts the doctrine of second wind, which is something far deeper and more "qualitative" than a stress upon mere bodily exertions and activities.

"When I speak of 'energizing' and its rates and levels and sources, I mean therefore our inner as well as our outer work. . . . To relax, to say to ourselves (with the 'new thoughters') 'Peace! be still!' is sometimes a great achievement of inner work."

Far from justifying even remotely the industrial strains

* James, William: The Energies of Men. Memories and Studies, p. 227. New York, Longmans, Green and Co., 1911.

and stresses such as we have been considering, James specifically limits his plea for deeper and more intensive living by the proviso "so long as decent hygienic conditions are preserved."

But our quarrel with the conditions of industrial labor is precisely that they are *not* "decent hygienic conditions." They are not normal media for human living, and they never can be so long as they continue to infract the first mandates of hygiene, the laws of metabolic equilibrium.

There is a practical consideration also for putting first among the forces which undermine health, the length of the workday. The cure for this injury lies at hand. Shortening the workday is something that legislation can effect for women and children today, for men doubtless in the future. But better conditions within the home—better sanitation, better nutrition and hygiene—can never be enforced by outside authority and can come only by slow process of education as people gradually learn to recognize such needs. The community can demand and enforce the requirement that workers be dismissed from factory and store at a given time. It can never *enforce* the requirements of hygiene at home except when their neglect becomes a public danger, through infection and the like. Hence the establishment of a shorter day is an immediate and practicable as well as an indispensable step towards conserving health.

But this practical consideration fades into insignificance beside the fact that the "few extra hours of work" which our casual critic so under-rates, can wholly undo the benefits of a higher standard of living, even were it assured by long hours. Consider, for instance, the vital matter of nutrition. It is well known that digestion is one of the first bodily functions to suffer in exhaustion. Exhaustion, as it drains our nervous energies, deranges the unconscious reflex activities of the nervous system which, as we have seen, regulate the unconscious actions of our organs—heart, stomach, intestines, and the rest. Their normal action is impaired or retarded.

What, then, is the benefit of a more ample diet if the organism is not in a fit condition to digest what is offered it? The habitually exhausted person scarcely profits from the increased food which larger wages afford, if after excessive work he literally cannot digest it. It has been too dearly bought. So, too, the nervous heart troubles and palpitations among working people of which Dr. Lübenau and the others write,—what are they but derangements of the nervous mechanism which regulates our most vital organ? What good to the worker are the higher standards,—better food, clothing, and shelter—so long as over-fatigue continues to limit or destroy his capacity of enjoying them?

Thus fatigue does mischief negatively as well as positively: lowering vitality and breeding disease is its active and positive aspect. Shutting out the exhausted from their rightful heritage, contracting, binding, inhibiting, is its negative. Other faculties suffer as well as the vital bodily functions. For as exhaustion nullifies the benefits of better food and shelter, so, too, it paralyzes the higher activities, all that feeds man's mental and spiritual needs. The higher standard of living includes besides food and drink and clothing, better education, saner amusements, nobler recreation. But as the over-fatigued digestion fails, so over-fatigued hearing is blunted, over-fatigued attention and appreciation flag. Offer what opportunities you will to the exhausted organism, they fall upon literally deafened ears.* Fatigue so closes the avenues of approach within, that education does not educate, amusement does not amuse, nor recreation recreate. Books and learning, pictures, music, play—all these enfranchisements of the spirit lose their power. "Our fires are damped, our drafts are checked." The wings of freedom are clipped, wings that soar above

> "the heavy and the weary weight
> Of all this unintelligible world."

* Archivio Italiano di Otologia, Rinologia e Laringolavia, July, 1907. No. 4. Della Influenza della fatica sull'organo dell'udito. Dr. Luigi Ragani and Dr. Vincenzo Frazola.

To be so crippled is deplorable enough for any members of society. It is the more so for industrial workers because, with industry as it exists, their development as human beings is more and more dependent upon the use of leisure. It is the peculiar sin of monotonous and subdivided labor that it destroys what we inadequately call pleasure in work,—the ever-so-slight satisfaction of man's creative sense, his dimmest feelings of mastery or self-expression in work, often more pain than joy.

The stress upon spontaneity and joy in work in the foregoing extracts from foreign insurance studies cannot have failed to strike the reader. It is the language of Ruskin and Morris on the lips of German insurance physicians. They actually talk as though there were after all a palpable connection between machine routine and deterioration, between health and the love of work. And these are not merely æsthetic considerations by theorists or dreamers. These physicians are not dealing with the stuff that dreams are made of. They are not seeking to evolve new theories or schemes of industry. They are as yet merely individual scientific observers, struck by brute facts which cannot be escaped: the enormous increase of certain forms of disease and suffering among working people year by year.

In time to come, means may again be found for the play of individuality in work, for some freedom of the human agent from the machine. Industrial training tends in this direction by giving the young some perspective, and teaching the relation of circumscribed tasks to wholes of which they are parts. A medical examination of young persons before employment which would start them towards work for which they are physically fit, and the restriction of all workers from tasks for which they are clearly unfit, will also help to emphasize the human element in manufacture and commerce. The wiser scientific management of businesses also offers vistas of betterment.

But in the main, and viewing the whole trend of industry, we cannot conceal from ourselves that its prodigious

processes are deadening to spontaneity, and that they are becoming more so. We can no more check subdivision and monotony than the pace of the machines. But we can seek to imbue the purely economic view of the workers, as units of production, by a broader physiological spirit. Our studies in fatigue have shown that human power is not a static thing, which can be screwed up to the sticking place and remain there. The workers' muscular powers may be raised to what seems like the *n*th degree, and yet they may fail, broken and unstrung, at an age when working capacity should still be at its height.

It is a truism that trade life in America has been shorter than in foreign countries, where the pace is slower. The race is to the swift in a sense never dreamt of before, and in our industries the swift are necessarily the young, even the very young.

The pace has indeed been kept so high in many great trades, partly because the steady flow of immigration keeps bearing to our shores at intervals of time, young laborers of new immigrant races, able to replace those workers who have broken under the strain. So long as immigration streams westward it may be expedient, from a narrow economic point of view, to press all workers to their physical limits, and to dismiss them so soon as efficiency shows signs of failing. What shall we say from the physiological or racial point of view?

We must bear in mind throughout that the essence of this newer view is its insistence on conserving the energies of men. In this the physiologist voices a larger, intrinsic demand of Democracy itself. He cannot consider man's output separate from himself, nor this year's nor next year's efficiency apart from its effects on future health and energy. Ten years' continuance at a maximum pace is in itself no criterion at all for the physiologist. Even one whole generation is too short to measure the ravages of anti-physiological living; and when overwork unfits man or woman for normal parenthood, it is in a deep sense, anti-physiological and anti-

social. It touches not alone the welfare but the very fibre of human society, that congregate "whole," which it should be our passionate concern to recognize, in the stirring words of the Supreme Court, as "no greater than the sum of all its parts," for "when the individual health, safety and welfare are sacrificed or neglected, the state must suffer."

Granting the truth of the Industrial Commission's conclusion ten years ago—that no program for reducing the intensity of exertion can succeed—there remains another horn of the dilemma, the reduction of the work day.

The workers' time and vitality need not be all consumed in their tasks. In leisure other ranges of the spirit are unfolded: "another race hath been, and other palms are won." The limitation of working hours, therefore, which assures leisure, is not a merely negative program. It limits work, indeed, to make good the daily deficits, and to send back the worker physiologically prepared for another day. It frees the worker from toil before exhaustion deprives leisure of its potentialities. It thus fulfils a reasoned purpose. As the physiological function of rest is to repair fatigue, so the function of the shorter day is to afford to working people physiological rest—with all that is implied further by way of leisure.

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PART II

THE WORLD'S EXPERIENCE UPON WHICH LEGISLATION LIMITING THE HOURS OF LABOR FOR WOMEN IS BASED

Part II consists of the material contained in four briefs submitted by Louis D. Brandeis and Josephine Goldmark to the Supreme Court of the United States (1908), the Supreme Court of Illinois (1909), the Supreme Court of Ohio (1911), and again to the Supreme Court of Illinois (1912). These briefs were submitted in the following cases, in defense of the ten-hour laws of Oregon and Illinois, of the fifty-four-hour law of Ohio, and of the amended ten-hour law of Illinois:

Muller v. Oregon, 208 U. S., 412; Ritchie v. Wayman, et al., 244 Ill., 509; Anna Hawley, ex parte, In the Supreme Court of Ohio, December, 1911; People v. Eldering, In the Supreme Court of the State of Illinois, February term, 1912.

THE WORLD'S EXPERIENCE UPON WHICH THE LEGISLATION LIMITING THE HOURS OF LABOR FOR WOMEN IS BASED

I. THE DANGERS OF LONG HOURS

A. *Causes*

(1) Physical Differences between Men and Women

The dangers of long hours for women arise from their special physical organization taken in connection with the strain incident to factory and similar work.

In structure and function women are differentiated from men. Besides anatomical and physiological differences, physicians are agreed that women are in general weaker than men in muscular strength and in nervous energy. Overwork, therefore, which strains endurance to the utmost, is more disastrous to the health of women than of men, and entails upon them more lasting injury.

British Sessional Papers. Vol. XV. 1831–2. Report from the Select Committee on the "Bill to regulate the Labour of Children in the Mills and Factories of the United Kingdom." **GREAT BRITAIN**

Samuel Smith, Esq., member of College of Surgeons and practising surgeon in Leeds:

10385. Are not the females still less capable of sustaining this long labour than males would be of a similar age?—No doubt whatever of it; because in the female neither the bony nor the muscular system is so strongly developed as it is in the male; in fact, the whole body is more delicately formed.

10386. Is the peculiar structure of the female form so well adapted

GREAT BRITAIN

to long continued labour, and especially which is endured standing, as is that of a male?—No, it is not. (Page 503.)

10453. You stated that females were not as competent to sustain the labour of the factories as males of the same age; is it not considered that females attain to full maturity and full strength much earlier than males?—They do.

10454. And would they not be so able to do the labour proportioned to their strength as the males of the same age?—No, I think not; the female is altogether a more delicate being than the male. (Page 510.)

Thomas Young, Esq., M.D., physician at Bolton:

10600. Will you state whether the female can bear labour as well as the male?—I think females cannot endure labour as well as males. (Page 522.)

John Malyn, Esq.:

10678. Do you conceive that the evils that result from the factory system are such as would fall with still greater severity upon the female sex, as compared with the male?—I think they would, from the greater degree of delicacy of the female frame, and from their having less resiliency than man when acted upon by disease. I have already in an early part of my evidence stated the probable effect of too early employment on the pelvis of that sex. (Page 532.)

10698. You have already said that its effect would be more pernicious to the females, and consequently that they need at least an equal protection, and that, coupled with the circumstances of the majority of those employed in mills and factories being females, strengthens you in your conclusion as to the necessity of a legislative measure on behalf of those individuals?—Yes, for three reasons: first, they are naturally of a weaker constitution than the male; secondly, injuries during growth might be of serious moment at the time of parturition; and, thirdly, their propensities are developed earlier than in the male,—which might be counteracted, if time or means were afforded for mental cultivation. (Page 533.)

James Blundell, Esq., M.D., lecturer on physiology and midwifery in the school of Guy's Hospital:

10874. . . . Will you state whether the female sex is as well fitted to sustain long exertion, especially in a standing position, as the male, either in respect of the peculiar structure of certain parts of the skeleton or of muscular power?—Decidedly females are not so well fitted to bear those exertions as the males; and the standing position long continued is, from the peculiarities of the womanly make, more especially injurious to them. (Page 544.)

Sir Anthony Carlisle, F.R.S., surgeon in the Westminster Hospital:

11067. A considerable majority of those employed in mills and factories are females; do you conceive that the female sex is as well fitted to endure labour of the description alluded to as males?—Oh, no, certainly not; they are by nature less muscular, and I would say there is less sensorial power about them, and less animal vigour. (Page 561.)

Peter Mark Roget, Esq., M.D., F.R.S., practising physician in London, consulting physician to the Northern Dispensary, consulting physician to Queen Charlotte's Lying-in Hospital:

11167. It is known that a considerable majority of persons employed are females; do you think the female constitution is as well adapted to labour of the description alluded to as that of the male?—I think it is not as well adapted, certainly. (Page 570.)

Sir William Blizard, F.R.S., surgeon to the London Hospital and lecturer on surgery, anatomy, and physiology:

11220. It is a known fact, and often referred to as a sort of an apology for this system, that it affords employment to females principally; would you conceive, arguing on physiological principles, that the female is as well calculated to endure long and active labour as the male?—Certainly not; and universal observation would confirm that opinion. (Page 574.)

Sir George Leman Tuthill, F.R.S., physician to the Westminster Hospital and Bethlem Hospital:

11334. . . . Do you conceive that the constitution of the female is as well calculated to sustain long and fatiguing labour as the male?—I do not. (Page 582.)

Joseph Henry Green, Esq., F.R.S., surgeon of St. Thomas's Hospital and professor of surgery at King's College:

11380. . . . Do you conceive that the female frame and constitution is as well adapted to long-continued and strenuous exertion as that of the male?—I do not.

11381. So the protection becomes the more necessary, when we refer to the fact of females being the principal operatives in such works?—Yes. (Pages 587–588.)

Charles Aston Key, Esq., surgeon at Guy's Hospital:

11441. . . . Do you consider that the female sex is, generally speaking, as well calculated to endure labour and fatigue as the male sex?—Much less able to endure labour than the male sex. (Page 593.)

James Guthrie, Esq., F.R.S., vice-president of Royal College of Surgeons, surgeon to Westminster Hospital and to Westminster Eye Hospital:

11488. . . . Will you state whether the female sex is as well fitted to sustain long exertion, especially in a standing position, as the male, either

GREAT BRITAIN

in respect of the peculiar structure of certain parts of the skeleton or of muscular power?—It is not. (Page 596.)

Benjamin Travers, Esq., F.R.S., senior surgeon to St. Thomas's Hospital in Southwark:

11603. It is alleged that a great majority of the young persons employed are of the female sex; do you think females as competent to sustain labour as males?—I should think not, in general. (Page 606.)

British Sessional Papers. Vol. XXVIII. 1844. Reports of Inspectors of Factories for Half-year ending 31st Dec. 1843.

Twelve hours' daily work is more than enough for any one; but however desirable it might be that excessive working should be prevented, there are great difficulties in the way of legislative interference with the labour of adult men. The case, however, is very different as respects women, for not only are they much less free agents, but they are physically incapable of bearing a continuance of work for the same length of time as men, and a deterioration of their health is attended with far more injurious consequences to society. (Page 4.)

British Sessional Papers. Vol. XVII. 1892. Select Committee on Shop Hours Bill.

Witness, Mr. Thomas Sutherst, barrister, and author of "Death and Disease behind the Counter":

1358. You have taken the evidence of 173 male shop assistants?—Yes.

1360. If all these men, with hardly an exception, complain of the conditions of shop life, must it not be harder upon the women than upon the men?—Very much harder. (Page 60.)

Ibid. Report of Lancet Sanitary Commission on Sanitation in the Shop.

Without entering upon the vexed question of women's rights, we may nevertheless urge it as an indisputable physiological fact that, when compelled to stand for long hours, women, especially young women, are exposed to greater injury and greater suffering than men. (Page 248.)

British Sessional Papers. Vol. XII. 1895. Report of Select Committee on Shops (Early Closing) Bill.

Witness, Dr. Percy Kidd, M.D., University of Oxford, Fellow of the College of Physicians and Member of the College of Surgeons; attached to the London Hospital and the Brompton Hospital:

GREAT BRITAIN

5282. Are those symptoms (debility of the nervous system, indigestion, constipation) more marked in women than in men?—I think they are much more marked in women. I should say one sees a great many more women of this class than men; but I have seen precisely the same symptoms in men, I should not say in the same proportion, because one has not been able to make anything like a statistical inquiry. There are other symptoms, but I mention those as being the most common. Another symptom especially among women is anæmia, bloodlessness or pallor, that I have no doubt is connected with long hours indoors. (Page 215.)

British Sessional Papers. Vol. VI. 1901. Report from the Select Committee of the House of Lords on Early Closing of Shops.

Witness, Sir W. MacCormac, President of the Royal College of Surgeons:

2470. Would you draw a distinction between the evil resulting to women and the evil resulting to men?—You see men have undoubtedly a greater degree of physical capacity than women have. Men are capable of greater effort in various ways than women. If a like amount of physical toil and effort be imposed upon women, they suffer to a larger degree. (Page 120.)

British Sessional Papers. Vol. X. 1904. Report of the Chief Inspector of Factories and Workshops. Report on the Thirteenth International Congress of Hygiene and Demography.

Dr. Treves cited the case of a machine capable of giving 33,000 blows per diem, at which the men employed utilize on an average 18,000 to 20,000, while the women, less inured to fatigue and less capable of attention, utilize but 13,000. (Page 298.)

History of Factory Legislation. B. L. Hutchins *and* Amy Harrison. *London, King, 1903.*

Women are "not only much less free agents than men, but they are physically incapable of bearing a continuance of work for the same length of time as men, and a deterioration of their health is attended with far more injurious consequences to society. (Page 84.)

GREAT BRITAIN

Man and Woman. A Study of Human Secondary Sexual Characters. HAVELOCK ELLIS. *London, Scott, 1904.*

In strength as well as in rapidity and precision of movement women are inferior to men. This is not a conclusion that has ever been contested. It is in harmony with all the practical experience of life. It is perhaps also in harmony with the results of those investigators (Bibra, Pagliani, etc. Arch. per l'Antrop., Vol. VI, p. 173) who have found that, as in the blood of women, so also in their muscles, there is more water than in those of men. To a very great extent it is a certainty, a matter of difference in exercise and environment. It is probably, also, partly a matter of organic constitution. (Page 167.)

The motor superiority of men, and to some extent of males generally, is, it can scarcely be doubted, a deep-lying fact. It is related to what is most fundamental in men and in women, and to their whole psychic organization. (Page 169.)

CANADA

Toronto University Studies in Political Science. First Series, No. 3. The Conditions of Female Labour in Ontario. JEAN THOMSON SCOTT, B.A. *Toronto, Warwick, 1892.*

In the struggle for existence women must recognize that whatever they are or may become intellectually, physically they are not men; . . . A girl who had lost her health, and finally was obliged to give up her situation, on account of continuous application to work, which after some years' experience proved beyond her strength, said to me, "We do not know at the time and do not believe that we are over-exerting ourselves." Isolated cases of women having shown themselves able to stand a severe physical strain cannot refute the fact that a vast majority of women are of a weaker mould than men, and that overwork has in many cases been the cause of a life of semi-invalidism. It is nothing short of criminal to permit, let alone to exact, an undue exertion of physical strength from women; and it is the duty of the government to prevent it. That women are willing, nay, even anxious sometimes, to attempt hard physical labour, is no reason for their being permitted to do so. (Page 29.)

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Verhandlungen des Deutschen Reichstags. 103. Sitzung. 18. April, 1891. [*Proceedings of the German Reichstag. 103d Session, April 18, 1891.*]

Representative Bebel:

Workers, both men and women, who realize the true relations of life and labor are everywhere united in endeavoring to shorten the hours of

labor as much as is possible. . . . Even those who refuse to listen to this request from working men are inclined to take a different attitude in regard to working women. (Pages 2418–2419.) GERMANY

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichts-beamten. XXII. 1897. [*Official Information from the Reports of the (German) Factory Inspectors, 1897.*] *Berlin, Bruer, 1898.*

The inspector from Baden writes:

The present 11-hour day, requiring constant standing, in weaving and spinning rooms, is far more destructive to the organism of women than it is to men. The undermining effects of the long hours mentioned upon health are clearly noticeable in the appearance of the middle-aged women. (Pages 241–242.)

Hygiene of Nerves and Mind in Health and Disease. AUGUST FOREL, M.D. *Formerly Professor of Psychiatry in the University of Zurich. Trans. from the German by* AUSTIN AIKENS, Ph.D. *London, Murray, 1907.*

The nervous hygiene of women demands special consideration because certain periods of their life require extraordinary precautions in view of the special predisposition to nervous troubles caused by menstruation, pregnancy, confinement, and the climacteric. (Page 320.)

It is of special importance to accentuate the injuriousness of certain kinds of fine hand-work which overstrain the attention and irritate the brain, especially long-continued sewing and similar sedentary occupations that strain the mind. The one-sided over-doing of such work makes many women nervous and psychopathic or exaggerates bad tendencies which are already present. (Page 321.)

Report of the Massachusetts Bureau of Statistics of Labor, 1875. UNITED STATES

Mr. D——, the publisher of a well-known periodical, says:

I have had hundreds of lady compositors in my employ, and they all exhibited, in a marked manner, both in the way they performed their work and in its results, the difference in physical ability between themselves and men. They cannot endure the prolonged close attention and confinement which is a great part of type-setting. I have few girls with me more than two or three years at a time; they must have vacations, and they break down in health rapidly. I know no reason why a girl could not set as much type as a man, if she were as strong to endure the demand on mind and body. (Page 91.)

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Report of the New York Bureau of Labor Statistics, 1884. Hygiene of Occupation, by DR. ROGER S. TRACY, *Sanitary Inspector of the Board of Health, New York.*

Since the dangers due to various occupations have been brought to public notice, it has become a grave question how far the employment of women and children in factories should be allowed. Women are certainly more delicately organized than men, less capable of sustained muscular exertion, and more susceptible to many of the poisons used in the arts and manufactures. As the physical condition of women has such an important bearing on the welfare of the race, and on the health of future generations, it becomes fairly a question of government control. (Page 199.)

Report of the Maine Bureau of Industrial and Labor Statistics, 1888.

Let me quote from Dr. Ely Van der Warker (1875):

Woman is badly constructed for the purposes of standing eight or ten hours upon her feet. I do not intend to bring into evidence the peculiar position and nature of the organs contained in the pelvis, but to call attention to the peculiar construction of the knee and the shallowness of the pelvis, and the delicate nature of the foot as part of a sustaining column. The knee-joint of woman is a sexual characteristic. Viewed in front and extended, the joint in but a slight degree interrupts the gradual taper of the thigh into the leg. Viewed in a semi-flexed position, the joint forms a smooth ovate spheroid. The reason of this lies in the smallness of the patella in front, and the narrowness of the articular surfaces of the tibia and femur, and which in man form the lateral prominences, and thus is much more perfect as a sustaining column than that of a woman. The muscles which keep the body fixed upon the thighs in the erect position labor under the disadvantage of shortness of purchase, owing to the short distance, compared to that of man, between the crest of the ilium and the great trochanter of the femur, thus giving to man a much larger purchase in the leverage existing between the trunk and the extremities. Comparatively the foot is less able to sustain weight than that of man, owing to its shortness and the more delicate formation of the tarsus and metatarsus. (Pages 142–143.)

Report of the Nebraska Bureau of Labor and Industrial Statistics, 1901–1902.

They (women) are unable, by reason of their physical limitations, to endure the same hours of exhaustive labor as may be endured by adult

males. Certain kinds of work which may be performed by men without injury to their health would wreck the constitution and destroy the health of women, and render them incapable of bearing their share of the burdens of the family and the home. The State must be accorded the right to guard and protect women as a class against such a condition, and the law in question to that extent conserves the public health and welfare. (Page 52.)

Report of the New York Department of Labor. Report of the Commissioner of Labor, 1908. C. T. GRAHAM-ROGERS, M.D., *Medical Inspector of Factories.*

The average healthy woman is very much inferior in physical strength and endurance to the average man. Her physical conformation is different, and the physiological and social parts that she plays in life differ from those played by man, therefore we find her more susceptible to the effects of hard labor and prolonged or sedentary occupation, which susceptibility is increased during the child-bearing period. (I. 73.)

Reference Handbook of the Medical Sciences. Hygiene of Occupation. Vol. VI. 1903. GEORGE M. PRICE, M.D., *Medical Sanitary Inspector, Health Department of the City of New York.*

In many industries . . . female labor is very largely employed; and the effect of work on them is very detrimental to health. The injurious influences of female labor are due to the following factors: (1) The comparative physical weakness of the female organism; (2) The greater predisposition to harmful and poisonous elements in the trades; (3) The periodical semi-pathological state of health of women; (4) The effect of labor on the reproductive organs; and (5) The effects on the offspring. As the muscular organism of woman is less developed than that of man, it is evident that those industrial occupations which require intense, constant, and prolonged muscular efforts must become highly detrimental to their health. This is shown in the general debility, anæmia, chlorosis, and lack of tone in most women who are compelled to work in factories and in shops for long periods.

The increased susceptibility of women to industrial poisons and to diseases has been demonstrated by a great number of observers. The female organism, especially when young, offers very little resistance to the inroads of disease and to the various dangerous elements of certain trades. Hirt says, "It must be conceded that certain trades affect women

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a great deal more injuriously than men"; and he mentions, among others, the effects of lead, mercury, phosphorus, and other poisons. Even where there are no special noxious elements, work may produce, as already mentioned, harmful effects on the health of women; but when to the general effects of industrial occupation are added the dangers of dust, fumes, and gases, we find that the female organism succumbs very readily, as compared with that of the male. Schuler found the frequency of sickness in females under eighteen, as compared with that of men of the same age, as 174 to 100. Miss Mary E. Abrams (Oliver: "Dangerous Trades") found that out of 138 lead-poisoning cases in Newcastle, where the number of men and women workers was about the same, there were ninety-four cases among the women and forty-one among the men. She also found that out of the twenty-three deaths from plumbism in the years 1889–1892, twenty-two were women and only one was a man. The women were all between seventeen and thirty years of age. These figures are substantiated by Hirt, Arlidge, C. Paul, Tardieu, and others. The predisposition of women in industrial occupations to disease in general is greater than it is in men, as was proven by Hirt in his statistics of tuberculosis among workers. The effect of work on the physical development of women was found to be very detrimental, especially when they were very young. Arlidge says that in those who from their youth work in high temperatures, the bones and joints are imperfectly developed, and that they are liable to female deformities and to narrow pelves. Herkner found in his studies of Belgian female workers that girls who are engaged in mines suffered from deformed joints, from deformities of the spinal column, and from narrow pelves.

It has been estimated that out of every one hundred days women are in a semi-pathological state of health for from fourteen to sixteen days. The natural congestion of the pelvic organs during menstruation is augmented and favored by work on sewing-machines and other industrial occupations necessitating the constant use of the lower part of the body. Work during these periods tends to induce chronic congestion of the uterus and appendages, and dysmenorrhœa and flexion of the uterus are well-known affections of working girls. (Page 321.)

(2) The Greater Morbidity among Women

(*a*) General Morbidity

The need of protecting the health of working women by limiting their working hours is emphasized by statistics of

the relative morbidity of men and women. In all countries where such statistics have been kept by sickness insurance societies, the morbidity of women has been found to be higher than that of men.

Sixth International Congress of Hygiene and Demography. Vienna, 1887. Part XIV, Vol. I. Fabrikhygiene und Gesetzgebung. [*Factory Hygiene and Legislation.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector. Vienna, 1887.* SWITZERLAND

At time of menstruation, during pregnancy, and after childbirth, the woman is especially liable to infectious and other diseases. This has been proved by the statistics of morbidity in Switzerland in those industrial establishments where men and women are at work together in the same trade, the proportion of cases of illness being as follows: Women, 127; men, 100. The number of days lost compared thus: Women, 150; men, 100. These proportions become more divergent when the workers are under 18 years of age. Thus, for such workers we find: proportion of cases of sickness; girls, 174; boys, 100. Taking the statistics of cotton mills only, we find the proportion of cases of sickness; for women, 156; for men, 100. These figures alone, to go no further, show the necessity of special protection for those who, without this legal protection, are liable to be frightfully exploited. (Page 29.)

Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*Investigations into the Conditions of Health of the Swiss Factory Workers.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector, and* Dr. A. E. BURCKHARDT, *Prof. of Hygiene, Basle. Aarau, Sauerländer, 1889.*

There are great varieties in the morbidity of the two sexes. In general men showed a greater frequency of sickness than women. In 1000 general cases there were among men 291 cases of illness; among women, 257. This result is partly induced by the large number of men in mechanical shops who fall ill. If, however, the figures are taken solely from workers in the same occupation the results are often reversed. So, for example, in cotton mills (spinning processes), where women show a morbidity of 128 : 100 as compared to men, and in cotton factories (weaving processes) of 139 : 100. In the silk mills the proportion of illness among the women is even more extreme, while in machine embroidery it is nearer to a balance —111 : 100. (Pages 33–34.)

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An das Schweiz. Industriedepartement, Bern. Die Eidgenössischen Fabrikinspectoren. [*Report of the Swiss Factory Inspectors to the Swiss Department of Labor on the Revision of the Factory Laws.*] *Schaffhausen, 1904.*

The 10-hour day is now almost the rule for men. . . . Those industries where the 11- or 12-hour shift is retained are almost entirely those which employ chiefly, or in large proportions, women and children. In other words, those as yet unprotected classes of workers who are obliged to toil for the longest number of hours in a day are almost entirely women and children. And yet women should be better protected than men, not only because their physical strength is less, but because they are the bearers of the race, whose vigor is materially modified by the health of the mothers. The State has the deepest interest in maintaining vigorous and able defenders, and therefore its foremost duty is to protect women and children from being overburdened. This necessity is most glaring in the case of cotton mills, as the researches of Schuler and Burckhardt, which have never been contested, prove a morbidity of women in this industry notably greater than that of men in the same. (Pages 26–27.)

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Verhandlungen des Deutschen Reichstags, 103. Sitzung. 18. April, 1891. [*Proceedings of the German Reichstag, 103rd Session, April 18, 1891.*]

Representative Dr. Schædler:

At the Sixth International Congress of Hygiene in Vienna, 1887, Dr. Schuler, the expert factory inspector, pointed out the greater liability of women to disease produced by unfavorable factory conditions. He stated that the morbidity of women in factory work in Switzerland had been approximately 27 per cent higher than that of men in the same industries. (Page 2406.)

Das Verbot der Nachtarbeit. Bericht erstattet an den internationalen Kongress für gesetzlichen Arbeiterschutz in Paris, 1900. (*Schmoller's Jahrbuch, 25*$^{3-4}$.) [*Prohibition of Night Work. Report presented to the International Congress for Labor Legislation at Paris, 1900.* (*Schmoller's Yearbook, 25*$^{3-4}$.)] Dr. Max Hirsch, *Germany. Leipzig, 1901.*

Adult women have also an inferior power of resistance to the evils of night work as well as to the other harmful tendencies of industry. . . . On this point the sick benefit funds give striking testimony. (Page 1265.)

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Schriften der Gesellschaft für Soziale Reform, Heft 7–8. [*Publications of the Social Reform Society, Nos. 7 and 8.*] *Die Herabsetzung der Arbeitszeit für Frauen und die Erhöhung des Schutzalters für jugendliche Arbeiter in Fabriken.* [*The Reduction of Women's Working Hours and the Raising of the Legal Working Age for Young Factory Employees.*] Dr. AUGUST PIEPER *and* HÉLÈNE SIMON. *Jena, Fischer, 1903.*

The daily toil in factory or shop, the harm that—aside from the evitable mental and physical exertion—arises from harmful bodily postures, such as continuous sitting or standing, and from the dust or steam that fills workrooms, has been becoming more extensive with the lapse of years, and the longer the hours of work, the more serious are the bad results of these conditions. The statistics of the Sickness Insurance Societies, both as to the total number of cases of illness and as to the relatively longer duration of attacks of illness among working women, show an astonishing amount of sickness under the present working hours. The reports of the factory inspectors for 1899 upon the employment of married women in factories show that they especially suffer an alarming extent of ill-health, and that this is, in many cases, directly traceable to beginnings long before marriage. (Pages 4–5.)

In contrast to the usual "occupation diseases" (as lead colic, etc.) are the characteristic diseases of weakness among women wage-earners, viz., anæmia and chlorosis; as in the printing trades of Berlin, where among the 4734 women there were 296 such cases, but only 72 among all the 11,801 men insured in these trades.

When the dangers to both sexes are alike, the figures of the sick fund are always higher for women, unless the totals are complicated by accidents.

It is so in textiles, glove and shoe trades, in the post-office and cigar manufacture. The Local Insurance Society for Berlin in 1899 showed 29.7 per cent ill, and 41.0 per cent women in cigar-making. According to Wirminghaus the percentage of illness in all Germany in 1888 in cigar-making was 0.20 for men and 0.25 for women, while the percentage for the whole country in spinning and weaving was 0.61 for men and 0.72 for women. (Page 93.)

Die Neue Zeit, 23², 1905. Ehret die Frauen. [*Honor to Women.*] EMANUEL WURM. *Stuttgart, 1905.*

In 1903 there were 1,000,000 and more women working beside the 4,000,000 men in German mills and factories. . . . The factory laws have some protective regulations, but not nearly enough to equalize the woman's far inferior physical power of resistance with that of men. The

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indisputable proof of this lies in the far higher percentage of illness among the women operatives as shown by the sick funds. Many such funds, as, for instance, those of the textile industry, with its membership of 420,000 women and 380,000 men in 1903, are, by this disproportionately high morbidity of women, in the most embarrassing financial situation. (Pages 156–157.)

AUSTRIA

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par Prof. ÉTIENNE BAUER. [*Nightwork of Women in Industry. Reports on its importance and legal regulation. Preface by* Prof. ÉTIENNE BAUER.] *Le Travail de Nuit des Femmes dans l'Industrie en Autriche.* [*Nightwork of Women in Industry in Austria.*] ILSE VON ARLT. *Jena, Fischer, 1903.*

According to the testimony of the Sickness Insurance Societies, women, when subjected to the same work as men, have a larger percentage of illness, this predominance being attributed to the influences of industrial labor, since the loss of time incident to childbirth is classified separately. It is much to be regretted that there are no data available which might enable us to judge how women would stand as to health, compared with men, provided that they were only employed during periods when their working capacity was unimpaired. Such data would not simply have purely theoretical interest, but would enable us to determine with precision the dangers to which women are exposed in the different industrial lines, and to elaborate protective measures for them upon an exact basis. (Page 100.)

FRANCE

Tenth International Congress of Hygiene and Demography. Paris, 1900. In one volume. Législation et réglementation du travail au point de vue de l'hygiene. [*Labor Legislation and Regulation from the Standpoint of Hygiene.*] M. ÉDOUARD VAILLANT. *M.R.C.S., England. Paris, Masson et Cie., 1900.*

. . . All reduction of daily and weekly working hours must be regarded as important hygienic progress.

If we study the statistics of morbidity and mortality in the different trades, and seek to isolate, as far as possible, the effects of dangerous trades and of working hours, we shall see very plainly in the reports of factory inspectors, and especially in the insurance records of Germany and Austria, that the reduction of working hours has succeeded, in a few years' time, in bringing down the totals of morbidity and mortality even below

the total of trades that are considered relatively more healthy, but where the length of hours had not been decreased. (Pages 515 and 516.) FRANCE

Report of the New York Bureau of Labor Statistics, 1890. UNITED STATES

Dr. Schuler, factory inspector of Switzerland, states in a recent report: ". . . According to the experiments made in Switzerland, the morbidness of female factory operatives is 27 per cent higher than that of males; and the average number of days during which the former are incapacitated to work is one and a half times as great as in the case of male workers." (Page 81.)

Bulletin of the United States Bureau of Labor, No. 75, March, 1908. Industrial Hygiene. GEO. M. KOBER, M.D., LL.D.

The statistics of the morbidity and mortality of various occupations, while far from satisfactory, and subject to more or less erroneous conclusions, nevertheless indicate that persons habitually engaged in hard work are more frequently subject to disease, and present a higher mortality than persons more favorably situated; and this is especially true of factory employees, because their work is generally more monotonous, fatiguing, performed under less favorable surroundings, and they are too often also badly nourished and badly housed. (Page 473.)

(*b*) DURATION OF ILLNESS GREATER AMONG WOMEN

The morbidity of women, measured by the number of days lost through illness, is greater than that of men. That is, women suffer from illnesses of longer average duration than men do,—and consequently are more disastrously affected by exhaustion from overlong working hours.

Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*Investigations into the Conditions of Health of the Swiss Factory Workers.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector, and* Dr. A. E. BURCKHARDT, *Prof. of Hygiene, Basle. Aarau, Sauerländer, 1889.* SWITZERLAND

If, however, not only the frequency but the average duration of single cases of sickness is observed in the two sexes, it will be found that the duration of illness averages, among men, only 85 per cent of that among women. And this prolonged duration of illness is not only found in single branches of industry, but throughout all—probably from various

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causes. For the woman not only belongs to the "weaker sex," but she is also the one who makes most effort to employ herself usefully in the house, even when she is not well enough to work in industry—contrary to the man whose work is entirely outside of the house. . . . More favorable figures for women are only found among youthful workers. (Page 34.)

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Jena, Fischer, 1903.*

From the hygienic point of view it is evident that the protection of wage-earning women can have only good effects, when we remember that the susceptibility of women with regard to disease germs is greater than that of men. According to the data of the statistics of diseases of the German Empire there have been for each case of sickness among the men 16 days, and for each case among the women 18 days of assistance or treatment at the hospital during the years 1888–1899. In Switzerland, judging from the researches made by F. Schuler and A. E. Burkhardt (1889) on the health conditions of factory workers, the average duration of sickness has been 21 days for men and 25 days for women. (Page xxxvii.)

Die Gegenseitigen Hilfsgesellschaften in der Schweiz im Jahre 1903. [*Mutual Aid Societies in Switzerland in 1903.*] *Berne, 1907.*

Of 100 men insured, an average of 26.76 received sick relief, but of 100 women only 24.26.

The men who received sick relief averaged 23.55 days of illness: the women averaged 32.46.

The women, therefore, show a lower percentage of relief, but a longer average of sick time, and, as a result of both circumstances, the average morbidity of the women is higher than that of the men,—7.87 as against 6.30. (Page 42.)

FRANCE

Encyclopédie d'Hygiene et de Médecine Publique, T. 6. [*Encyclopedia of Hygiene and Public Medicine, Vol. 6.*] *Edited by* Dr. JULES ROCHARD. *Le Travail des Enfants et des Femmes dans l'Industrie.* [*Industrial Labor of Women and Children.*] Dr. ALEXANDER LAYET. *Paris, Delahaye, 1894.*

The few statistics that we possess on these lines show that the morbidity of women is greater than that of men in the same trades.

The Mutual Aid Society of silk workers at Lyon (with 4117 members of

all ages and both sexes) in 1889 found that the days of sick time for the men in its membership amounted to 1522, and for the women, during the same time, 3978. Between the ages of 20 and 40, the days lost by sickness averaged 3.56 apiece for men, and 7.28 for the women. (Page 721.) FRANCE

Italian Workman's Aid Societies with mixed membership showed the same results. Thus, while between 20 and 40 years each man in the membership lost 5.4 days' average by sickness, the women's average was 8.1. (Page 722.)

Handbuch der Hygiene, Bd. 8[1]. [*Handbook of Hygiene, Vol. 8*[1].] *Edited by* Dr. THEODORE WEYL. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. EMIL ROTH. *Jena, Fischer, 1894.* GERMANY

The investigations of Schuler and Burckhardt, embracing 18,000 members of Swiss insurance against sickness (about 25 per cent of the Swiss factory workers and fifteen industries), show that factory work, even in a short period, produces very unfavorable effects upon the development of the body of young men. It is even more conspicuous in the case of women. Thus, of 1000 men in the manufacture of embroidery, 302 were sick to 332 women. In bleaching and dyeing, 279 men, 316 women; also in cotton spinning and weaving, the morbidity of women was much greater than of men.

Similarly, the number of working days lost through illness was more among women than among men, being 6.47 among women to 6.25 among men.

With increasing years, both frequency and duration of illness increase. (Page 7.)

A second form of physical inferiority of women is their lessened refractoriness to external injurious conditions. All statistics dealing with the relative morbidity of men and women employed in factories justify the deduction that the greater number of days lost from work by women indicate that disease makes greater inroads upon them, and that in general industrial labor is more injurious to women than to men. (Page 87.)

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1903. Bd. I, Preussen. [*Annual Reports of the (German) Factory and Mine Inspectors for 1903. Vol. I, Prussia.*] *Berlin, Decker, 1904.*

The following figures are taken from the statistics of the local sickness insurance societies for men and women in tailoring and allied trades (chiefly dressmaking establishments of Berlin) and also, for the first time, for those employed in home industries (needle trades), for the year 1902.

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Corresponding figures for all the German Sickness Insurance Societies throughout the Empire, with over nine and a half million members, are given from the imperial statistical year-book for 1900 and 1901:

	Tailoring Trades 35,627 Members	General German Statistics 9,500,000 Members	
	1902	*1900*	*1901*
Cases of illness per member	0.36	0.39	0.38
Days of illness per member	9.21	6.82	6.91
Average duration of an illness	25.6	17.4	18.1

The figures showing cases of illness to each member are seen to be lower in the tailoring trades, but those showing the average days of illness and the average duration of illness are both considerably higher. This difference is largely due to the women members, who constitute ninety-two per cent of the workers. The figures relating to the men tailors approach more nearly to those of the General Imperial Statistics. (Page 71.)

Handbuch der Medizinischen Statistik. [*Handbook of Medical Statistics.*] Dr. Friedrich Prinzing, *Ulm. Jena, Fischer, 1906.*

The days of illness per person averaged, to every 100 persons, as follows:

Age	Frankfort		Austria		Bockenheim	Mutual Leipzig, 1856–80		Ital. Workingmen's Society, 1866–75
	Men	*Women*	*Men*	*Women*	*Men*	*Men*	*Women*	*Men*
Under 15	14.7	18.4	12.6	14.5	10.3	..	..	17.9
15–20	16.4	19.3	13.7	16.1	12.5	19.3	21.6	23.4
20–30	19.3	24.6	14.3	18.0	12.3	19.9	30.3	24.9
30–40	22.7	31.4	15.9	20.2	13.9	24.0	33.4	25.4
40–50	27.1	31.6	18.6	21.6	17.9	30.7	37.9	28.2
50–60	32.9	45.4	21.4	23.9	19.4	38.9	44.4	30.3
60–over	38.9	58.1	29.8	31.3	26.0	44.1	55.1	36.8
Average	21.6	24.4	16.5	18.8	14.3	27.4	35.0	27.3

(Page 110.)

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The appearance of anæmia and chlorosis among women is unusually frequent, especially when the cases of those who continued at work are included. In Frankfort, about one-fifth of all the insured women members have medical treatment for these troubles. (Page 116.)

Geschäfts-Bericht der Ortskrankenkasse für Leipzig und Umgegend, über das Jahr 1907. [*Official Report of the Local Sickness Society of Leipzig and Environs for 1907.*] *Leipzig, Bär und Hermann, 1907.*

Most of the published statistics speak only of "members" without distinguishing between men and women. How different the curve actually is for men and women is shown in the following table:

Age	Days of Sickness for	
Years	*One hundred Men*	*One hundred Women*
Under 15	595.0	533.5
15–19	617.4	753.6
20–24	657.1	955.0
25–29	707.5	1,205.4
30–34	813.6	1,395.1
35–39	940.9	1,465.3
40–44	1,088.0	1,453.3
45–49	1,243.4	1,495.9
50–54	1,456.2	1,489.8
55–59	1,704.7	1,485.0
60–64	2,068.9	1,631.7
65–69	2,760.3	2,376.0
70–74	3,456.3	2,530.5
75 and over	4,042.9	2,512.1

(Page 74.)

The curve of women shows how injuriously the double task of being woman and wage-earner affects them. It is evident their number of days lost through sickness during the years of development and child-bearing capacity is greatly in excess of those lost by men. The younger women, those under 15, have a more favorable curve of morbidity than boys of the same age. From 15 to 54 years women are more subject to loss of time from illness than men. Only when the active period of sex

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life has passed does the woman's curve again show her superior resistance to morbidity as well as to mortality. (Page 75.)

Statistik des Deutschen Reichs. Bd. 186. [*Statistics of the German Empire. Vol. CLXXXVI.*] *Die Krankenversicherung im Jahre 1906. Bearbeitet im Kaiserlichen Statistischen Amt.* [*Sickness Insurance for 1906. Compiled in the Imperial Office of Statistics.*] *Berlin, 1908.*

According to Heym, among 100 cases of illness, the length of time lost by men as compared with women was as follows:

	Men	Women
	Per cent	*Per cent*
14–25 weeks	3.5	5.7
26 weeks and over	2.3	2.8

Prinzing adds to this: "Sickness of short duration is almost twice as frequent among men as women: but with sickness of a longer duration (more than 3 weeks), the case is exactly reversed." (Page 12.)

(*c*) Continuance at Work during Illness

Women suffering from minor illnesses continue at work more commonly than men. That is, women have fewer illnesses involving complete loss of earning capacity, more illnesses during which they continue to remain at some form of work. Hence excessive hours of labor are doubly injurious to them, because often performed when health is already impaired.

Handbuch der Medizinischen Statistik. [*Handbook of Medical Statistics.*] Dr. Friedrich Prinzing, *Ulm. Jena, Fischer, 1906.*

The records next below show only those cases of illness that entailed incapacity for work. The numbers, as before, show the percentage, exclusive of confinements.

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Age	General Relief Fund. Some Voluntary Members		Vienna 1896 Trade Societies' Funds (Genossenschaftkasse)		Mutual (Gegenseitigkeit). Leipzig. 1856–80		Italian Workman's Society 1866–75
	Men	*Women*	*Men*	*Women*	*Men*	*Women*	*Men*
Under 15	43.4	30.9	38.2	26.9	..	..	28.0
15–20	56.9	46.9	40.2	36.5	29.5	20.3	29.6
20–30	51.6	48.0	29.4	26.9	25.6	20.8	25.0
30–40	53.3	46.8	27.9	26.3	24.5	19.6	24.4
40–50	55.4	52.9	35.3	28.2	26.1	18.8	24.8
50–60	57.0	49.9	41.8	30.6	28.1	18.4	26.3
over 60	68.0	59.2	56.2	41.4	31.7	21.5	31.2

The differences in frequency of illness in the above tables could only be explained by a thoroughgoing consideration of the details of the management of the sick funds. . . . (Page 107.)

The difference in morbidity between the two sexes is obvious. In general, women have fewer illnesses involving complete inability to work, than men. . . . On the other hand, illness without loss of earning capacity is much more frequent among the women. (Page 108.)

The total list of all the Berlin sickness insurance offices for 1898 show that to every hundred men insured, 39.46 had illness attended with loss of earning capacity, and of every hundred women, 37.64 had illness attended with loss of earning capacity. (Page 115.)

Inquiries have all shown that the number of sick cases with loss of earning capacity do not in themselves alone give a correct idea of the morbidity of an occupation. (Page 125.)

To estimate the morbidity of an occupation those cases of illness which do not necessitate loss of earning power must be considered. It is then found that many occupations which appear favorable when loss of earning power alone is considered, have actually a much worse standing. So, for instance, Frankfort a. M. in the year 1896, has the following tables. Among women the cases of illness without loss of earning capacity predominate in every occupation.

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Frankfort a. M.

Men	Cases of Illness				To Every 100 Members (Including Both Sick and Well)			
	20–30 Years		*30–40 Years*		*40–50 Years*		*50–60 Years*	
	Able to earn	*Not able*	*Able to earn*	*Not able*	*Able to earn*	*Not able*	*Able to earn*	*Not able*
Factory workers and day laborers	33	34	34	41	30	45	31	56
Porters, Packers	40	24	46	30	51	31	52	33
Traffic men and drivers	32	31	28	30	26	41	34	55
Waiters, Cooks	44	21	43	25	50	39	42	68
Salespersons	55	21	41	20	45	34	60	26
Printers-lithographers	43	29	49	31	41	37	44	31
Tailors	44	21	52	28	37	32	53	37
Carpenters	40	33	50	37	27	30	43	54
Painters, Varnishers	28	29	33	35	40	53	46	58
Smiths (lock and other)	49	36	42	34	43	55	41	48
All occupations	41	29	38	35	37	40	40	48

(Page 126.)

Women	Cases of Illness				To Every 100 Members			
	20–30 Years		*30–40 Years*		*40–50 Years*		*50–60 Years*	
	Able to earn	*Not able*	*Able to earn*	*Not able*	*Able to earn*	*Not able*	*Able to earn*	*Not able*
Factory and day workers	45	37	52	40	47	32	51	40
Servants	43	24	43	30	30	26	42	38
Waitresses, Cooks	46	21	35	18	53	34	25	41
Salesgirls	63	30	64	37	33	20	47	37
Sewing women	53	31	62	40	49	40	29	54
All occupations	51	31	51	36	42	33	41	40

(Page 127.)

(*d*) Mortality

Statistics show that the mortality of working women is higher than that of working men, and also higher than that of other women not at work.

Journal of the Royal Statistical Society, Vol. LV. London, 1892. Morbidity and Mortality according to Occupation. Dr. Jacques Bertillon, *Chief of the Municipal Statistical Department of Paris. [Trans. from the Journal de la Société de Statistique de Paris, October–November, 1892.]* FRANCE

[*Statistics from the Lyons Silk Workers' Mutual Aid Society—(Société de Secours mutuels des Ouvriers en Soie de Lyon),—the Statistical Office of Italy, and M. Henri Rauchberg's Study of Workmen's Sick Funds in Vienna—(Die Erkrankungs und Sterblichkeits Verhältnisse bei der allgemeinen Arbeiter, Kranken, und Invaliden Casse in Wien—Statistische Monatschrift, Vienna, 1886.).*

Women between 20 and 45 show a considerably greater morbidity than men of the same age; above 45 their rate approaches that of the men. At least it is so in the Lyons Silk-Workers' Society, in the Italian societies, and (as far as can be judged from a table in which there is no distinction of age) in the Vienna Arbeiter-Casse. At the same time it should be noted that among the Lyons silk-workers not only the morbidity but also the mortality of females is considerably above that of the males, whereas the opposite holds good with the population as a whole. It is thus at least permissible to enquire whether there be not some peculiarity in this employment which is hurtful to the health of the women engaged in it. The Italian table, which includes a great number of occupations, also brings out a higher rate of morbidity for women than for men, and their mortality at each age (calculated, however, from too small a number of cases) is greater than that of the men.

The tables of the Vienna Arbeiter-Casse point also to the fact that the morbidity of women (526 cases and 9,255 days of sickness per annum per 1,000 women) is above that of men (427 cases and 8,366 days). (Pages 564–565.)

Note (6). The general mortality of the women (without distinction of age) is, on the other hand, less than that of men, while the mortality at each age is greater. To explain this apparent anomaly, it is sufficient to consider the first two columns in Table II: it will be seen that nearly half the women (42 per cent) are under 40

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years of age, whilst only a quarter (26 per cent) of the men are under 40. The female members being younger, it is not surprising that their general mortality is lower than that of the men, although their mortality at any particular age is greater.

TABLE II. COMPARATIVE MORBIDITY OF THE TWO SEXES

AGE OF THE MEMBERS	LYONS SILK-WORKERS (1872–1889)				ITALIAN SOCIETIES (1881–1885) (CORRECTED FIGURES)					
	Annual average number of members		*Morbidity*		*Mortality*		*Morbidity*		*Mortality*	
			Days of sickness per annum per member		*Deaths per annum per 1000 members*		*Days of sickness per annum per member*		*Deaths per annum per 1000 members*	
Years	*Mas.*	*Fem.*	*Mas.*	*Fem.*	*Mas.*	*Fem.*	*Mas.*	*Fem.*	*Mas.*	*Fem.*
18 and 19	96	479	1.76	2.18	..	..	..	..	..	..
20–24	607	3897	3.06	6.37	13.0	10.2	5.0	7.8	6.3	..
25–29	1481	6100	3.40	7.49	5.4	9.3	5.4	8.0	5.9	9.1
30–34	2507	7377	3.37	7.64	6.4	9.2	5.1	8.9	6.2	10.7
35–39	3259	8209	4.32	7.62	6.4	8.9	6.0	7.7	7.8	8.1
40–44	3442	8161	5.29	7.64	10.2	6.2	6.2	9.3	9.2	10.0
45–49	3569	7720	5.89	8.12	11.8	13.5	6.8	8.2	11.6	8.9
50–54	3214	6429	8.04	9.58	20.2	14.3	7.9	9.3	14.9	14.1
55–59	2964	5021	8.38	11.01	19.5	21.9	9.2	9.7	22.2	15.9
60–64	2623	3795	11.15	14.52	40.7	41.9	11.2	10.0	32.5	..
65–69	1956	2617	16.73	18.57	67.0	55.0	13.4	8.2	50.4	..
70–74	999	1146	19.76	24.48	88.0	85.4	14.7	..	73.6	..
Above 75	378	366	26.90	30.87	148.0	161.0	13.4	..	..	..
Average	27093	61317	7.81	9.39	23.4	17.6	6.6	8.5	11.7	10.7

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Handbuch der Medizinischen Statistik. [*Handbook of Medical Statistics.*] Dr. FRIEDRICH PRINZING, *Ulm. Jena, Fischer, 1906.*

As to the danger to life to women in industry the statistics are scanty: those of the Austrian sick insurance offices for 1891–95 are almost the only figures that offer considerable material as to women in industry on this point (mortality). According to them, the women engaged in industrial labor not only have a far higher mortality than working men, but also their mortality between the ages of 15–50 years is higher than that

of the whole female population. Compared with men, the mortality of working women between 15–60 years is as 100 (men) to 109 (women). (Page 492.) GERMANY

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry: Its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Jena, Fischer, 1903.*

Moreover and above all we observe, in all countries where woman is protected, a lessening of female and also of infant mortality. For England the convincing argument drawn from this fact has often been cited. There, since the rigorous enforcement of the protective legislation concerning them, the total mortality of women has fallen much below that of men. The ratio of the mortality of men to that of women, 1841 to 1850, was 23.11 per cent for men to 21.58 per cent for women; from 1881 to 1890, as 20.22 per cent to 18.01 per cent. The diminution of these figures shown by comparing the earlier with the later period should be attributed to the great hygienic progress realized during the interval; and the relatively greater reduction of female mortality should be attributed to the protective legislation for the workers, and doubtless also to the activities resulting from sick benefits. By way of reaction, this fortunate condition was shown in the figures of infant mortality. (Pages xxxvii–xxxviii.)

The following figures for the German Empire, giving the proportional figures for men and women in the Sickness Insurance Department, show that after 1891, when women were legally protected, their mortality diminished more than that of men.

COMPARATIVE MORTALITY IN EACH 100 MEMBERS

Years	*Men*	*Women*
1890	1.05	0.75
1891	0.99	0.74
1897	0.91	0.63
1898	0.87	0.61
1899	0.93	0.66

(Page xxxviii.)

(3) The New Strain in Manufacture

(*a*) Speed

Such being their physical endowment, women are affected to a far greater degree than men by the growing strain of modern industry. Machinery is increasingly speeded up, the number of machines tended by individual workers grows larger, processes become more and more complex as more operations are performed simultaneously. All these changes involve correspondingly greater physical strain upon the worker.

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British Sessional Papers. Vol. XXI. 1833. Second Report of the . . . Commissioners for Inquiring into the Employment of Children in Factories . . . and Reports by the Medical Commissioners. Medical Reports by Sir David Barry.

The first and most influential of all disadvantages of factory work is the indispensable, undeviating necessity of forcing both their mental and bodily exertions to keep exact pace with the motions of machinery propelled by unceasing, unvarying power. (Page 72.)

British Sessional Papers. Vol. XVI. 1875. Reports of Inspectors of Factories for the Half-year ending 30 April, 1875.

. . . The speed of machinery has already been pushed to the farthest extent, and lowered from a point which had been attempted but found unprofitable, and injurious to the work. The real evil has long been, not too long hours, but too great tension of the nervous system by aiming at a larger earning, and consequently, the charge of more machinery than is consistent with the health or good work of either.

Hence also an increase of irritating conflict between master and man as to the excellence of workmanship. . . . Far better 60 hours a week and less of this sad unnatural strain; for over-tension may kill in 50 hours a week, and reasonable work not injure in 60. (Page 32.)

British Sessional Papers. Vols. XXIX and XXX. 1876. Factories and Workshops Acts Commission. Vol. XXX. Minutes of Evidence. A. Redgrave.

205. . . . Unhealthiness combined with necessity for close application to rapidly moving machinery. I take those two to be the principal

and main causes for the limitation of the hours of young persons and women. (Page 14.)

Effects of the Factory System. ALLEN CLARKE. *London, Richards, 1899.*

Greater speed of improved machinery, whereby the work is increased sixfold, resulting in physical deterioration and mental worry. (Page 41.)

The toil is ceaseless; the machinery demands constant watching. . . . Their feet are never still; their hands are full of tasks; their eyes are always on the watch; they toil in an unending strain that is cruel on the nerves. (Page 49.)

And all these hours—ten hours a day—spinner and weaver are on their feet; no sitting down; no resting; one must keep up to the machinery though agonized with headache or troubled by any other complaint. While the engine runs the workers must stand. (Page 51.)

Women's Work. A. AMY BULLEY *and* MARGARET WHITLEY. *London, Methuen, 1894.*

. . . machinery has been speeded up to a point which is immensely in excess of that which prevailed when the hours were longer. At the present time, therefore, the strain upon the attention and the wear and tear of the nervous system are greatly in excess of former times, and the worker must be "on the stretch" the whole time to attend properly to the work. (Pages 151–152.)

Dangerous Trades. THOMAS OLIVER, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the Home Office. London, Murray, 1902.*

The introduction of steam has revolutionized industry. . . . Machinery acts with unerring uniformity. At times so simple is its mechanism that a child can almost guide it, yet how exacting are its demands. While machinery has in some senses lightened the burden of human toil, it has not diminished fatigue in man. All through the hours of work in a factory the hum of the wheels never ceases. . . . While the machinery pursues its relentless course and is insensitive to fatigue, human beings are conscious, especially towards the end of the day, that the competition is unequal, for their muscles are becoming tired and their brains jaded. . . . Present-day factory labor is too much a competition of sensitive human nerve and muscle against insensitive iron, and yet, apart from an appropriate shortening of the hours of labor, it is difficult to see how this can be

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remedied. The greater the number of hours machinery runs per day the larger is the output for the manufacturer, but the feebler are the human limbs that guide it. To the machine time is nothing; to the human being each hour that passes beyond a well-defined limit means increasing fatigue and exhaustion. (Pages 115–117.)

Women Workers. Conference in Manchester, 1907. Arranged by the National Union of Women Workers of Great Britain and Ireland in conjunction with the Committee of the Manchester Branch of N. U. W. W. London, King and Son, 1907.

Factory legislation has done much to improve general conditions and to shorten hours in the textile factories, but the intensity of labour has increased. Owing to the overdriving and the speeding up of machinery the nervous strain and pressure upon the worker is probably greater than in any other industry. (Page 28.)

The Economic Journal. Vol. XVIII. London, 1908. Gaps in our Factory Legislation. B. L. HUTCHINS.

Now it is important to remember that these (ten) hours mean more work and more fatigue than they did when the normal day was first introduced fifty-odd years ago. The speeding up of machinery has increased the strain, and even as long ago as 1872 shorter hours were agitated for by the trade unions. . . . One of H. M.'s inspectors tells me that "both in cotton and woolen the strain of the full hours with speeding up is almost intolerable to the less robust women and girls." (Page 223.)

Diseases of Occupation from the Legislative, Social, and Medical Points of View. THOMAS OLIVER, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the British Home Office. New York, Dutton, 1908.*

In trades that are dangerous to health the hours should not be long; and in textile industries, as the speed of machinery is quickened and the nervous tension upon the worker becomes greater, the hours of labour should be proportionally reduced. (Page xi.)

It is an interesting problem to consider the probable effects upon the health of the workpeople in the future of the increased speed at which machinery is being run in the factories and the speeding-up of the work in ship yards. That there is greater strain upon the nervous system, more exhaustion and consequently need for greater leisure, few will deny, and

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that in many instances the hard work induces premature old age goes without saying. Will this speeding-up tend to make female mill-workers better mothers and help them to give birth to healthy and robust children, or to infants who are puny, ill-nourished, and of a highly strung nervous system? In some American factories in which stitched muslin underwear is made, so great has been the improvement in the machinery of late that the sewing machines are carrying two to ten needles instead of one as formerly, and as a consequence many of the girls are no longer capable of the sustained effort necessary to follow the improved speed, and have been obliged to relinquish their occupation. The strain of the eyes in watching for broken threads in order to stop the machinery is almost intolerable; it requires an amount of nervous energy and a constancy of attention which the operators cannot supply. There is a limit beyond which the speeding of machinery cannot be run without detriment to the health of the operators unless their hours of work are materially shortened.

Clearly, therefore, there are occupations, especially the textile trades, that tend through sheer strain to wear out the body of the worker and induce premature old age. These industries may be said to show their baneful effects upon the nervous system. (Pages 3–4.)

Although the introduction of machinery has cheapened products and placed more of them within the reach of the poorer working classes, it has not always lightened labour. The rate at which machinery is run demands greater attention from the workpeople and imposes upon them a severe strain. To the artisan classes the Saturday half-holiday and the shortened working day have proven a boon from a purely physical point of view. Great as the rush and pressure are in this country, they are even greater in America. (Page 5.)

The lightening of the burden of the textile worker by improved machinery has not altogether made mill-work easier, for by raising the speed and increasing the output a larger amount of machinery has to be tended, and this constant vigilance imposes a considerable strain upon the worker. If this is true of simple muscular movements necessitating only mechanical supervision, how much greater must be the strain and exhaustion upon persons who in their employment are obliged to execute a series of educated and rapid muscular movements in which volition is sustained throughout. (Page 358.)

Report of the Inspectors of Factories for the Province of Ontario, Canada, 1894. CANADA

With the increased speed and complications of machinery in textile industries, especially in cotton looms, the attendant has more mental

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worry in watching the machines, and no doubt is more exhausted physically after a day's work. (Page 13.)

Report of the Inspectors of Factories for the Province of Ontario, Canada, 1895.

A very small fraction of the work requires muscular strength, but it is the constant and steady application of the mind, the eager use of the eyes, which exhaust and wear out the human body. The entire nervous system is so intently directed to the detail of the work, while the machinery is running to its utmost capacity, that by night the workers are not only tired and weary, but well-nigh worn out. (Pages 24–25.)

Report of the Inspectors of Factories for the Province of Ontario, Canada, 1896. Toronto, 1897.

Though there is little work which requires great muscular strength or exertion in our factories, yet the alertness and exactness of attention and constant application required exhaust the nervous vitality very rapidly. Most of the operators are necessarily on their feet nearly all the time, and this fact has an unfavorable effect upon the health of women and girls. (Page 22.)

Canada Labour Gazette, August, 1903. Report of British Columbia Royal Labour Commission. Dawson. Ottawa.

The report concludes with a recommendation as to the shortening of the hours of labour. "In these days," say the Commissioners, "when the human energies are strained to their utmost amid whirling dust and machinery, long hours are a crime against nature. The machine should be the servant of man, and not man the slave of the machine. One of the most legitimate modes in which a legislature can aid in improving the condition of the workmen is by the shortening of hours. (Page 136.)

Report of the Royal Commission on a Dispute Respecting Hours of Employment between the Bell Telephone Company of Canada, Ltd. and Operators at Toronto, Ontario. The Department of Labour, Canada. Ottawa, 1907. Conclusions and Recommendations.

We agree entirely with the view expressed by the local manager that it is the pace that kills, and the working of women at high pressure at work of this kind should be made a crime at law as it is a crime against Nature herself. (Page 98.)

New South Wales. Legislative Assembly. Report of the Working of the Factories' and Shops' Act. 1904. AUSTRALIA

Miss Duncan, Inspector:

The effect of factory work on the individual appears to be to produce a skillful specialized worker moving within narrow limits and ill-fitted to rise above them.

On the physical side, the want of exercise among those who sit all day at their work, the long standing of others in those processes which cannot be conveniently carried on when sitting, in either case the over-exercise of certain muscles and the non-exercise of others, must bring about a very one-sided development. . . . Again the constant vibration and noise, the unflagging attention demanded by work on power machines, and the high rate of speed, must tend to operate disadvantageously on the nervous system. (Page 13.)

Fatigue. A. Mosso, *Professor of Physiology, University of Turin, 1896. Translated by* Margaret Drummond, M.A., *and* W. B. Drummond, M.B., *Extra Physician, Royal Hospital for Sick Children, Edinburgh. New York, Putnam, 1904.* ITALY

By constant increase in the rate of movement, by instruments ever better adapted to their ends, modern society endeavours to multiply and render more productive the work both of muscle and of mind. The prodigious extension of the arts and the increasing velocity of machinery combine to hurry us onward; our haste will grow from more to more, till it reaches an extreme point at which the law of exhaustion sets an insuperable barrier to the greed of gain. . . . (Page 168.)

The machinery in our factories is ever becoming more ponderous; it is increasing in size, velocity of motion, and productivity, and this increase still continues despite the fact that we have already surpassed the furthest limit set at first by our imagination. (Page 169.)

One very quietly perceives, however, that those machines are not made to lessen human fatigue, as poets were wont to dream. The velocity of the flying wheels, the whirling of the hammers, and the furious speed at which everything moves, these things tell us that time is an important factor in the progress of industry, and that here in the factory the activity of the workers must conquer the forces of nature. The hiss of the steam, the rattling of the pulleys, the shaking of the joints, the snorting of these gigantic automata, all warn us that they are inexorable in their motion, that man is condemned to follow them without a moment's rest, because

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every minute wasted consumes time that is worth money, seeing that it renders useless the coal and the movement of these colossi. (Page 171.)

Marx, in his celebrated work (*Le Capital*, Karl Marx, p. 161), devotes a chapter to machinery, and arrives at the following conclusions: that all our inventions have not diminished human fatigue, but simply the price of commodities; that machinery has rendered worse the condition of the worker, because by rendering strength of no avail it has entailed the employment of women and children, instead of shortening the working-day it has prolonged it, instead of reducing fatigue it has rendered it more dangerous and injurious; that to the accumulation of riches corresponds an increase of poverty; that owing to machinery society is receding further and further from its ideal; that the reality has not corresponded to our hopes.

. . . The powerful automaton of mechanics wants nothing but intelligence and a nervous system; this want a child or a woman can supply and guide the blind giants by the hand. It is a grave accusation to launch against science, that in making herself mistress of the forces of nature she tends to establish a monopoly for machinery, to make labour the slave of capital. There are, moreover, those who fear that human fatigue will come to be less and less regarded, and that the workers will be gradually eliminated and dismissed without means of subsistence, that the intelligence of the people is deteriorating, because the greater the perfection of the machine, the less the skill and ability required from the worker. (Pages 173–174.)

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Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichts-beamten. XXII. 1897. [*Official Information from Reports of the (German) Factory Inspectors.*] *Berlin, Bruer, 1898.*

The demand for shorter hours of work is justified by the hardships in which modern industry has plunged the whole working class. In a comparatively short time, for instance, machinery of much greater speed has been installed in a number of branches of industry. Even the young, industrious workman must stretch every nerve to keep up with the speeding process necessitated by machinery. (Page 156.)

Machine work allows no time for rest and variety, the workman's nerves suffer, and when, as sometimes happens, his Sunday's rest is taken from him, he breaks down. Older workmen cannot accommodate themselves to this pace, and the rapidity of development has been such that a gradual adaptation to the altered conditions is for them absolutely out of

the question. The result is that older people are excluded more and more from factory work. (Page 157.) No unsatisfactory results appear to have followed in any instance where hours have been shortened. (Page 158.)

Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1902. [*Reports of the Factory Inspectors in the Kingdom of Württemberg for 1902.*] *Stuttgart, Lindemann, 1903.*

In general the reduction of women's hours takes place with the utmost slowness, sometimes under pressure of organization . . . sometimes where employers have come to an agreement among themselves. . . .

But this reduction of hours does not keep pace with advances in technique . . . where there is an obvious tendency to make use of human power to the fullest possible extent. This is especially true in the textile mills, where certain older processes are modified by new contrivances. . . . The result now is, that, while the wages or skilled spinners (women) have risen about 12 or 13 per cent, the number of spindles, on which they must concentrate attention for 11 hours, has been raised from 500 to 750 —an increase of 50 per cent. This is not quite the same as saying that the strain upon the spinners is 50 per cent greater, since a certain number of helpers are provided, nevertheless the attention and skill demanded are much greater than was formerly the case. . . . Such examples make it plain that, with this increasing intensity of strain in work, the hours of work must be correspondingly shortened if the people are to be protected from ruin of health. (Pages 74–75.)

Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1903. [*Reports of the Factory Inspectors in the Kingdom of Württemberg for 1903.*] *Stuttgart, Lindemann, 1904.*

To-day the technical development of industry leads to ever and ever greater demands upon the intensity and attention of the worker. When the speed of the machine is greatest, then the workman has more given to him to attend to. This uncontested fact of rising claims upon the physical and mental capacity of the workman, which is more or less strikingly evident in every department of labor, has in recent years brought the question of shorter hours to the front. The necessity of compensation through shorter hours is not only recognized by the inspectors, but by many employers as well. (Page 96.)

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Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1904. Bd. II. Württemberg. [*Reports of the (German) Factory and Mine Inspectors for 1904.*] *Vol. II. Württemberg. Berlin, Decker, 1905.*

The claim for a ten-hour day for women is an old and much-contested one: factory inspectors are continually reminded of the great need for its fulfilment, as they see how technical improvements in machinery increase the productivity of the machine and consequently intensify the demands made upon the working strength and capacity of the wage-earners. And this is especially true of the industries which employ women in large numbers. (Page 4.[102])

Die Arbeitszeit der Fabrikarbeiterinnen. Nach Berichten der Gewerbe-Aufsichtsbeamten bearbeitet im Reichsamt des Innern. [*The Working Hours of Women in Factories. From the Reports of the (German) Factory Inspectors compiled in the Imperial Home Office.*] *Berlin, Decker, 1905.*

From Frankfurt am Oder it is reported that the insurance records for two textile mills show steady deterioration in the health of the women employed eleven hours a day. One reason for this is believed to be the speeding up of the machinery. Vigorous weavers stated repeatedly that the old, slow looms exhausted them less in twelve and thirteen hours than the swift new looms in eleven hours. The more intensive work requires better nourishment; but there is no adequate increase in wages to afford this improved food, and the eleven-hour day of more rapid work is presumably responsible for the deteriorated health. (Page 119.)

Archiv für Unfallheilkunde, Gewerbehygiene, und Gewerbekrankheiten. Bd. I. Über den Gesundheitsschutz der Gewerblichen Arbeiter. [*Protection of the Workingman's Health.*] Dr. SCHAEFER. *Stuttgart, Enke, 1896.*

The more technic is perfected, the more complicated the machine and the more rapid its speed, the greater are the demands made upon the workman and the more important it becomes to shorten his hours of work. (Page 204.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen; and* EDG. LOENING,

Professor of Law in Halle. Arbeitszeit. [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.* GERMANY

The workman sees in reduction of working hours the surest remedy for all the dangers that arise from his work, and that menace him with premature exhaustion of his working power, his only capital. The more piece work and speeding stimulate the intensity of production, the more quickly a dangerous degree of fatigue is likely to appear, resulting from the one-sided exertion of certain nerves or muscles (a feature of the subdivision of labor). (Page 1204.)

Intensiveness of work means progress for the worker, so long as the tempo keeps within customary bounds; that is, while speed can be maintained without requiring continuous new impulses of will-power. If, in spite of shorter hours, intensiveness of work leads to chronic overfatigue, then it is just as necessary to overcome that evil as the overfatigue resulting from overlong hours of less intensity. (Page 1217.)

Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*Investigations into the Conditions of Health of the Swiss Factory Workers.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector,* and Dr. A. E. BURCKHARDT, *Prof. of Hygiene, Basle. Aarau, Sauerländer, 1889.* SWITZERLAND

Instead of becoming wearied by personal labor, as in earlier stages of industry, it is today the unremitting, tense concentration in watching the machine, the necessary rapidity of motion, that fatigues the worker. (Page 62.)

An das Schweiz. Industriedepartement, Bern. Die Eidgenössischen-Fabrikinspectoren. [*Report of the Swiss Factory Inspectors to the Swiss Department of Labor on the Revision of the Factory Laws.*] *Schaffhausen, 1904.*

As technique becomes more developed, machinery more complicated, and the pace swifter, so much more insistent become the demands of the workers and the claims of hygienists for a shorter work day as a physiological necessity. (Page 23.)

When we consider the great material advantages of modern industry in being enabled to economize material by the use of water power day and night, by keeping its furnaces forever burning, and so on, it seems as if it might well be in place to economize also the strength of the people by shortening their shifts of work. (Pages 34–35.)

AUSTRIA

Eighth International Congress of Hygiene and Demography. Budapest, 1894. Vol. VII, Sec. V. Über das Verhältniss der Dauer des Arbeitstages zur Gesundheit des Arbeiters und dessen Einfluss auf die Öffentliche Gesundheit. [*The Length of the Working Day in its Relation to the Workman's Health and its Influence upon Public Health.*] Dr. E. R. J. KREJCSI, *Vice-Secretary of the Chamber of Commerce in Budapest. Budapest, 1896.*

In branches of industry where machinery is used, the normal working day of which the worker is fully capable is shorter in proportion as machinery is more complicated and the demands made upon the intelligence, attention, and memory of the worker are more incessant.

Such workers expend both their mental and physical strength in strenuous exertion, and thus their normal energy is sooner exhausted and the injurious results of overstrain become evident earlier than in simpler forms of labor. (Page 326.)

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Report of the Maine Bureau of Industrial Labor Statistics, 1892.

The constant nervous tension from continued exertion in a modern factory or workshop, for a period of ten hours, is a severe strain upon the physical system. Work is not done in the old, slow way, and, in nearly all industries, by the present methods, from two to four times the quantity of product is turned out in the ten hours. How much faster is the operative compelled to work, and how much greater is the strain, to accomplish this amount of work, in comparison with the old twelve-hour method. (Page 11.)

Seventh Annual Convention of the International Association of Factory Inspectors of North America. Chicago, Sept. 19–22, 1893. Forest City Printing House, Cleveland, Ohio.

Inspector Dyson, of Massachusetts:

Let it be remembered that the gradual reduction in the hours of labor has been met by the manufacturers with improved machinery. . . .

In a textile mill there is a very small fraction of the work that requires muscular strength. But it is the constant and steady application of the mind, the eager use of the eyes, which exhaust and wear out the human body.

The entire nervous system is so intently directed to the detail of the work while the machinery is running to its utmost capacity, that by night

the worker is not only tired and weary, but wellnigh worn out. (Pages 118–119.) UNITED STATES

Report of the United States Industrial Commission on the Relations and Conditions of Capital and Labor employed in Manufactures and General Business. Vol. VII. 1900. Testimony of Mrs. Fanny B. Ames, former Factory Inspector of the State of Massachusetts.

Mrs. Robertson tells me that when she was a girl, to run one or two looms was as much as any woman would have tried. Now, in some instances, there are women running nine looms, and the looms have more than doubled or trebled their speed. This means more work and harder work. (Page 63.)

United States Congress, House Report No. 1793. (4405). Hours of Laborers on Public Works of the United States. Report from the Committee on Labor. 57th Congress, 1st Session. 1901–1902.

While there is still a variance of opinion on the question whether modern machinery and methods so lighten the physical drudgery of most occupations as to have an equivalent effect to the shortening of hours in the conservation of energy, or whether such machinery and methods operate to so tax the nervous powers as to be equivalent in exhaustive effects to the lengthening of hours, your committee are of the opinion, after what has been said on both sides, that the higher tension of modern employment is at least a full offset to the saving accomplished in muscular force.

This effect of modern machinery on the powers of the worker has been a question more immediately affecting the American workman than those of any other nations. The foreign workman has very generally held to the surface theory of some older varieties that machinery is a competitor of labor and the one most threatening to his employment, hence labor has strenuously and to a considerable extent successfully resisted the introduction of modern machinery. (Pages 9–10.)

Report of the United States Industrial Commission. Final Report, Vol. XIX, 1902.

It is brought out that in nearly all occupations an increasing strain and intensity of labor is required by modern methods of production. . . . The introduction of machinery and the division of labor have made it possible to increase greatly the speed of the individual workman. . . . .

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The testimony of a representative of the Cotton Weavers' Association shows this increasing strain of work. He says:

. . . "Anybody who works in the mills now knows it is not like what it was twenty-five or thirty years ago, because the speed of the machinery has been increased to such an extent, and they have to keep up with it." (Page 763.)

Even these cases where machinery has not increased the intensity of exertion, a long workday with the machine, especially where work is greatly specialized, in many cases reduces the grade of intelligence. The old handwork shops were schools of debate and discussion, and they are so at the present time where they survive in country districts; but the factory imposes silence and discipline for all except the highest. Long workdays under such conditions tend to inertia and dissipation when the day's work is done. (Page 772.)

Report of the Maine Bureau of Labor and Industrial Statistics. 1908.

For the first time, women were interviewed who were running twelve and sixteen Draper looms. These machines are practically a recent addition, and are so arranged that the filling in the shuttle is changed automatically, thus enabling them to go at a greater rate of speed and with less interruption. The women are not expected to clean, oil, or sweep. This matter was quite fully discussed and the complaint made that the work was too hard, but that they tried to do it, as they were dependent upon their positions and they knew there were plenty of foreign men waiting for their places. Where a woman has been accustomed to tend a six loom set, with the Drapers she is given from twelve to sixteen which extend over quite an area. There is no time for sitting during the day, as when employed on the other looms. One woman said she could not sleep at night after running these fast machines, and many have had to give up their places and find other work.

This marks another evolution in the machinery world. Years ago, a woman tended two slowly running looms. Later, as the hours of work grew less, the number of looms was increased to four and six, and now with the Drapers, an operative is expected to look out for twelve or sixteen. (Pages 42–43.)

Report of the Minnesota Bureau of Labor, Industries and Commerce. 1909–1910.

As has been frequently pointed out, the work of women is so divided as to leave no variety. The great "speed" that is maintained is so heavy a

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demand upon the nervous force that long hours are far more wearisome than labor that offered greater change. When the machine needles take 3,500, 4,000 or 4,200 stitches per minute the girl does not drive the machine—the machine drives the girl! She is not mistress of her work—it is her master! The presser foot falls and like a flash of light the work flies from the hand. Every nerve is tense and strained to follow the lightning like whir of the machine that it drives both work and worker. The expenditure of mere bodily strength is not so great; it is the demand upon the nervous force and hence it is that the "pace-makers," as the most rapid of the operatives are called, are the very young. Older operatives learn by sad experience, that "speeding," which means, of course, a high wage, is in the end the most wasteful of all forms of human labor.

Harmful as are the long hours it is literally "the pace that kills."

For it goes without saying that women so employed cannot in the very nature of things be healthful themselves, and it is absolutely impossible for them to be healthy mothers. (Page 604.)

Report on Condition of Woman and Child Wage-Earners in the United States. Vol. III. Glass Industry. Senate Document 645. 61st Congress, 2nd Session, 1911.

The two chief characteristics of the electric-lamp industry, the minuteness of the work and the extreme speed with which the operations are performed, while not peculiar to it, are found to exist in a degree almost without parallel in any other industry. In some industries the speed rate is highly developed by means of machinery and special systems of wage payment; in others the work is even more delicate and requires as great accuracy as the electric-lamp work, but in no other probably are both features developed together to the degree which characterizes this particular industry. Out of this combination of speed and minuteness, linked as they are at times with other undesirable conditions, arise nearly all the evil effects attributable to the industry.

From the time the various filaments are baked until the "mount" is completed the operators are dealing with materials so delicate and minute that they can be clearly seen only in the best of light and by persons possessing at least normally good sight. This can be very easily appreciated by inspecting an ordinary carbon or tungsten lamp, the filament of which is not clearly visible unless the lamp is held close to the eyes and in a strong light. To handle one such filament at leisure would be neither difficult nor trying; every day the housewife performs an equally delicate operation in threading a very fine cambric needle. If, however, this

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needle-threading operation were repeated two or three thousand times a day, and particularly if it were done at a piece rate, which urges one to the highest speed in order to increase one's earnings and to secure the higher rate paid for very rapid production, it would soon assume tremendous proportions to the person doing the work. There is perhaps no better illustration of the general nature of these occupations than of fine needle threading repeated at top speed day in and day out. (Pages 477–8).

As has been pointed out above almost all the operations performed are light, requiring no muscular strain and indeed very little muscular exertion. There is, however, a nervous strain manifesting itself in a feverish concentration on the work, to be seen in most of the establishments and particularly in the larger and more modern plants. This situation, the ultimate results of which will be apparent to all those familiar with the effects produced on girls and young women by undue concentration and feverish eagerness to hurry the assigned task, is a result of the attempt to reduce the cost of production of the lamp. (Pages 478–479.)

Industrial Conference under the Auspices of the National Civic Federation, New York, 1902. The Eight-hour Day. Prof. GEORGE GUNTON, *Institute of Social Economics. New York, The Winthrop Press, 1903.*

The factory system makes this (shortening of the working day) more and more necessary in proportion as it is perfected in its mechanism. It becomes all the time more and more exacting. The greater the perfection of the machinery or the method, the more attention is required. (Page 173.)

American Academy of Political and Social Science. Vol. XXVII, No. 3, 1906. The Manhood Tribute to the Modern Machine: Influences Determining the Length of the Trade Life among Machinists. Philadelphia, The American Academy of Political and Social Science, 1906.

James O'Connell, President International Association of Machinists:

The purpose of this paper is to prove that with the introduction of modern high-speed machinery the life of the operator of such machinery has been shortened. . . .

Great changes have been made in the last quarter of a century, and every industry has been affected with the advent of the machine, but in no other sphere of human activity has such a change been affected as has occurred in the machine shop. (Pages 491–492.)

First of all, old men have disappeared.

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. . . Time was when age was honored in the machine shop; . . . The speeding up of the machine has changed all this, . . . his added years prevent him from keeping pace with the machine, its gait is too rapid, so he is forced aside to make room for a younger man. . . .

The youth fresh from school . . . enters the machine shop. . . . The great strain, both mental and physical, soon proves too much for him. . . . If his period of service in the machine shop is broken by intervals of rest and recreation, nervous breakdown is averted.

. . . Great care and watchfulness to guard against the effects of the nervous strain are necessary when the youth begins his career in the machine shop, for skill, exact skill, cannot be acquired without it. And when proficiency has been reached, although the young machinist does not notice it, he is still bearing the strain upon his nerves. It is this overexertion kept up at high tension, day in and day out, year after year, that is shortening the life of the machine-shop worker, and robbing him of longevity. (Page 494.)

Lessen the number of hours the worker is forced to work at high speed, concert pitch, and his nerves will remain normal, and he will live to the full—his promised threescore years and ten. (Page 495.)

Ibid. Length of the Trade Life in the Glass Bottle Industry.

Denis A. Hayes, President of the Glass Bottle Blowers' Association of America:

Each year the production of the individual workman becomes greater. The highest day's work of this season becomes the standard for the next.

A man working according to present-day methods can make three times as many bottles in a day of eight and a half hours as he did twenty years ago in a day of ten hours, but the expenditure of strength and energy is now much greater than it was then.

. . . The hours of labor should be still further reduced, so that men would, after leaving their work, retain sufficient mental and physical vigor for recreation, study, and social intercourse. (Page 498.)

Women and the Trades. ELIZABETH B. BUTLER. *The Pittsburgh Survey. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1909.*

A third factor affecting health, beside essential trade disease and unhealthful building construction, enters into the industrial environment. This is speeding. In the different industries we have seen how the pace of

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many workers is kept high by the speed of machinery. A travelling chain carries cans of beans past a row of cannery operatives. They must slip a bit of pork into each can as it passes, and the chain is set at a pace which keeps each girl rigid in her place, with every nerve at a tension, fixed on the one motion required of her. In a cracker factory girls lift hot crackers from a travelling conveyor, packing them in oblong boxes with one quick motion, as the conveyor passes; each girl is responsible for all the crackers on a certain section of the conveyor, which is set at a pace requiring her utmost physical and nervous effort.

Among hand workers, and workers who control their machines, systems of pace setting are combined, as we have seen, with piece-rate payments to keep up the speed. Four stogy factories, for example, stimulate their girl rollers by a sliding scale which provides $.13½ a 100 when 400 stogies are rolled from a pound, but only $.10 when 300 are rolled. To earn the pay customary in the district (12 cents a hundred), girls must cut close, and at the same time work at an almost impossible rate of speed. In another factory, rollers receive only 9 cents a hundred if they make less than 6000 stogies a week, and 11 cents a hundred (the market rate in one district) if they make 6000 or over. The foreman of a printing establishment paid his girls seven dollars a week for an average output (in register folding) of 300 an hour. A system of piece payments was introduced, and in two days the rate went up to 500 an hour; week work was then resumed at the old price, and the girls were required to keep the new pace. A lamp factory pays 14 cents an hour for punching 600 pieces, and a cent for every hundred pieces finished within the same time. This list of examples could be extended indefinitely.

Thus the speed of machinery, when pay is by the week, or a piece-payment system, impels the worker to increase the quantity of her output, and repeated rate-cutting in some industries seems not only to keep weekly earnings down to a customary level, but to spur the workers to a fiercer pace. The nervous strain inevitable under these conditions has no inconsiderable share in causing the positive breakdown which so frequently follows a girl into her home after she has left the factory. It is the final exaction that the trade makes of her. (Pages 365–66.)

(*b*) Monotony

Besides the physical strain due to speed and complexity of machinery, health is injured by the extreme monotony of many branches of industry. Specialization has been

carried so far that change and variety of work is reduced to a minimum. Minute division of labor results in the constant repetition of similar motions and processes by the same worker, favoring the onset of fatigue and requiring for relief the establishment of a shorter workday.

British Sessional Papers. Vols. XXIX–XXX. 1876. Factory and Workshops Acts Commission. Vol. XXIX. Report. GREAT BRITAIN

We have already referred more than once to the unremitting and monotonous character of all labor at a machine driven by steam. If the day's work of a housemaid or even of a charwoman be closely looked at and compared with that of an ordinary mill hand in a card room, or spinning room, it will be seen that the former, though occasionally making greater muscular efforts than are ever exacted from the latter, is yet continually changing both her occupation and her posture, and has very frequent intervals of rest. Work at a machine has inevitably a treadmill character about it; each step may be easy, but it must be performed at the exact moment under pain of consequences. In hand work and house work there is a certain freedom of doing or of leaving undone. Mill (*i. e.* machine) work must be done as if by clockwork. . . . The people are tied as it were, to machinery moving at a great speed in certain operations; again it has been alleged that the state of the atmosphere is very unhealthy, and the temperature at a great height, and from the employment of machinery the speed has been so much increased that the wear and tear, not merely of the body but of the mind also, of the operatives were too great for them to bear. (Pages xxix–xxx.)

The Hygiene, Diseases, and Mortality of Occupation. J. T. ARLIDGE, M.D., A.B., F.R.C.P. *Consulting Physician to the North Staffordshire Infirmary; late Milroy lecturer at the Royal College of Physicians, etc. London, Percival, 1892.*

The majority of indoor industries have the disadvantage of presenting little variety in the methods of working, especially in manufactories, where there is great monotony in whatever branch of employment is pursued, and the workman counts for little else than an appendage to a machine. Day by day the worker is called upon to do the same mechanical act, without feeling a personal interest in the result of his labour; for this is no product of his thinking or inventive faculty, but predetermined by

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mechanical contrivances; and day by day he continues at his task, wearisome to the spirit, earning a fixed rate of payment, sufficient, usually, to supply his animal requirements, but holding out small prospect of escape from toil, and whilst he can perform it, or a coming period of competency and enjoyment. (Page 18.) And, generally speaking, it may be asserted of machinery that it calls for little or no brain exertion on the part of those connected with its operations, it arouses no interest, and is wearisome by monotony. Machinery, consequently, has nothing in it to quicken or brighten the intelligence, though it may sharpen the sense of sight, and stimulate muscular activity in some one limited direction.

. . . That some effect must follow upon the rapid whirling of machines and the noise produced, is a reasonable inference. The special senses so exposed are necessarily subjected to a species of strain or overuse. Those unaccustomed to machinery are dazed by its operations, and willingly escape from its presence; and those regularly occupied with it, in conducting and regulating its action, and in intently watching its output, can only do so at the expense of more or less wear and tear of nerve function, and, indeed, of the whole nervous system. Their fatigue is the fatigue of watching, not of working. (Pages 25–26.)

Condition of the Working Class in England in 1844. FREDERICK ENGELS. *Translated by Florence Kelley. London, Sonnenschein, 1892.*

The supervision of machinery, the joining of broken threads, is no activity which claims the operative's thinking powers, yet it is of a sort which prevents him from occupying his mind with other things. We have seen, too, that this work affords the muscles no opportunity for physical activity. Thus it is, properly speaking, not work but tedium, the most deadening, wearing process conceivable. The operative is condemned to let his physical and mental powers decay in this utter monotony. . . . Moreover, he must not take a moment's rest; the engine moves unceasingly. . . . This condemnation to be buried alive in the mill, to give constant attention to the tireless machine, is felt as the keenest torture by the operatives, and its action upon mind and body is in the long run stunting in the highest degree. (Page 177.)

The Effects of the Factory System. ALLEN CLARKE. *London, Grant Richards, 1899.*

And all these hours—10 hours a day, spinner and weaver are on their feet, no sitting down, no resting; one must keep up to the machinery

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though agonized with headache, or troubled by any other complaint. While the engine runs the workers must stand. . . . It will thus be seen that this employment is a severe and ceaseless mental strain that makes a tribe of toilers alert at their tasks, but weakens the physique, as does all narrow and monotonous mental strain if continuous. (Pages 51–52.)

No doubt the factory system, by the increased work and worry, contributes a good share of the imbeciles to the asylums. It is well known that monotony is a cause of insanity, and there is nothing more dreadily monotonous than factory work. (Page 66.)

Women's Work and Wages. EDWARD CADBURY, M. CÉCILE MATHESON, *and* GEORGE SHANN. *London, T. Fisher Unwin, 1906.*

The incessant noise of the machinery, the excessive monotony of the work (presswork), and, above all, the long hours, which are too often spent in an ill-lighted and ill-ventilated atmosphere, all tend to produce a depressing and deadening effect which cannot fail to destroy alertness of attention and to create a craving for excitement which will catch at the least opening for distraction. . . . (Page 53.)

Women Workers. Conference in Manchester, 1907. Arranged by the National Union of Women Workers of Great Britain and Ireland in Conjunction with the Committee of the Manchester Branch of the N. U. W. W. London, King and Son, 1907.

Monotony, noise, and dirt are inseparable from many occupations and have a depressing effect on vitality that we are apt to forget. In many cases only the movements of a machine are required in tending a machine, and this monotony is largely responsible for the ungovernable excitement shown by many boys and girls when released from work. As one girl said, "When you have been a few days at a press you want to scream." Imagine passing ten hours a day, with never a week's holiday, unless one is ill or out of work, amid the noise of looms, the dirt and dust of polishing lathes, in the heat of a lacquering shop, or in the odour of rubber manufacture or of French polishing. (Page 106.) Monotony of work, movement, or position may be responsible for mental sluggishness, but its effects are more apparent in the low standard of physical development reached by many of the working classes, while the whole trend of industrial development is to increase and not decrease this monotony. (Page 108.)

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The Economic Journal. Vol. XVIII. London, 1908. Gaps in our Factory Legislation. B. L. HUTCHINS.

The extreme monotony of factory work is in itself a cause of strain. (Page 224.)

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Gesammelte Abhandlungen, Bd. III. [*Complete Works, Vol. III.*] *Die Volkswirthschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages.* [*The Economic Significance of a Shorter Working Day.*] ERNST ABBÉ. *Paper read before the Political Society at Jena, 1901. Jena, Fischer, 1906.*

Our whole industrial labor nowadays is characterized by what we call "Effects of the Division of Labor." . . .

This division and subdivision has become a necessary condition of progress, and, much as we may deplore its effects in certain details, it is impossible to abandon it. It stamps all work with uniformity. . . . With this sameness and continually recurring monotony we also get the continuous fatigue of the same organ,—of the same group of muscles,—of the same nerve centers,—of the same part of the brain,—because all that is to be done, whether muscular or brain work, must be constantly repeated in the same manner from morning to night, day by day, and week by week. (Page 225.)

Fourteenth International Congress of Hygiene and Demography. Berlin, September, 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue Resulting from Occupation.*] Dr. EMIL ROTH, *Regierungsrat, Potsdam. Berlin, Hirschwald, 1908.*

. . . With the progressive division of labor, work has become more and more mechanical. . . . A definite share of overfatigue and its sequels, especially neurasthenia, must be ascribed to this monotony,—to the absence of spontaneity or joy in work. (Page 613.)

ITALY

Proceedings of the First International Convention on Industrial Diseases. Milan, 1906. Frenastenia e delinquenza in rapporto a taluni ordinamenti del lavoro. [*Imbecility and Criminality in Relation to Certain Forms of Labor.*] Prof. CRISAFULLI.

To understand how cerebral fatigue can cause the arrest of mental development in youths and criminal actions in adults, we must bear in mind that the special functions of the brain have separate centres, the

foundation of the psychic and motor-psychic life of individuals. Thus, ITALY
there is a centre for hearing, another for sight, another for speaking, etc. When only one centre works it becomes overfatigued much more easily than if the functions were alternately performed by the various centres.

Here, then, is another factor in overfatigue due to the *monotony* of work, interrupted only at long intervals.

This monotony is the determining cause of local disturbances and endangers the entire organism. (Page 150.)

The National Civic Federation Review. Vol. II, No. 8. Jan.–Feb., 1906. UNITED STATES
The First Annual Meeting of the New England Civic Federation. Boston, Jan. 11, 1906.

Marcus M. Marks, President of the National Association of Clothing Manufacturers:

. . . Labor asks for shorter hours . . . because the conditions of employment have been changed so much in recent years that workers feel justly entitled to a shortening of the day. They contend that the introduction of machinery has in a large degree replaced the exercise of the muscles, by the use of the eye and mind. This causes more strain on the system. They contend further that specialization of labor has taken away the restful variety and change of occupation which formerly diversified the day's employment, and has substituted a regular monotony of daily labor which is much more tiring. For, whilst a workman might contribute his maximum efficiency in working to twelve hours per day when strictly variegated effort was required, the greater strain of the present so-called "improved" condition of labor may now bring about the necessity for a reduction of hours in order to preserve the same degree of efficiency. (Page 8.)

Women and the Trades. ELIZABETH B. BUTLER. *The Pittsburgh Survey. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1909.*

The only women in the trades considered who can be called skilled in any true sense are the millinery trimmers and telegraph operators.

Added together, however, the women of these two groups make less than 3 per cent of the 22,185 under consideration in Pittsburgh, and from their work we can scarcely judge of the nature of women's work as a whole. That work is, as a rule, of a nature to require neither strength, endurance, intelligence nor training. . . .

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One woman puts fifty hinges a minute through a machine. Each second a hinge is lifted out and slipped into place, the hand drawn back as the machine moves, another hinge lifted and slipped into place—this for ten hours each working day. Other women spread out the tobacco leaves on the suction plates, put the half-made bunch in the leaf, press the treadle and push the rolled stogy aside; spread out another leaf, cut, put the bunch in place, press the treadle and push aside. They pack crackers, candy, glass, lamps, with quick, machine-taught, unvarying motions, lifting, wrapping, putting in place, for ten hours each day. Still others steady the paper in a box-covering machine, guide it according to the gauge, replace it when the strip runs out, guide it according to the gauge. Such work not only requires no thought; it is stupefying. The operative who has become in truth an adjunct of the machine, works with a machine-like precision, and with machine-like absence of thought. Work which demands nothing of the intelligence, costs the intelligence more than work which demands too much. (Pages 370–371.)

(*c*) Piece Work

All the evils of speed and monotony in industrial establishments are intensified by the abuses of piece work. When each worker aims to work faster for the sake of a slight increase in wages, a premium is put upon feverish activity, regardless of the physical cost to the worker.

SWITZERLAND

Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*Investigations into the Conditions of Health of the Swiss Factory Workers.*] Dr. Fridolin Schuler, *Swiss Factory Inspector, and* Dr. A. E. Burckhardt, *Prof. of Hygiene, Basle. Aarau, Sauerländer, 1899.*

. . . The larger proportion of women in factories is certainly to be thought of in estimating the effects of the violent motion of the machinery on health. . . . But even more important is the overexertion . . . this is exhausting, especially when the practice of piece work spurs the women to greater exertion, and much more so when an overseer, warning and reprimanding the workers, urges them to the utmost degree of exertion. (Page 82.)

Deutsche Medizinische Wochenschrift, Nr. 21, 25. Mai. Die Neurasthenie in Arbeiterkreisen. [*Neurasthenia in the Working Classes.*] Dr. P. LEUBUSCHER *and* Dr. W. BIBROWICZ, *formerly of the Beelitz Sanitarium of the State Old Age and Invalidity Department of Berlin. Berlin, 1905.* GERMANY

. . . Work has become very different! Piece work has indeed obtained larger wages, but has developed an impetus and speed and intensity of effort that used to be unknown, and this invariably crushes the weaker workers, those for whom all work is a heavier burden than for the strong. Continuous anxiety is felt by these lest they fall behind. Then sometimes voluntarily, sometimes compulsorily, overtime is undertaken, and so it turns out that the working hours, instead of being comparatively shorter than the usual day, are really much longer, and, by reason of the irregularity, far more exhausting. (Page 821.)

Fourteenth International Congress of Hygiene and Demography. Berlin, September, 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue resulting from Occupation.*] Dr. EMIL ROTH, *Regierungsrat, Potsdam. Berlin, Hirschwald, 1908.*

Of greater importance is the excessive overstrain of piece work, which indeed pays better, but at the cost of a speed and intensity of work which was formerly unknown. That these injurious effects first assail the weaker part of the working population is self-evident. (Pages 614 and 615.)

Il Ramazzini. Giornale Italiano Di Medicina Sociale. Anno I, 10–11. [*Italian Journal of Social Medicine.*] *October–November, 1907. Le Stagioni, i giorni, le ore degli infortuni del lavoro.* [*Days, Seasons, and Hours when Industrial Accidents occur.*] Prof. G. PIERACCINI *and* Dr. R. MAFFEI, *Head Physicians in the Royal Main Hospital of S. M. Nuova, Florence, Italy.* ITALY

Piece work, necessitating higher speed, tends both in itself and together with the fatigue that ensues to favor the occurrence of labor accidents. . .

We should see to it . . . that, above all, piece work should be condemned, preference being given to time work, the honesty of the worker and the consciousness of his own labor capacity regulating the speed of work. (Pages 593–594.)

CANADA

Report of the Inspectors of Factories for the Province of Ontario, Canada, 1898. Toronto, 1899.

In almost every industry the working day is ten hours. The system of piece work is becoming more generally adopted. The small pay given by the hundred or thousand, according to the different industries, stimulates the eagerness of the workers to the highest possible pitch. I have seen girls working so rapidly that I have asked myself the question, how long their nervous systems could resist the strain of the excessive fatigue resulting therefrom. A shorter working day for this class of operatives seems an imperative necessity. (Page 31.)

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Report of the Minnesota Bureau of Labor, Industries and Commerce. 1907–1908.

. . . The work that is done by women in so many departments of industry is "piece" work, where the nervous strain is at its highest tension.

When, by reason of skill or deftness, or a longer sustained energy, a girl is able to do a maximum amount of work, she is said to "set the pace," and she becomes a "pace maker" for the others. Those less skilled or less deft, or who for any reason are unable to keep up with the leader, are striving with every nerve to earn as much as is possible, and this great demand upon nervous energy entails a rapid decay of nervous force. (Page 244.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part VII. Women Workers in Milwaukee Tanneries. IRENE OSGOOD, *Special Agent.*

Organized workmen usually object to the piece-work system. It so frequently leads to "speeding up." And the rate per piece is often cut down until only the fastest workmen are able to secure anything like a living wage. Those less skilled and less dexterous are thus made to suffer from the ambition or greed of a few involuntary pace-makers who work themselves out in a short time for the sake of temporarily earning higher wages. (Page 1053.)

The girls have complained, too, of being cut when they began to earn high wages. This was substantiated by a superintendent, who remarked: "Oh, if they get to earning too much they know what they will get," contending that a general level of wages must be maintained. This would mean, then, that the average worker practically determined the amount

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one could earn, and any exertion beyond this only reacted upon all in a general cut of the piece rate. Employers quite generally admit this situation. Men meet it by organization and by attempting to regulate their employment by agreements with the employer.

But, paradoxical as it may seem, stimulation to greater speed is frequently furnished in the opposite way. Another superintendent insisted that cutting the rate was the surest way to get more work done. He argued that when workers find their wages decreasing from a customary sum they naturally try to get back to the old standard by extra work. Thus they are caught between the upper and the nether millstones. The possibility of a cut is ever-present. If they work unusually hard and earn higher wages, they face a cut in rates. If they do not turn out enough work to satisfy the superintendent, a cut is made anyhow to spur them on to higher exertions. They are annoyed and bewildered and uncommonly helpless. (Page 1054.)

Report on Condition of Woman and Child Wage-earners in the United States. Vol. III. Glass Industry. Senate Document 645. 61st Congress, 2nd Session, 1911.

In few industries, however, has there been such . . . highly developed methods for securing this result (speed) as in the electric lamp industry. . .

These methods are four in number: First, the establishment of a minimum output, below which the employees dare not fall for fear of discharge. At the time of this investigation a tabulation of the output of all employees for a period of six weeks had just been completed in one establishment as a basis on which to establish minimum standards in all occupations. The fact that this system is not in general use, however, seems to indicate that it is of no great efficacy. Second, the payment of higher piece rates for increased production.

In one of the factories, for example, the rates paid for "gem" mounting are as follows:

	Per 1,000
Output under 900 per day	$1.03
Output 900 to 1,000 per day	1.07
Output 1,000 to 1,100 per day	1.12
Output 1,100 and over per day	1.17

In the case of the highest net output, 1,200, the difference to the operator between being paid at the lowest rate and highest is the difference between $1.24 and $1.40, or 16 cents per day—that is, more than 10 per cent of the total wages. Third, a method very similar to that just cited,

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that of giving bonuses for all production above a certain standard. This method is likewise widely used. The fourth and last of these methods is perhaps the most interesting. When an entirely new process is introduced or there is some one occupation the output of which has fallen below normal, one of the most skilled and willing workers is made the "leader" of a group. She acts as a pacemaker, and is urged to her best efforts to increase both her own production and that of her group by being paid 5 per cent more than the average of the entire group. In such a case the use of bonuses or graded piece rates is ordinarily added in order to urge the individual workers to their highest speed. After this system has been in vogue for a short time and the girls have become accustomed to working at their maximum efficiency, the "leader" is removed, the bonuses discarded, and according to the testimony of many of the girls, the piece rate is cut to such a point that the average wage level is as it was when the employees were producing much less. By this means the production is said in several cases to have been doubled within a short time. (Pages 479–80.)

. . . In 1890, from information furnished by a bulletin of the New Jersey Bureau of Statistics of Labor and Industries, the average hourly output of carbons mounted by hand was 90, whereas now, on identically the same work done by the very same methods, the average hourly production has risen to 125, an increase of approximately 40 per cent. (Pages 178–179.)

B. *The Nature and Effects of Fatigue*

(1) General Medical Views of Fatigue

The fundamental need of limiting excessive working hours for women is based on their physiological organization. For medical science has demonstrated that while fatigue is a normal phenomenon—the natural result of bodily and mental exertion, excessive fatigue or exhaustion is abnormal—the result of over-exertion or work pursued beyond the capacities of the organism.

Two processes are continually carried on in the living body: assimilation or building up; disassimilation or breaking down material into simpler chemical form, ultimately expelled as waste products. These wastes are

poisonous impurities arising from the chemical processes of cellular life. They circulate in the blood, poisoning brain and nervous system, muscles, glands, and other organs until normally removed by the oxygen of the blood, by the liver or kidneys.

When these waste products accumulate in the blood, fatigue ensues. When they exceed their physiological or normal amount, exhaustion results and health is impaired. After excessive labor there is also a consumption of energy-yielding material, essential for activity. The processes of disassimilation are in excess of those of assimilation.

Diseases of Occupation from the Legislative, Social, and Medical Points of View. THOMAS OLIVER, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the British Home Office. New York, Dutton, 1908.* GREAT BRITAIN

Fatigue or tiredness is a sensation, the outcome of a particular state of the nervous system, the result of work carried beyond the capabilities of the organism. In ordinary physiological activity exhaustion is never attained, for fatigue is the warning signal. In each of us there is a certain amount of reserve force which allows our muscles and nerves to be overtaxed at times without injurious consequences. The increased functional activity is met by a corresponding improved nutrition, whereby recovery is secured. Life involves change of structure. The waste products added to the blood act upon the nerve endings in muscle and upon the gray matter of the brain, and create a sense of fatigue. Although the sensation of tiredness is referred by us to the overworked muscles, the location of the cause is less in the peripheral than in the central nervous system. On the one hand waste products act upon the muscles, diminish their contractibility and render them less responsive to nerve stimuli; and on the other hand they poison the large nerve cells in the gray matter of the brain, render them less receptive of sensory stimuli, and in this way reduce their power of emitting volitional impulses. There is, therefore, in fatigue an element that is mental as well as physical.

After rest and sleep the sensation of fatigue wears off, we rise invigorated and strengthened for work. During repose structure is being rebuilt and waste products are eliminated.

GREAT BRITAIN

The proof that the circulation of waste products in the blood is a cause of fatigue is demonstrated by taking some of the blood of a fatigued animal and injecting it into a healthy one, when in the latter the physical signs of fatigue gradually appear. (Pages 6–7.)

GERMANY

Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Sec. IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalitès et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel ou tel mode d'organisation du travail? [*To what extent may fatigue, its forms and degrees in different occupations be studied by physiological methods? What arguments can physiological or medical sciences bring to bear in favor of various modes of industrial organization?*] Dr. ZUNTZ, *University of Berlin. Brussels, 1903.*

Fatigue, resulting from various occupations, which marks the limits of the workingman's capacity or, if disregarded, endangers his health, is very variable in its aspects, according to the organs especially affected.

We may first of all differentiate between fatigue of the motor apparatus and fatigue of the nervous apparatus.

The first group may be again subdivided into two divisions: first, the general muscular weariness resulting from heavy work; second, the fatigue of certain local groups of muscles which have been overstrained.

In fatigue of the nervous apparatus we distinguish between fatigue of the special organs of sense, and fatigue of the central nervous system. (Page 1.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen; and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit. Hours of Work.* Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

Conclusions from the physiological and psychological investigations into fatigue.

Physiologically considered, human labor represents a transformation of the potential energy of oxygen and food materials. When assimilated, they are transformed into mental and physical energy, and, in so far as this is utilized for industrial purposes, we have work in the ordinary sense. Every piece of work, then, means expenditure of energy. . . .

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Products of tissue change are created (after fatigue), especially carbonic acid and other acids which have a poisonous and paralyzing action. Fatigue consists essentially in this—that waste products are created in the muscles more rapidly than they can be eliminated by the blood current and excretory organs. (Pages 1214–1215.)

Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue Resulting from Occupation.*] Dr. E. ROTH. *Berlin, Hirschwald, 1908.*

Every muscular contraction increases the consumption of oxygen. This greater demand for oxygen is largely met by the correspondingly increased rapidity of the circulation. The increased drain made by the tissues upon the supply of oxygen may be fully compensated for by the more rapid circulation, though the kind of work being done may modify or interfere with this balance. . . .

Accordingly, as a greater amount of oxygen is consumed, a correspondingly greater amount of carbonic acid gas is produced, so that the relative proportion remains the same during work as during rest. . . . Only when work becomes overwork, or when the needed oxygen is not supplied to the tissues, is the excretion of carbonic acid gas greater than the intake of oxygen; in this case the respiratory coefficient fluctuates. (Page 595.)

The well-known experiments of Ranke and Mosso have proved that the products of fatigue circulate in the blood. . . . From the experiments of Ranke we know that, among these fatigue products, acids play a prominent part, whilst those of Kronecker show that blood containing a high percentage of oxygen is of far superior restorative power for muscular fibre than an ordinary supply. The experiments of Fletcher likewise suggest that the beneficial effect of oxygen on fatigued muscle arises from the rapid oxidation of readily combustible fatigue products in the tissues. . . . (Pages 595–596.)

It has been shown by Mosso that the blood of fatigued animals is poisonous, and Kraus has stated that the lack of energy in the motions of fatigued animals is due primarily to the toxic products of disassimilation (waste materials) and that fatigue is thus a form of auto-intoxication. (Page 597.)

The more gradually the metabolic processes go on, the more slowly does fatigue develop, for the fatigue products are then excreted as rapidly as the assimilation of nutritive material takes place, if not more rapidly. On the other hand, fatigue appears more quickly when waste products

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are created in the tissues more rapidly than they are excreted, no matter whether this is the result of delayed excretion or of accelerated production of waste material. The latter condition may be demonstrated, as an example, by the action of extreme heat, with the resultant sweating followed by languor; the former in the absence of sufficient oxygen. (Page 605.)

ITALY

Fatigue. A. Mosso, *Professor of Physiology, University of Turin. 1896. Translated by* Margaret Drummond, M.A., *and* W. B. Drummond, M.B., *Extra Physician, Royal Hospital for Sick Children, Edinburgh. New York, Putnam, 1904.*

Fatigue is a chemical process. At the end of the eighteenth century Lavoisier, in a memorable series of chemical analyses made jointly with Sequin, succeeded in demonstrating a fact of fundamental importance, namely, that muscular exertion increases the quantity of oxygen absorbed and of carbonic acid eliminated by man.

The most demonstrative experiments in the analysis of fatigue are usually made upon cold-blooded animals, commonly on frogs. When the sciatic nerve is stimulated, we notice a contraction of the leg. The contraction, upon being repeated a great number of times, becomes more and more feeble. This diminution of energy is not to be attributed to the dissipation of some explosive substance, so to speak, in the muscle, that is to say, of the substance capable of giving rise to contractions. In fact the muscle will still continue to contract for a long time, but no stimulus will produce a contraction so strong as the first ones. The lack of energy in the movements of a weary man depends, as in the case of the frog, upon the fact that the muscles, during work, produce noxious substances, which little by little interfere with contraction.

The proof that we are not here dealing with a phenomenon of deficit is found in the fact that after the frog's leg has been fatigued by long exertion, we can restore its contracticity and render it capable of a new series of contractions, simply by washing it. Of course we do not wash the outer surface, but having found the artery which carries blood to the muscle, we pass through it water in place of blood. . . . Upon the passage of a current of this liquid through the muscle, the fatigue disappears, and the contractions return as vigorously as at the beginning. (Page 106.)

The experiment upon frogs' muscles washed in saline solution shows that, in order to maintain muscular contracticity, there is no need of continual contact between the muscle fibre and the oxygen of the air through the medium of the blood. It is only necessary to eliminate the carbonic acid. (Page 112.)

ITALY

Two important facts . . . mark the beginning of our knowledge of the chemistry of muscle.

In 1845 Helmholtz discovered that a muscle in repose contains only a small quantity of matter soluble in alcohol. Let 1 represent the quantity found. Upon taking an equal amount of muscle from a fatigued animal, he found there was a greater quantity of such matter, the amount being 1.3. This is an experiment made, as the saying is, *en bloc*, by which one gets a glimpse of the changes which are produced in the muscles as the result of exercise.

Another discovery of no less importance is that of Du Bois-Réymond, who found that the fatigued muscle is acid, while the muscle in repose is alkaline. (Page 116.)

To demonstrate that muscles accumulate products which interfere with contraction, Ranke made an aqueous solution of muscle which has been exercised, and having injected this into a fresh muscle, found its power of exertion was diminished. After it had been washed, however, its energy returned. (Page 116.)

It was a French chemist, Gautier, who isolated some of these substances which are derived from the albuminoids of living cells. He gave them the name of leucomaines to indicate that they are chemical compounds arising from the decomposition of albumen. Here we have some very recent observations which open a new horizon in the study of the causes which produce disease. (Page 117.)

I have now given a rapid glance at the toxic substances which are produced in the organism. They are not so much poisons as dross and impurities arising from the chemical processes of cellular life, and are normally burned up by the oxygen of the blood, destroyed in the liver, or excreted by the kidneys. If these waste products accumulate in the blood, we feel fatigued; when their amount passes the physiological limit, we become ill.

Thus is our conception of fatigue widened. It is a process which, as we examine it, seems even to become more complicated. Meantime, we know that fatigue is not produced merely by the lack of certain substances which are consumed during exertion, but that it depends also in fact upon the presence of new substances due to decomposition within the organism. (Pages 118–119.)

Observing that after a whole day's walk even the muscles of the arms are tired, I was struck by the thought that fatigue might alter the composition in the blood; and so long ago as 1887 I found that the blood of a fatigued animal is toxic, for if injected into another animal, it produces the phenomena characteristic of fatigue. (Page 119.)

ITALY

Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Section IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel ou tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what arguments can medical and physiological science present in favor of special methods of industrial organization?*] Dr. ZACCARIA TREVES, *University of Turin. Brussels, 1903.*

The internal process which causes the phenomenon of fatigue is, according to the doctrine of Hering, and applied by Biedermann to muscular tissue, a defective balance between the processes of assimilation and those of disassimilation. These two categories of phenomena are displayed, in permanent fashion, side by side, in the living tissues, and this fact constitutes the very basis of all life.

As long as these opposing processes balance one another there is no fatigue; but, as soon as this equilibrium, under the influence of any excitation whatever, is disturbed in favor of the processes of disassimilation, fatigue appears; the capacity of the tissues to function is weakened little by little; that is to say, under stimulation which does not vary in intensity, the degree of irritability of muscle diminishes. This conception of fatigue, which a thousand different biological phenomena confirm experimentally, is so simple and so rigorously logical that it is impossible to pick a flaw in it. If we now consider that this degradation of tissue is not only quantitative but that it may, at a given moment, become qualitative and be accelerated by an accumulation of the products of disassimilation, we shall have included in the definition of fatigue, beside the two first factors, *i. e.*, 1. *Repetition of stimulus*, and (2) *excess of the processes of disassimilation over those of assimilation*—the third factor, which is to-day for every physiologist indissolubly bound to the idea of fatigue—namely, *auto-intoxication of tissue*. (Page 2.)

Professor Kraus . . . calls "measure of the constitution" that relation existing between the maximum quantity of energy that the organism is capable of developing at a given moment and that part of this energy that is utilized in the form of external muscular work. . . .

The respiratory changes are measured by the method of Zuntz and Geppert, and the results serve to establish the relation between the work and the energy employed.

As a general rule, the higher degrees of fatigue are clearly shown in the chemics of respiration. ITALY

The need of oxygen, corresponding to a given quantity of work, is so much the greater as the muscles are nearer to exhaustion. When the cardiac activity begins to be insufficient and the blood does not convey enough oxygen to the muscles, an abnormal augmentation in the value of the respiratory quotient becomes noticeable: that is to say, the organism has eliminated CO_2 in excess, as compared with the amount of oxygen consumed. The number of calories developed by the organism during the execution of a given amount of external work may be deduced from the quantity of oxygen (in c.cm.) respired. (Page 29.)

De la Fatigue et de son Influence Pathogénique. [*Fatigue and its Pathogenic Influence.*] Dr. M. CARRIEU, *University of Montpellier. Paris, Baillière et Fils, 1878.* FRANCE

General fatigue, when carried to an extreme degree, takes the name of exhaustion; all the reserves of strength, accumulated in the organism by nutrition, are expended; all functions flag or cease, the organism, incapable of manifesting activity, is overwhelmed with depression: the organs necessary to life alone continue with difficulty to perform their functions. A state of fatigue incompatible with life is seen in animals that have been overdriven or pursued: thus a stag after a long and desperate chase has been known to drop dead, though unwounded. The body becomes rigid immediately and putrefaction comes on rapidly. (Pages 6–7.)

There are indeed individuals who are always under the influence of fatigue. This subnormal condition is usually linked with anæmia, and is caused by some one of the many pathogenic conditions of this malady (anæmia). (Page 8.)

Étude sur l'Influence de la Durée du Travail Quotidien sur la Santé Générale de l'Adulte. [*Study of the Effect of the Length of Working Hours upon the General Health of Adults.*] ILIA SACHNINE. *Lyon, 1900.*

Gautier has shown that, among the products of muscular exertion in the tissues, alkaloidal leucomaines are formed whose toxicity is not inferior to those poisons produced in putrefied meat which are well known as ptomaines. (Page 31.)

According to Herzen, fatigue is produced first in the motor centres, less so or not as evidently in the terminal filaments of the motor nerves,

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and to a certain still inferior degree throughout the body. Then there occur in the muscular fibre those nutritive changes due to the combustion which accompanies contractions. These chemical changes profoundly alter the structure of the tissues at whose expense they have taken place, and from this alteration the products of combustion, of disassimilation, appear in the muscles. (Page 33.)

Acute overstrain is then a poisoning by products appearing in the course of chemical transformation of muscular tissues. (Page 34.)

The toxicity of urine is considerably augmented after muscular effort pushed to the degree of fatigue, even if the diet is exclusively of milk.

According to Tissié, urine, after excessive muscular exertion, has a toxic power greater than the co-efficient of that of acute infectious fevers. (Page 37.)

M. Arloing has demonstrated that the toxicity of sweat is almost nil when it is produced by a hot bath, etc., but that it is very considerable during violent muscular exertion. (Page 37.) Sub-acute overstrain, says Lagrange, is due to the impregnation of the organism with the waste materials of activity. It is found among persons whose bodies have been subjected to sustained labor or to repeated fatigue without having had sufficient periods of rest. (Page 43.)

La Protection Légale des Travailleurs. [*Legal Protection for Working People.*] *Discussions of the French Section of the International Association for Labor Legislation in 1905 and 1906. Paris, Alcan, 1907.*

Mme. Moll-Weiss:

. . . It has been shown absolutely beyond question that, when work of a certain duration of time is under consideration,—say, for example, eight or ten hours,—the effectiveness of any worker is less at the end of five hours than previous to that time, because there is an accumulation of waste products in the organism, the remains of incomplete combustion, resultant upon work. It has been commonly agreed upon to call this fatigue. (Page 181.)

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The Mental Symptoms of Fatigue. (*Reprinted from the Transactions of the New York State Medical Association.*) EDWARD COWLES, M.D., *Medical Superintendent of the McLean Hospital, Somerville, Mass. New York, Fless and Ridge, 1893.*

The bodily conditions of fatigue should first be considered as far as

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we can know them, and may be studied in their two forms or degrees: (1) *normal fatigue*, or the condition of wholesome tire from daily physiological use; and (2) *pathological fatigue*, or the condition of persistent "impoverishment of nervous tissue in excess of repair," according to Beard, which constitutes nervous exhaustion or neurasthenia. The mental symptoms are to be studied in their close and direct correspondence with these conditions of fatigue.

The effects of fatigue are produced by sufficiently continued exercise in the physiological use of any functions, muscular or nervous. The sense of fatigue is complex, and may have a central or peripheral source, or both together. In muscular tissue, the condition of fatigue depends upon the physiological fact that muscular contraction is in some way or other the result of a chemical change whereby the latent energy is set free and expended in the mechanical work, with also the setting free of heat. The resultant chemical products are toxic, and obstructive of muscular function unless they are duly washed away in the blood current; and time must be given in rest and sleep for this process, as well as for nutrition and repair. These toxic products being variously irritant or benumbing, doubtless thus affect the sensory apparatus through which fatigue is felt. It is evident from this that the condition of muscular fatigue has always a dual character—there are direct expenditure of energy, requiring repair, and a toxic element that may be obstructive of function, both that of discharging energy and of taking up nutrition.

In nervous substance, the nature of nerve force being unknown, the effects of the passage of a nervous impulse along nerve-fibres are not demonstrable as attended by chemical changes, or loss of normal irritability as a manifestation of fatigue. But in the central nervous organs it is found that their function is dependent on an adequate supply of oxygen, and this implies that "in nervous, as in muscular substance, a metabolism, mainly of an oxidative character, is the real cause of the development of energy." In fact we do not doubt that toxic waste products attend upon central nervous activity, and this accords with the biological theory that all function is due to chemical changes taking place within the organism, and that the functional activity of a specialized tissue depends upon the changes in its individual cells. The dual character of all conditions of primary fatigue is evident, as is also the importance of recognizing the effects of the self-produced poisonous substances that regularly result from the chemical changes in tissue metabolism within the body, as we are taught by the brilliant revelations of modern chemical physiology and pathology. (Pages 5–6.)

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Sixty-fifth Annual Meeting of the American Institute of Instruction. The Relation of Fatigue to Social and Educational Progress. HENRY S. BAKER, Ph.D. *Boston, 1895.*

It is a fact not questioned, that every movement of a muscle and every mental act, whether it be thinking, feeling, remembering, or the passive reception of impressions through the senses, is accompanied by some chemical change in the muscular or nervous tissue or both. This change may be called a "wearing out," an oxidation or metabolism, and the worn out material or ashes, as it were, is thrown into the blood, from which it is removed by the various organs of depuration as the kidneys and liver. It is important to note that this debris of nerve and muscle is decidedly toxic to the various organs and especially so to the brain. (Page 33.)

Any movement of the mind or body, because it introduces some of the above materials (leucine, creatine, leukomaines, and lactic or sarco-lactic acid, tyrosin, and a substance with effects like ptomaines) into the blood, and because it removes by oxidation a portion of the brain always, and, when a muscle is moved, of the muscular tissue, also produces fatigue. Three conditions always exist: 1. Deleterious material in the blood. 2. A changed, abnormal condition of the brain cells. . . . 3. There is general fatigue of the entire body, caused by toxic materials in the blood. . . . 4. There sometimes exists also a local accumulation of waste products in the tissue which produced them, as a muscle, and this is the case when the labor is rapid or violent. Since the brain is the motive power, all fatigue is brain fatigue; that is, there can be no fatigue in which the brain does not share, locally in some centre. In all cases, then, there is local fatigue of brain or muscle, or both. When these conditions exist to a small extent the fatigue is normal, healthful, and the recovery takes place quickly. When they are carried to a great extent the system, as a whole, is weakened and permanently injured in one or more organs or tissues. (Pages 34–35.)

The waste products in the blood not only poison tissues and glands by their presence, but prevent the oxygen of the blood from performing its functions. When a man or animal falls dead from over-exertion, it is because he is poisoned to death by his own waste products, which were formed faster than they could be eliminated. Fire horses last but a few years, because at every run the above conditions exist to a great extent. (Page 35.)

Report of the New York Bureau of Labor Statistics. 1900.

A French physician . . . concludes that the abnormal sickness and mortality among working people is due not simply to poisonous or noxious

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substances in the materials of work, but also to fatigue, which affects the nerves. He describes as follows the effects of long hours of work: (1) Fatigue resulting from prolonged *physical* effort is a phenomenon of self-poisoning produced by the substances destroyed within the body. (2) It is altogether probable that in mental effort the phenomena of fatigue likewise proceed from the products of decomposition which have been thrown into the circulation. (3) In physical fatigue, resulting from excessively prolonged manual labor, there appear not only the phenomena of peripheral fatigue localized in the muscles and ends of nerves, but also the same phenomena in the nerve centres. Hence, mental effort after physical labor, or vice versa, bodily exercise after long mental effort cannot serve as rest; the human organism then demands a certain period of absolute rest. (4) Bodily exercises set the circulation strongly in motion, raise the blood pressure and sensibly increase the number of heart beats. If muscular efforts are excessive or continued long they may in due time produce functional and organic alterations both in the heart and in the blood vessels. Hypertrophy and enlargement of the heart are the most usual consequences. (5) It is very probable that excessive and prolonged physical labor retards the circulation of the kidneys, and in some degree causes anæmia of the kidneys. . . . (7) The bodily development of the factory operative remains inferior to that found in other social classes. (Pages 65–66.)

The Harvey Lectures, 1905–1906. Fatigue. FREDERIC S. LEE, Ph.D. *Philadelphia, Lippincott, 1906.**

It is customary to seek the causes of the physical phenomena of fatigue in the chemical changes undergone by the active living substance. . . . In all tissues during activity substances of value to the organism are broken down and substances of little or no value are formed. . . . (Page 180.) It is now customary to recognize three distinct metabolic products as fatiguing, namely, sarcolactic acid, mono-potassium phosphate, and carbon dioxid, all of which are acid in reaction. . . . (Page 183.) The organism produces normally in the course of its activity a number of acid substances which tend to inhibit further activity. Fatigue is due in great measure to the depressant action of these toxic products of metabolism on the body tissues, particularly on the muscular system, and the sensation of fatigue is in large part the psychic manifestation of the recog-

*See also by the same author: Physical Exercise from the Standpoint of Physiology. *Science* N. S. Vol. xxix. Apr. 2, 1909, pages 521–527. The Nature of Fatigue. *Popular Science Monthly*, February, 1910.

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nition of this depressant action. (Page 185.) The action of fatigue substances is not confined to the tissues in which they arise. The excessive activity of one tissue is capable of causing fatigue to appear in others. . . . Thus localized activity is capable of producing general fatigue, a fact which is often overlooked in our daily life. The explanation of this is afforded by Mosso's well-known experiment: A dog was fatigued by long-continued running; his blood was then transfused into the vessels of a second dog, from which an equivalent amount of blood had been withdrawn, with the result that the second dog exhibited the usual phenomena of fatigue. The blood had evidently become charged with the fatigue substances produced in the muscles, and thus they were able to reach all parts of the body. (Pages 188–189.)

(2) The Toxin of Fatigue

The need of limiting excessive working hours for women is further emphasized by recent medical research which claims that fatigue is due not only to actual poisoning, but to a specific poison or toxin of fatigue, analogous in chemical and physical nature to other bacterial toxins such as the diphtheria toxin. This theory claims that when artificially injected into animals in large amounts the fatigue toxin causes death.

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Diseases of Occupation from the Legislative, Social, and Medical Points of View. Thomas Oliver, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the British Home Office. New York, Dutton, 1908.*

Weichardt, in 1904, advanced the theory that the cause of fatigue is a toxin generated in the overtaxed organism, and that the ravages of the toxin, like the poison of diphtheria, can be met by the introduction of an anti-toxin into the body. Wolff-Eisner (Centralb. f. Bakteriol. bd. XI, 1906, page 634) is of the opinion that during athletic training there is produced an immunity to the toxin of fatigue, whereby the trained athlete becomes capable of accomplishing more than the untrained man, and without experiencing the sensation of fatigue. It is common knowledge that men who are doing hard, physical toil regularly have not the sense of tiredness felt by men who are new to the work, and we explain this by

saying that the latter are not trained. Wolff-Eisner throws new light upon the subject, having obtained a fatigue toxin from overworked animals; he injected small doses of the poison into other animals and produced in them symptoms of fatigue, drowsiness, and a lessening of activity. Large doses caused death, but if very minute doses were injected for a lengthened period there was established in the animals a genuine immunity to fatigue. The toxin is not found in the blood but in the muscles, whereas the anti-toxin is only present in the blood. (Pages 6–7.) GREAT BRITAIN

Centralblatt für Bakteriologie, Bd. XL, Abt. I; Heft 5; 1906. Über Ermüdungs- und Reduktionstoxine. [*The Toxin of Fatigue.*] Dr. ALFRED WOLFF-EISNER, *Charlottenburg. Berlin, 1906.* GERMANY

In the early part of 1904 Weichardt propounded his theory that fatigue was produced by a toxin the composition of which was fully analogous to such previously well-known toxins as ricin, abrin, diphtheria and tetanus toxins, the leading characteristic of which was also to be found in it, in that injections of the fatigue toxin produced an anti-toxin which neutralized the effects of the toxin *in vivo* and *in vitro*. This theory was at first striking through its novelty, as the view had been quite generally held, among physiologists, that fatigue was produced by chemically analyzable products of metabolism, especially lactic and other acids. And yet there were numerous well-known facts which might have given rise to fresh inquiries into the nature of fatigue products.

It was well known that suitable "training" had an astonishing effect, and every one knew, also, that expert—that is, trained—professional bicyclists, gymnasts, etc., could easily accomplish achievements which would have resulted in death after a comparatively short time, for raw recruits or untrained men. It seemed impossible to explain these undoubted facts simply on the ground that the blood supply and its circulation were better in trained muscles. . . . There was much to support the thesis that the trained man benefited by an anti-toxin, which neutralized the fatigue poison at the moment when it was produced. From this point of view it also became clear why for an efficient training it is essential not only to develop the muscles but also to observe a special daily regimen.

It was to be expected that this teaching of the actions of poisons in fatigue would meet great opposition in many circles of physiological specialists, the more so as the whole doctrine of toxins and immunity, well founded though it was, was still regarded in these circles as a dubious acquisition. It was consequently necessary to prove that fatigue, when

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pushed beyond normal circumstances, produced an accumulation of poison which was capable of causing death.

An experimental demonstration to prove that fatigue had such capacity naturally encountered extraordinary difficulties. In instances where men might be subjected to extraordinary physical exertion, circumstances would make scientific observation impossible. Physiology had already an apparatus for testing dogs while running; but running is not a sufficiently exhausting exertion for large dogs to make it possible to demonstrate the anti-toxin. Weichardt therefore invented a modification of this apparatus by which, while standing on a rough surface, large dogs were continuously pulled backward. Their resistance to this and their efforts to go forward resulted in exertions sufficient to produce an accumulation of fatigue products. (This being obtained and injected into small and rapidly moving animals, such as mice, the influence of the fatigue-producing toxin was fully demonstrated.)

After Weichardt has succeeded in demonstrating the clinical "symptomo-complex" of forced fatigue, his next task was to demonstrate the fatigue material itself. This material, he proved, is not found in the blood current, as the first supposition might be. The blood functions solely as a carrier of the anti-toxin, and in the blood of highly overfatigued dogs no fatigue poison was present. The poison was demonstrated in the muscles,—a discovery that helps to explain the lifelong activity of the cardiac muscle, for the heart, of all muscles, has the richest blood supply, and the blood continually frees the cardiac muscle from its fatigue material. (Pages 634–635.)

The effects of the toxin on animals are as follows: in small doses it produces weariness and craving for sleep, whose demonstration is made evident by the length of time in which the animals will remain in unusual positions, as, for instance, a mouse placed upon its back will remain so for some time. (Page 638.)

In large doses it causes the death of animals, after a persistent fall of temperature, that is, with all the symptoms analogous to those of extreme fatigue.

The injection of the toxin produces in the large animals experimented on a true anti-toxic immunity. (Page 638.)

From all these researches into the nature of albuminous material, poisons, etc., it is evident that fresh emphasis must be laid upon the importance to the animal and human organism of adequate aeration with oxygen, such as is accomplished by the functioning of healthy lungs. Here we must remember the clinical experiences with human beings,—that in all of those whose supply of oxygen is interfered with, whether it

be by disease of the lungs or by a deficiency of hemoglobin arising from anæmia,—the body is extremely susceptible to fatigue, and it will be seen that it is far more important to bring the natural supply of oxygen for the body to its normal adequacy, than it is to administer an artificial anti-toxin to fatigue. In this connection it may be recalled how often it is possible by deep inhalations of fresh air to dispel the symptoms of accumulating fatigue toxin. The effect of bad air, as leading to fatigue, is also explained by the insufficient oxidation. (Page 643.) GERMANY

I would define "training" as follows:

As practice of muscle groups in harmonious associated activity (synergesis) without detriment to strength; as modification of respiration in the sense of increased aeration with oxygen for the repair of the blood and tissues and for the oxidation of fatigue products created by work; finally, as heightened production of the anti-toxin of fatigue, by which a surplus of unoxidized fatigue toxin in the blood may be neutralized and so a working capacity made possible which would, for the untrained, result in steadily lowered temperature and death. (Page 644.)

Fourteenth International Congress of Hygiene and Demography. Berlin, Sept., 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue resulting from Occupation.*] Dr. EMIL ROTH. *Berlin, Hirschwald, 1908.*

Weichardt succeeded in obtaining a toxin from the extract of the muscles of fatigued guinea pigs, which he injected into the peritoneal cavity of a mouse, with the result that it was thrown into the same condition of extreme fatigue that follows from forced exertion. With repeated intravenous injections of large animals with the fatigue poison, a specific anti-toxin was produced, with which he conducted active and passive immunization experiments, proving successfully that under its influence the muscles of the animals experimented on displayed a lesser degree of fatigue than under ordinary conditions. The fatigue toxin does not pass through dead membranes by dialysis, but is taken up by the living cells of the stomach.

As has been demonstrated by experiments with animals, the toxin exhibits a composite character, as do other well-known poisons (tuberculin; snakepoison).

Weichardt subsequently succeeded in preparing the toxin artificially, and in augmenting the endurance capacity of animals under experiment by administering small doses to them; he also demonstrated the presence of the fatigue poison in the excretions of animals and human beings.

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Weichardt is of the opinion that this proteid-like product of fatigue characterized by poisonous qualities is extremely widely distributed both in the vegetable and animal kingdoms. (Page 597.)

The experiments of Zuntz and Schumberg as well as others show that the expenditure of strength, or, in other words, the cost in energy, for a given work-unit, diminishes with increased practice. The skilled worker economizes his strength more than the unskilled. According to Weichardt, the value of "training" so-called consists not only in bringing about an actual increase in tissue elements, but also in producing a bio-chemical substance of marked characteristics, the anti-toxin of fatigue, which is produced by the immunizing action during "training" of the small amounts of toxic material developed in the course of repeated exertions. (Page 608.)

Vierteljahresschrift für Öffentliche Gesundheitspflege, XXXIX, 1907. Ermüdungs und Überermüdungs Massmethoden. [*Methods of estimating Fatigue and Overfatigue.*] Dr. WOLFGANG WEICHARDT, *Erlangen. Braunschweig, Vieveg, 1907.*

I first sought for the toxin in the bodies of animals, and in those which had been excessively overfatigued I found it, not in the blood, but in the juices extracted from their muscular tissues. When this (by various processes described) was freed from indifferent albumins and then injected into animals, it produced symptoms of excessive fatigue and, in large doses, killed them. When repeated injections of this purified extract were administered to horses, the specific, neutralizing agent—the antidote for the fatigue poison—appeared in the blood serum of the horses. Both also, the toxin and its antidote, may be produced, as I was later able to state, by the separation of the albumin molecules by means of physical and chemical processes.

I have demonstrated isolating both substances and have used them in an extensive series of experiments. All the typical signs of fatigue, up to death from extreme fatigue, may be produced by the artificially produced fatigue poison. On the other hand, the effect of the poison has been invariably successfully neutralized by the artificially produced antitoxin.

That fatigue toxin is of ordinary routine occurrence in the excreta and urine of human beings, shows that the production of poison takes place with ordinary, physiological fatigue; and that it does not follow that there must be a state of severe, pathological fatigue for the development of fatigue poison in the body.

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In every healthy body the process of supplying an increased amount of the specific anti-toxin takes place as soon as moderate amounts of the fatigue poison appear. This is easily demonstrated by mice, with which, by means of a special apparatus, the Kymograph, one can obtain a curve illustrating this process. (Page 330.)

The results of experimentation allow us to formulate the two following principles, taking into consideration the practical as well as the theoretical domain of the researches into fatigue and overfatigue. Small amounts of fatigue toxin bring about active immunization, which is later, after a certain time, expressed in heightened efficiency.

Overdoses of toxin, on the other hand, bring on a decrease of efficiency and may even produce death.

If overdoses of toxin are met by corresponding amounts of anti-toxin a decrease of efficiency does not take place, but, instead, after a certain time, a notable increase in capacity is evident. (Pages 332–333.)

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The Harvey Lectures, 1905–1906. Fatigue. FREDERIC S. LEE, Ph.D. *Philadelphia, Lippincott, 1906.*

Mention should here be made of the claim of Weichardt, working in Zuntz's laboratory in Berlin, to have isolated from fatigued muscles a true toxin, of a chemical and physical nature like bacterial toxins, which, when introduced in minute quantity into the body, is capable of giving rise to the phenomena of fatigue. Weichardt further claims to have obtained by the usual methods of the bacteriologists an antitoxin endowed with the power of neutralizing the fatiguing properties of the toxin. (Page 187.)

(3) NERVOUS FATIGUE

The most serious injury to the health of working women from excessive hours of labor is due to the fact that overexertion uses up nervous energy. For all industrial work, whether it involves muscular effort or not, requires the expenditure of nervous energy. Overlong working hours may therefore wholly exhaust nervous endurance.

In the nerve cells energy is generated; nerve fibers are its carriers to the muscles. Fatigue of the nervous system is ascribed to the same double origin as muscle fatigue; accum-

ulation of toxic waste products, and consumption of substances essential for activity. The poisonous waste products of fatigue act also upon nerve tissue.

Since the central nervous system controls all the vital functions, unrepaired nervous fatigue is more fatal to the organism than the exhaustion of any organ or function.

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Royaume de Belgique. Conseil Supérieur du Travail, 6e Session, 1901–1902. T. I. Fasc. II. [*Higher Council of Labor, 6th Session. 1901–1902. Vol. I, Part II.*] *Note sur la Législation relative au Repos Hebdomadaire.* [*Weekly Rest Day.*] *Discussion by* M. DENIS, *Member of Council. Brussels, 1902.*

In order to justify the intervention of the legislator the testimony of psychology must be added to that of the physiology of fatigue. We then learn that the consciousness of fatigue does not appear coincidently with the physiological phenomena of fatigue and the accumulation of the waste of combustion in our tissues. It comes on more slowly. "The workman who works," says M. Nitti, "does not perceive the oncoming of fatigue until it has reached a certain degree of intensity. This is the chief reason why society, desirous of preventing a wasteful expenditure of energy, must of necessity resort to a legal limitation of labor." And we understand the import of these words when we read in Mosso:

"Fatigue, which we may regard as a sort of poisoning, can alter the composition of the blood and the conditions of life without our experiencing any other feelings than a vague sensation of weakness." (Page 174.)

The labor contract made by one individual with another may thus be vitiated by a short of permanent error or illusion of the worker, and the principle of social intervention is based on the psycho-physiological constitution of his being.

The collective consciousness of injury must supplement the individual consciousness. (Page 175.)

Les Projets de Limitation de la Durée du Travail des Adultes en Belgique. [*Proposals regarding Limitation of Hours of Work for Adults in Belgium.*] HECTOR DENIS. *No. X. of the publications of the Belgian Section of the International Association for Labor Legislation. Liége, Benard, 1908.*

Researches into the psychology of work prove that the consciousness of fatigue is only attained when a really grave state of overfatigue has

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been reached. This alone would justify the intervention of the law. . . . The classic idea was that unrestricted individual liberty best secured individual interests . . . but now it is shown that, in what is a most imperative interest of the working man, namely, conservation of his strength, he is only enlightened imperfectly and tardily by consciousness; what, then, must be the result of all that complicated train of motives which, as Treves has pointed out, may impel the working man to risk overwork and overstrain? (Pages 10–11.)

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Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Section IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel ou tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what arguments can medical and physiological science present that will influence favorably certain methods of industrial organization?*] Dr. Zaccaria Treves, *University of Turin. Brussels, 1903.*

The solution of the problem (of nerve fatigue in muscular work) has a very practical importance, because the working man, especially when he works with machinery, is most frequently subjected to a mechanical rhythm and uniform intensity, and his labor continues regularly for hours. In reality, *man is provided, by his neuro-muscular apparatus and the systems of levers dependent on it, with a mechanism capable of making a lengthy resistance either to the direct exhaustion of muscle, or to the action of ponogetic substance* (waste materials derived from the brain or nerve tissues); *so that he is capable of doing intense work, under a permanent routine, and yet of being unaware of the gradual appearance of fatigue, which, however, reveals itself by other symptoms.* (Page 5.)

By the effect of training, which, as we know, enables the minimum maximal weight (technical ergographic term, meaning minimum of effort with maximum result of work accomplished) to be doubled, in experiments, the individual will be able to endure more intensive work as a regular thing; but it will be necessary for him to expend, with every contraction, a greater amount of nervous energy, so that his total store of disposable nervous energy will be reduced to a minimum.

Now, according to my experiments, *it has not been found that training has as favorable an effect upon nervous energy as upon muscular strength.* The only evident advantage that training shows in the nervous function

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of voluntary motion is a more ready co-ordination of muscles and an accomplishment of the purpose with a smaller number of muscles.

This qualitative perfecting of motion has also, no doubt, the effect of conserving a certain amount of nervous energy.

The well-trained athlete, then, can by practice lift heavy weights with increasing ease; but, when his muscles have attained their greatest strength, the nervous energy at his command will not have augmented proportionately with the work that his muscles are able to perform. The result is that in order to perform this work his nervous energy will be proportionately more expended. (Page 6.)

This fact explains why muscular training cannot go beyond certain limits and why athletes are often broken down by the consequences of overexertion.

And this fact also teaches us the practical necessity of preventing women, children, and even adult men from being subjected to toil, which, indeed, a gradual muscular training may make possible, but at the price of an excessive loss of nervous energy which betrays itself by no evident and immediate symptom, neither objective nor subjective.

While the individual works, the reserves of disposable nervous energy in the neurones, which preside over muscles, diminish much more rapidly than the production of work, which may, indeed, proceed according to a regular pace. In spite of this diminution, if circumstances continually demand intense and constant work, the stimulus will continue to be sent to the muscle with the intensity necessary to accomplish the purpose. (Page 6.)

Here we have an arrangement of things which is of inestimable value to man in the production of work: but this beneficent provision becomes injurious to the dynamic equilibrium of the organism as soon as it is irrationally employed. It is this that needs to be avoided in the practical organization of industry. (Page 7.)

The dynamometer might serve for this purpose (examination of approximate nervous energy of the individual) by calculating the product of medium strength exerted upon the dynamometer by the duration of the tetanic contraction. A dynamometric comparative test of different hours of work in different occupations, made upon a large number of individuals over a long period of time, might perhaps give us some satisfactory results and discover for us symptoms of fatigue that a superficial observation can neither perceive in the subjective condition of the individual nor by the quality or quantity of work executed. (Page 7.)

Intelligence and will-power driving us on in intensive labor in order to attain the maximum useful result in a minimum of time, and our practi-

cally inexhaustible muscles aiding in this, a state of things is established which involves formidable overstrain of those parts of the nervous system which act as the immediate regulators of our energies. . . . I must conclude from my experiments that the average energy of contraction does not increase in an appreciable extent as the result of practice: *It would appear that a true training of the nervous motor function does not exist.* (Page 24.) ITALY

Industry has developed in an almost dizzy fashion, and the worker's tasks have been almost completely transformed, labor having become more intense and more monotonous. It is only by following the methods indicated previously that we shall be able to know exactly whether this state of things may, or may not, be a natural cause of physical and psychical overstrain of working people.

Such overstrain would constitute a danger with which our hygienic reviews have concerned themselves too little, and which is no less grave and menacing than overwork in the school, which in the past few years has become the favorite theme of sociologists and pedagogues as well as physiologists.

And yet, when we consider the knowledge and the methods in the possession of physiology to-day for examining into the resistance of the human organism, the study of the fatigue of working men seems to offer the hygienist a better chance of arriving at a practical solution than that of the fatigue of the schoolboy. (Page 30.)

The above (ergograph, modified ergograph, electric stimuli, sphygmograph, physical and laboratorical examination, psychic tests, ergostat, chemical experiments) are the most exact methods at the disposal of the physiologist for measuring the energetic value of the human organism, and these methods only can prove to the hygienist how a state of what we may call chronic fatigue may be a permanent cause of enfeeblement of the working man. (Page 30.)

. . . The efficiency of the human organism depends rigidly on the stage of evolution and of the resistance of all higher faculties, both moral and intellectual. The workman's productivity depends on his ability to use his head as well as his hands. (Page 32.)

Archiv für Anatomie und Physiologie, 1890. Physiologische Abtheilung. Über die Gesetze der Ermüdung. [*The Laws of Fatigue.*] Dr. ARNALDO MAGGIORA, *University of Turin. Leipzig, 1890.*

I found, by experiments morning and evening, that the chief importance of sleep is for its effect on the nerve centres. With moderate exertion,

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such as the ordinary occupations of a day demand, the store of muscular energy is not exhausted, and the night's rest is therefore of minor effect upon the muscles, but the influence of sleep upon the nerve centres is far more definite. (Page 225.)

Fatigue. A. Mosso, *Professor of Physiology, University of Turin, 1896. Translated by* Margaret Drummond, M.A., *and* W. B. Drummond, M.B., *Extra Physician, Royal Hospital for Sick Children, Edinburgh. New York, Putnam, 1904.*

The nervous system is the sole source of energy; and although we must admit a certain amount of localization, this is not of such a nature as to prevent the neighboring organs feeling any loss through the great activity of any one organ. The exhaustion of energy is general; and all the magazines of energy can be drained by the exaggeration of any activity whatever of the organism. The conclusion to which we are led by my experiments is that there exists only one kind of fatigue, namely, nervous fatigue; this is the preponderating phenomenon, and muscular fatigue also is at bottom an exhaustion of the nervous system. (Page 243.)

Cerebral fatigue diminishes the force of the muscles, and with the ergograph we measure this phenomenon with exactitude. The need of rest after intense brain work arises then from the fact that the nervous centres are exhausted and the muscles weakened. The feeling of discomfort and the prostration which characterize intellectual fatigue are due to the fact that the brain, which is already exhausted, has to send stronger stimuli to the muscles in order to make them contract. The exhaustion is twofold: central and peripheral. This explains why after brain fatigue one feels one's energy exhausted by the slightest movement, and why every obstacle which we have to overcome seems to have grown more serious. (Page 280.)

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Berliner Klinische Wochenschrift, N^r 5. Feb. 4, 1901. Ermüdung und Erholung. [*Fatigue and Repair.*] Prof. Max Verworn, *Jena. Berlin, Hirschwald, 1901.*

There is an organ whose state of fatigue arouses our physiological and pathological interest to a far greater extent than does muscular fatigue, and this is the central nervous system. The central nervous system, as the dominating system of our bodies, which communicates to all other however important organs the impulses which promote or check their activities, must always share in the fatigue of single organs, such as the

muscles, by reasons of this co-ordinating function and relation. But it results, too, from the centralization of the control of all our vital functions there, that fatigue of the central nervous system has a far more decisive importance for the collective bodily activities than has the fatigue of a single group of organs such as the muscles. This is made most plainly evident by all the symptoms of pathological fatigue. (Page 127.) GERMANY

Grenzfragen des Nerven und Seelenlebens. [*Borderland Problems of Nervous and Psychic Life.*] *Edited by* LOEWENFELD *and* KURELLA. *Vol. 6. Über die Geistige Arbeitskraft und ihre Hygiene.* [*On Mental Working Power and its Hygiene.*] Dr. L. LOEWENFELD. *Wiesbaden, Bergmann, 1906.*

The nerve elements of the brain, like other nerve structures, are by no means capable of activity for unlimited time periods. After a certain duration of activity the nerve elements lose their responsiveness to stimulation, and fatigue results, or, under forced stimulation, complete exhaustion follows, even though the store of energy accumulated in the chemical combinations of the nerve cells has not been used up. If we ask why nerve elements become incapable of exertion after long-continued work, though their disposable energy is not consumed, we find that we have here to do with the effect of a poisonous product, the toxic waste product of fatigue. The accumulation of this poison paralyzes the nerve substance. This is one of nature's protective measures. Through the paralyzing action of the poison the elasticity of the tissues is protected from overstrain, and a destruction of tissue substance, which cannot be compensated by rest and food, is prevented. (Page 13.) The hygiene of the mental working capacity in adults demands before all else an economic use of the same, that is, the avoidance of overexertion. The individual's capital of available nerve force, whether that capital is large or small, must not be permanently decreased by the work executed. A disproportionate mental exertion may impair the nerve-capital in two ways:

1. By necessitating a consumption of nerve elements which cannot be fully compensated for by the available nutrition and sleep, thus leading to a progressive diminution of strength.

2. By accumulating poisonous waste products in the tissues, in excess of excretion. These wastes, as we have seen, by virtue of their poisonous properties, and their paralyzing action on nerve elements, lower the mental efficiency even more seriously than is the case when the chemical constituents of the tissues are impoverished by insufficient nourishment.

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According to all evidences, mental overexertion does not always exhibit these two phenomena in equal proportion, but one or the other predominates according to the circumstances of the nutrition of the individual. It is clear that those persons whose cerebral circulation is poorer will sooner suffer a loss of mental capital if they are forced beyond their normal mental working power, just because the overconsumption of elasticity that is made necessary by the overexertion does not find adequate reimbursement in the nutritive properties of the blood; and it is also clear that those whose cerebral circulation is especially abundant are enabled to retain their mental capital longer even if subjected to severe nervous strain of work. The disturbances noted in course of time in such an individual are more likely to be those of auto-intoxication from retained waste products. (Pages 43–44.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen; and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

In modern industry the activity of the worker is usually confined to certain muscular groups alone. The burden therefore rests upon a few overworked organs. The same muscles, the same nervous tissues, and the same parts of the brain are continually at work. In this way fatigue comes on much more rapidly than where an alternation allows temporary use of various organs, thus giving them time for rest. As, in monotonous muscular work, muscular fatigue comes on quickly, so with monotonous, one-sided mental work (for instance, long-continued addition) fatigue comes on very quickly. In general, fatigue of the nerves approaches more slowly than muscular fatigue; but, on the other hand, nervous repair takes a much longer time. (Page 1215.)

Man realizes fatigue not only by the less satisfactory results of work but also by sensations of pain and aversion. These are warning signals and protective devices of nature, by whose help injury may be averted. But it is possible that in the zeal of work these signals may be ignored. The injurious effects will therefore, however, not be avoided. Again, the signal may be noticed but cannot be heeded through the compulsion of circumstances. The day's work must be finished, and work must be kept up longer for the sake of the day's wages. Then, with the utmost strain of the will power, further activity must be wrung from the wearied organism.

But this effort of will also means an expenditure of energy, probably a more excessive drain upon albumen. (Pages 1215–1216.) GERMANY

Étude sur l'Influence de la Durée du Travail Quotidien sur la Santé Générale de l'Adulte. [*Study of the Effect of the Length of Working Hours upon the General Health of Adults.*] ILIA SACHNINE. *Lyon, 1900.* FRANCE

According to the same author (Lagrange) there are two other types of overwork which are not due to auto-intoxication: first, organic exhaustion; an individual compelled to work with expenditure of physical strength must, if his nutrition is insufficient or imperfectly assimilated, draw upon his reserve tissues for material for combustion, and, when this reserve is exhausted, the organs essential to life are next drawn upon to supply the necessary energy. The organism thus deprives itself of the organic elements indispensable to the equilibrium of health. This is auto-phagia, or exhaustion. According to Lagrange, overwork, insufficient sleep and nourishment, and, above all, excessive *hours* of work, give rise to organic exhaustion. The second type of overwork mentioned is dynamic exhaustion; here there is a sort of exhaustion of the motor nerve centres. This form of fatigue shows no appreciable anatomical changes, but only a loss of energy. It results from an over-expenditure of nerve force. (Pages 45–46.)

Diseases of Occupation from the Legislative, Social, and Medical Points of View. THOMAS OLIVER, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the British Home Office. New York, Dutton, 1908.* GREAT BRITAIN

As the result of overwork Hodge, an American physiologist, found structural changes in the nerve cells which rest removed. F. H. Scott (Journ. Physiology, Vol. XXXIV, Nos. 1 and 2, p. 145) states that in nerve cells there is formed from the nucleus and Nissl bodies of the cell a substance which passes into the nerve fibres. These fibres are capable of carrying impulses without becoming fatigued, but they cannot maintain the end-organs of the nerve in a condition of activity beyond a limited period. It would appear, therefore, as if some substance were given out from the nerve cells, hence as a consequence the readier fatigue of the central nervous system compared with the peripheral. Scott tried to locate the seat of fatigue. Muscle fibre may become fatigued, also the nerve cells in the spinal cord, owing to the hypothetical substance already alluded to being used up and time not given for fresh secretion to have been formed. (Page 8.)

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Brain Work and Overwork. Dr. H. C. Wood, *Clinical Professor of Nervous Diseases in the University of Pennsylvania. Philadelphia, Blakiston, 1880.*

Voluntary motion of a hand and arm is the result of a complicated series of acts. Successive discharges of nerve force occur, commencing in the upper brain and passing downward along the spinal cord and outward along the nerves until the muscles are reached and are called by the nervous impulse or force into action. It is a lesson not to be forgotten, that in exercise, not merely the muscle, but almost the whole nervous system labors; and that muscular movements are just as truly a putting forth of nervous power or energy as are mental efforts. (Page 92.)

There is certainly in the adult some antagonism between hard physical and mental labor. Muscular work rests upon a putting forth of nervous energy, and the man who has exhausted his stock of nervous energy in violent exercise cannot be expected to perform a prodigy of brain labor. (Page 98.)

Alienist and Neurologist. Vol. XXI. Influence of Age upon the Production of Nervous Diseases. William C. Krauss, B.S., M.D. *St. Louis, Hughes, 1900.*

The study of the influence of exhaustion upon the central nervous system has received renewed vigor and enthusiasm since the classic experiments of the American investigator, C. F. Hodge, and later verified by those of Vas, Lambert, Lugaro, Mann, and others. In a series of brilliant experimental researches, Hodge has established the existence of definite morphological alterations in the cell bodies of neurons accompanying the excessive exercise of their physiological function. His experiments on cats, sparrows, pigeons, and honey bees, showing that after prolonged exercise or activity demonstrable changes take place in the protoplasm and nucleus of the cells of the brain and cord, are familiar to you all. (Page 647.)

The Harvey Lectures, 1905–1906. Fatigue. Frederic S. Lee, Ph.D. *Philadelphia, Lippincott, 1906.*

The term, muscular fatigue, requires a word of explanation, for it has been shown by various investigators, including Waller, Abelous, Santesson, and Joteyko, that when the muscle in fatigue ceases to respond to stimuli sent to it through its nerve, it is still capable of contracting on direct stimulation. Their inference from this fact is that the motor nerve

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endings within the muscle are the first part of the mechanism to succumb. This inference is probably justified; the nerve endings are probably more susceptible to fatigue than the protoplasm of the muscle cells, and hence the muscle protoplasm itself within the organism probably never reaches the stage of profound exhaustion. . . . (Page 173.) It has long gone without dispute that in prolonged activity the brain and spinal cord succumb first, and thus the exhaustion of the peripheral tissues is prevented. The nerve center has been compared to the fuse of an electric circuit, the burning out of which protects the muscle from grievous injury. By most upholders of the neuron theory central fatigue has been referred to the bodies of the nerve cells, in which Hodge, Vas, Mann, Lugaro, Eve, and others have demonstrated histologic changes after activity. . . . (Pages 175–176.)

While these histologic changes after excessive activity have generally been interpreted as significant of fatigue, there does not exist general agreement as to their mode of origin. (Page 176.) Other experiments, however, indicate that there is less justification than has commonly been supposed for the idea that the central nervous system fatigues before the muscular system, and lead us to suspect that the reverse is true. (Page 177.)

With the general problem in this somewhat uncertain state, what can we say of mental fatigue? That it is a reality can not, of course, be denied. It is characterized pre-eminently by a weakening of the powers of attention and the reproductive phase of memory, and the psychophysical laboratories have shown us in innumerable ways how it manifests itself. . . . We can not deny fatigue to psychic centers, but the intimate relations of central and peripheral fatigue are much in need of exact experimental study. (Page 180.)

Bulletin of the Committee of One Hundred on National Health. Prepared for the National Conservation Commission by Professor Irving Fisher, Yale University. No. 30. Washington. July, 1909.

The present working day is a striking example of the failure to conserve national vitality. In order to keep labor power unimpaired, the working day should be physiological—*i. e.*, it should be such as would enable the average individual to completely recuperate over night. Otherwise, instead of a simple daily cycle, there is a progressive deterioration. A reduction in the length of the work day would be a chief means of improving the vitality of workmen, as well as the worth of life to them. The fatigue of workmen is largely traceable to their long work day and serves to start a vicious circle. Fatigue puts the workman in an abnormal frame of

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mind. He seeks to deaden his fatigue by alcohol, tobacco, exciting amusements, and excesses of various kinds. The momentary relief which he thereby obtains is purchased at the expense of an increasing susceptibility to fatigue, resulting sooner or later in complete depletion of his vital energies and in the contraction of tuberculosis or other fatal disease. (Page 45.)

The relatively slight impairment of efficiency due to overfatigue leads to more serious impairment. Just as minor ailments prove to have an unsuspected importance when considered as gateways to serious illness, so the inefficiency from fatigue is vested with great significance as the first step toward minor ailments. Obviously if overfatigue could be reduced to a minimum, this reduction would carry with it the prevention of the major part of minor ailments, which in turn would lead to a great reduction in more serious illness, and this finally would lead to a great reduction in mortality. A typical succession of events is first fatigue, then colds, then tuberculosis, then death. Prevention, to be effective, must begin at the beginning. (Page 47.)

(4) Muscular Fatigue

The dangers of excessive working hours for women are increased by the fact that the onset of fatigue is often unperceived by the worker. Not until the damage is done and health is impaired by the strain of overlong hours is the injury manifest.

Yet though fatigue may thus accumulate unperceived, the laws of fatigue and its progressive growth have been exactly studied by scientific instruments of measurement. The most important such instrument—the ergograph—was devised to measure the fatigue of a single muscle or group of muscles. It records the curves traced upon a revolving cylinder by momentary contractions of the finger muscles lifting a known weight or stretching a spring of known tension at regular intervals. Such a record shows a steady diminution of the lifting power of the muscle, the rate and regularity of the diminution varying with individuals.

After a certain degree of fatigue has set in, the muscle becomes incapable of performing further work unless a lighter weight or less tension is involved, or its contractility is restored either by artificially irrigating the muscle or by allowing an interval of adequate rest to intervene before renewed exertion. If fatigue has not proceeded too far, this suffices to remove the toxic fatigue products which have been produced in the muscle. After exhaustion has set in, a much longer period of rest is required to restore the muscle to use, or it may become wholly incapacitated.

To prevent injurious accumulation of unperceived fatigue, therefore, over-exertion through excessive working hours must be prevented.

Special Reports on Educational Subjects. Vol. IX. On the Measurement of Mental Fatigue in Germany. C. C. TH. PAREZ, *German Master at Merchiston School. London, Wyman, 1902.* GERMANY

The application of the first of the above-mentioned methods (physical or muscular test) is due to Mosso, professor of Physiology in Turin, who perfected a method of measuring the work done by a certain group of muscles in raising a definite weight again and again at regular intervals until complete exhaustion ensued.

For this purpose Mosso hit upon the idea of employing an adapted form of the myograph, an instrument devised by H. von Helmholtz for recording muscular contractions, the principle of which may be gathered from the following well-known experiments:

The leg of a frog is separated from the rest of the body, and to its extremity a pencil is attached, which is so arranged that its point comes in contact with a cylinder covered with sooty paper, which revolves round a vertical axis; as long as the leg remains at rest, the pencil traces out an even line on the revolving cylinder, but if the nerves connected with the muscles are excited by electricity, the muscles contract, and the pencil traces a curve on the cylinder, first upward and then downward, whose form corresponds to the muscular contraction of the leg, and gives a measure of the energy developed in the leg by the nervous irritation produced by electricity. After continued application of electricity, the muscle becomes tired and the curves traced on the cylinder show a corresponding modification in size and form.

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Acting on the principle here exemplified, Mosso constructed the ergograph, an instrument designed to record the work done by a particular muscle or group of muscles of the human body. The chief point aimed at in the construction of the instrument was to isolate the working muscles completely, so that no other muscle could be in a position to aid them when tired. The apparatus is accordingly arranged so that one part of it holds the arm, hand, and all the fingers fast, except the middle finger, which alone is capable of extension and contraction; that is, the flexor muscles alone can be brought into play; the other part of the apparatus is similar to Helmholtz's instrument, except that to the writing apparatus, which records the curves on the cylinder, a weight of two, three, or more kilograms is attached.

When using the instrument, the person who is to be subjected to the test contracts his middle finger at regular intervals of time, generally every two seconds; the height to which the weight attached to it is raised, is recorded on the cylinder, and decreases gradually until at length, in consequence of fatigue, the flexor muscles have no longer the power to raise the weight at all, so that the mark on the cylinder appears simply a straight line. If a grown man uses a weight of three to four kilograms, and repeats the contractions every two seconds, he is usually able to raise the weight forty to eighty times, each lift being, as a rule, slightly less than the previous one. . . .

If the highest points of all the separate contractions as recorded on the cylinder be joined, the result is a line of characteristic form known as the Curve of Fatigue.

This curve displays a characteristic and constant form for each individual, supposing him to be in fresh condition and the weight raised and the intervals of time to be the same at each trial, from which it may be inferred that every person has special characteristics as regards capacity for work, and liability to fatigue. This inference is confirmed by the following experiment: The nerves of the muscles employed in lifting the weight, attached to the weight were subjected to the action of an electric current, so that all mental influence was eliminated. In this case the curve obtained from the record of the work done by the excited muscles showed again the characteristic form peculiar to the individual, although deficient in length and height. At the same time, however, variations in the mental and physical state of the individual have of course a direct influence in the form and size of the curve; the curve is in fact, as Mosso tells us, "the resultant of a complexity of causes which influence the muscles, nerve centres, and circulation, and depend upon the composition of the blood, and the general condition of the system."

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Increase and decrease of bodily vigour, practice, mode of life, duration of sleep, rest, mental excitement, physical as well as mental exertion, all tend to cause modification of the curve. . . .

Practice, of course, strengthens the muscles and enables them to perform more work in course of time, but the results of practice can easily be distinguished and do not effect the characteristic form of the curve. (Pages 531–532.)

A comparison of curves obtained from different individuals affords an interesting insight into their respective working powers.

Seldom are the curves alike; the number of lifts varies, as also the height of each single effort.

With some persons the contractions attain the same height for a considerable period and drop suddenly towards the end, with others they drop more quickly at first, while in the case of others again, the height decreases regularly for a considerable period and suddenly sinks to a minimum after some time. (Page 533.)

In fact, the record of the ergograph bears out the results of ordinary observation, that some persons feel tired and begin to play almost immediately while others work at comparatively high pressure for some time and give way suddenly as complete exhaustion ensues, some are capable of longer, others of shorter periods of work.* (Page 533.)

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Precise estimates of phenomena of fatigue are more easily made in the case of muscle than of nerve. Energetic muscular work makes extra work for the heart, lungs, and digestion, that is easily estimated. If, for instance, the pulse rate exceeds 50–60 per cent of its rate when at rest—if it is over 140, and if after 10 minutes' rest it has not yet fallen to normal, we have before us an injurious degree of fatigue.

Respiration should not exceed the rate existing in a state of rest by more than 75 per cent, and after a fifteen minutes' pause for rest it should not remain higher than 30 per cent above normal. Elevation of the body temperature to 39° or 40° centigrade (Fahrenheit 103°–104°) is unquestionably very harmful.

* For another full description of the ergograph see the Text Book of Physiology by William H. Howells, M.D. Philadelphia, W. B. Saunders Co., 1907.

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The most exact estimate we can make of the consumption of energy is that obtained by the test of the oxygen consumption of the body. This procedure it is true, requires the use of complicated apparatus in physiological laboratories. (Page 1215.)

GREAT BRITAIN

Diseases of Occupation from the Legislative, Social, and Medical Points of View. THOMAS OLIVER, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the British Home Office. New York, Dutton Co., 1908.*

During inactivity living muscle is absorbing oxygen from the blood and is throwing off small quantities of carbonic acid—it is storing up glycogen and fat; but during activity the nutrition of the muscle is quite altered. A larger quantity of oxygen is absorbed, the carbonic acid evolved is considerable, glycogen disappears, for it is used up, and the temperature rises. The contractile substance of the muscular fibre becomes acid in reaction, owing to the presence of lactic acid and other derivatives. Whenever muscular activity is carried to the point of exhaustion, glycogen, which is the source of the muscular energy, disappears. It is used up, being transformed into carbon dioxide and water with lactic acid. Although deprived of glycogen, muscle can still contract owing to the nitrogenous substances it contains. Muscular activity requires nervous activity as well. Nerve cells as producers of force, nerve fibres as carriers, and muscles as the agents of contraction are all involved in manual labour. Each of these plays its own part in fatigue. (Page 9.)

ITALY

Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Section IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel ou tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what arguments can medical and physiological science present in favor of special methods of industrial organization?*] Dr. ZACCARIA TREVES, *University of Turin. Brussels, 1903.*

The curves of work production and of contractile energy in voluntary muscular work, both under a given rhythm and under a spontaneous rhythm, have shown us that the unfavorable conditions of work may be unperceived by the workman who is subjected to a task beyond his

strength. This possibility is greater than is realized, for the observations of Zuntz and Schumberg have proved that, though muscular work provokes ordinarily a greater expenditure of albumin, a fatiguing piece of work performed by an organism in a state of slight inanition results in an accumulation of albumin, an augmentation of the muscular mass, from whence there is an augmentation of the absolute strength of the muscles; so that even in a condition of slight inanition the individual may still exact greater and greater efforts from his muscles. ITALY

All circumstances which hamper work in any way, such as ill health or local pain, have the effect of augmenting the expense of energy in proportion to the external work . . . We can then affirm, as a general law, that *fatigue finds its expression in an abnormal augmentation of the expenditure of tissue materials as compared with work done.* (Page 28.)

When, after fatiguing work, ordinary reagents show traces of albuminuria, it must be concluded that the muscular effort, even if it has not been too prolonged, has surpassed the physiological limits of the individual. The resistance of the human body to work depends on the integrity of its organs; all work results in a destruction of organic substance which should be replaced by food. Alimentary substances constitute not only an aid to matter, but to energy also. The sum of energy which they represent is estimated by the calories developed during the combustion of aliments, while a definite amount of mechanical work estimated by kilogrammeters corresponds to these calories. Now, man can transform into motor force the energy brought to him by his food, and this is a more or less economical way according to circumstances. If conditions are favorable, the useful result may correspond to a third of the energy contained in the substances consumed; but this proportion between energy employed and useful result may fall to one-sixth, and then there will be waste.

This latter working system is injurious to the organism and must be scrupulously avoided, since, if waste augments and continues, the nutritive alterations of the muscle, which at first were only quantitative, become qualitative as well; that is to say, the afflux of blood having become insufficient, the muscular substance undergoes a remarkable and lasting alteration and becomes functionally damaged. (Pages 27–28.)

Archiv für Anatomie und Physiologie, 1890. Physiologische Abtheilung. Über die Gesetze der Ermüdung. [*The Laws of Fatigue.*] Dr. ARNALDO MAGGIORA, *University of Turin. Leipzig, 1890.*

My experiments proved that after one whole night's wakefulness the muscles weary much more quickly, so that at 8 A. M. of the following morn-

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ing the amount of mechanical work obtainable from them is reduced to the half of what it would be under normal circumstances.

In the daytime, after a night without sleep the finger contractions give one contraction of normal or nearly normal size, but the next ones fall off with unusual rapidity. As in anæmia, the reserve strength may be observed to diminish even though spasmodic or single contractions may be performed.

Mosso has shown that, under such circumstances (nightwork without sleep), not only the irritability but the productive capacity is lessened. The diminution of mechanical work is often more extreme than that caused by anæmia. (Page 226.)

Loss of sleep promotes muscular fatigue for the reason that it brings about a general exhaustion of the organism. The muscles can, it is true, continue to perform some work, but they more quickly give out and the amount of mechanical work they produce is small.

This exhausting effect of loss of sleep is not altered by taking food, but disappears only after a compensating degree of sleep. (Page 227.)

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Travail et Plaisir. [*Work and Enjoyment.*] CHARLES FÉRÉ, *Doctor of Medicine. Paris, Alcan, 1904.*

The maximum useful work of a muscle is obtained (in experimentation) with a medium weight. Increase of this weight can only be balanced by a much greater increase in the intervals of rest allowed between muscular contractions. The more frequent the contractions the smaller is the quantity of work and the greater the fatigue. The longer the rest pauses, the less fatigued does the muscle become. The strength of a muscle under intermittent work may attain almost double that which it displays under continuous work. Rapid contractions exhaust the oxygen of the blood, place the muscle in an anaerobic state which is fatal to it, while intermittent contractions permit the blood to renew its oxygen, which destroys the noxious and toxic products of muscular activity. . . . In voluntary ergographic work a rhythm is spontaneously established which represents the maximum frequence compatible with constant work. (Page 20.)

BELGIUM

Instituts Solvay. Travaux du Laboratoire de Physiologie, Tome VI, Fasc. 4. Les Lois de l'Ergographie; Étude Physiologique et Mathématique. [*The Laws of the Ergograph—a Physiological and Mathematical Study.*] Mlle. J. IOTEYKO. *Brussels, Misch and Thron, 1904.*

All physiologists agree in attributing a double origin to muscular fatigue. There is, from the view-point of chemistry, a predominance of

the process of disassimilation over that of assimilation. On one hand there is progressive consumption of elements necessary to activity which cannot rebuild themselves rapidly enough to suffice for the exigencies of the moment, and on the other hand there is an accumulation of waste products which cannot be eliminated or neutralized with sufficient rapidity. (Pages 393–394.) BELGIUM

Consumption of stored elements is never absolute: a muscle ceases to contract before complete exhaustion of its reserves. . . . It is, then, not so much the consumption of all reserves as the impossibility of drawing further upon them that characterizes fatigue. . . . It is generally admitted that, in its initial contractions, a muscle does not consume the same materials as it consumes in its final contractions. (Page 394.)

Mosso has devised an apparatus which records the curve of nervous effort which functions during fatigue. He has demonstrated by experiments with the ponometer that the nervous stimulus necessary to produce contraction in muscle is much greater if it is fatigued than if it is rested. "Effort increases with fatigue" (Mosso). Thus ergographic fatigue has, for effect produced, increasing resistance in the muscles (proof of the peripheral seat of fatigue), and it is to overcome this resistance that the nerve centres are compelled to send to the periphery orders of increasing intensity. The ponometric curve, says Mosso, follows, therefore, a course which is the inverse of the ergographic curve. (Page 398.)

The Harvey Lectures, 1905–1906. Fatigue. FREDERIC S. LEE, Ph.D. *Philadelphia, Lippincott, 1906.* UNITED STATES

Owing to the unequalled opportunity of applying to the study of muscular activity the exact methods of the physicist and the chemist, the phenomena of muscular fatigue are known more exactly than those of other tissues. . . . Let . . . a muscle be stimulated by a series of artificial stimuli of equal intensity, regularly repeated and applied either directly to the muscle itself or indirectly through the mediation of the nerve, and let the muscle perform mechanical work, such as the lifting of a certain load. We may then observe the following phenomena: the degree of shortening of the muscle during each contraction increases for a considerable time, hence the height to which the load is lifted or the amount of work that is performed is gradually increased. Later the reverse occurs—the shortening decreases, reaches its original amount, falls below it, and disappears slowly and very gradually, the muscle becoming incapable of performing further work unless a stronger stimulus or a lighter load be employed, or a period of rest be allowed to intervene, or the chemical composition of the

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muscle be artificially altered in a suitable manner. The irritability of the muscle at first increases and later decreases; its total capacity for performing work begins to decrease at the beginning of the experiment. (Page 170.)

More than twenty years ago the Italian physiologist, Mosso, devised the important apparatus called the ergograph, and by its means began the long series of studies of voluntary contractions in man, which has made the Turin school famous, and has immeasurably extended our knowledge of fatigue in living human beings. . . . An ergographic record usually consists of a series of curves of momentary contractions, at regular intervals, of certain finger muscles, either one or more, a known weight being lifted or a spring of known tension being stretched. Such a record exhibits in fatigue a gradual diminution of the lifting power of the muscle, the rate and regularity of the diminution varying with individuals. . . . In the course of the experiments I have quoted, it may justly be said that fatigue begins with the first contraction—the muscle is less capable of work by reason of this contraction. It is convenient to set aside the late stages as the period of exhaustion, although the beginning of such a period is not marked by distinctly physical phenomena. If at any time the muscle be irrigated by a stream of fresh blood, by Ringer's solution, or even by an indifferent isotonic solution of sodium chloride, or, what is less efficient, although in some degree effective, if it be allowed simply to rest, the physiologic pendulum tends to swing back, the irritability and the total capacity for work increase, and physiologically the organ is pushed back to an earlier stage of the fatigue process; in other words, the muscle is in some degree restored. (Pages 172–173.)

(5) The Greater Strain on Fatigued Muscles

The need of limiting the length of working hours for women is due to the fact that the greatest strain is attendant upon "overtime," or work continued after and in addition to the regular working day.

When the hours of labor are so long that work must be continued after fatigue has set in, the dangers to health are correspondingly increased. Greater injury results from work done by fatigued muscles than from severer labor accomplished before the worker is tired. This is because

strain, or the continued exertion of will power to keep up, is more exhausting than work in itself.

Scientific investigation confirms this fact and demonstrates by the ergograph that the final small contractions of the finger muscles expend more energy and exhaust more than the first large ones, made before fatigue has set in.

Archiv für Anatomie und Physiologie, 1890. Physiologische Abtheilung. **ITALY**
Über die Gesetze der Ermüdung. [*The Laws of Fatigue.*] Dr. ARNALDO MAGGIORA, *University of Turin. Leipzig, 1890.*

At the outset of my experiments I found that muscles which had been wearied rapidly regained their former energy after the night's rest, but that, by subjecting them to continuous work through the day without sufficient time for rest, they gave a regularly diminishing amount of mechanical work as the day went on. (Page 205.)

It was shown by my experiments that for the first three observations an hour's rest period was sufficient for each hand, to restore energy completely, but not after the three first trials. Following muscular fatigue which is not completely banished we get a mechanical result which diminishes in a regular ratio. (Page 206.)

Having found a one-hour pause insufficient, I repeated the experiments with a pause of an hour and a half for rest. It was proved that this also did not suffice to keep the muscles up to their full capacity, as the amount of mechanical work gradually diminished. Then in another series of experiments I lengthened the pause to two hours, and found this period was sufficient to keep the muscles up to their full capacity and to prevent the development of fatigue, so that from morning to evening the muscles were able to produce that normal amount of mechanical work that they exhibited after full and complete rest. (Page 207.)

It is important to give the muscles a rest in the beginning, so that fatigue does not accumulate, if it is desired to obtain recurring mechanical work from them at regular periods throughout the day. (Page 207.)

Fatigue is complicated here (in certain experiments which have been described) because the utmost possible exertion of the will was continually made. This altered the results, because, as Mosso has shown, and as I have also demonstrated, strain is more exhausting than work. (Pages 210–211.)

The work performed by a muscle that is already wearied is much more

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harmful in its wear and tear than severer work would be under normal circumstances. (Page 211.)

It is a well-established fact that muscles weary much more quickly under direct stimulus than when they are indirectly stimulated by the nerves, and that a more powerful nerve stimulus is required to make a wearied muscle contract than one which is rested. (Page 211.)

It was shown plainly by a series of experiments that, when the strength of the muscle was not completely exhausted, but the task was remitted before the final stage of weariness came on, the muscle remained much more capable and wearied less easily, being able to produce an amount of mechanical work which was double that produced when it was worked up to full exhaustion, even though the most favorable conditions of periodical rest were then allowed. (Page 213.)

These observations teach that the last smaller contractions of a work tracing exhaust more than the first large ones, and this is most important, as it proves that strain is more fatiguing than work. This result is also stated by Mosso and Kronecker. (Page 213.)

Anæmia produces the same results as fatigue. (Page 217.)

The fatigue of the working muscles reproduces itself in those that are not working directly. (Page 218.)

Mayer, in his work "Die organische Bewegung in ihrem Zuzammenhange mit dem Stoffwechsel," stated that weariness, when it did not simply result from a momentary excess of work, was diffused over the whole muscular system; for instance, the temporary work of one arm does not fatigue the other arm, but after a fatiguing walk the arms as well as legs are indisposed to further exertion. This I have demonstrated experimentally with the ergograph. (Page 218.)

After a fatiguing day's march, certain soldiers' hand tracings showed a notable diminution of energy even after the night's rest, being very low at 7 A. M., less so at 9 and 11, but only rising to normal energy by 3 P. M. (Page 224.)

Fatigue. A. Mosso, *Professor of Physiology, University of Turin. 1896. Translated by* Margaret Drummond, M.A., *and* W. B. Drummond, M.B., *Extra Physician, Royal Hospital for Sick Children, Edinburgh. New York, Putnam, 1904.*

The consumption of our body does not increase in proportion to the work done. If I do a unit of work, I cannot say that I shall have a unit of fatigue, nor that, if I do twice or thrice the amount of work, I shall have twice or thrice the amount of fatigue.

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Dr. Maggiora, in a series of researches carried on in my laboratory, has shown that *work done by a muscle already fatigued acts on that muscle in a more harmful manner than a heavier task performed under normal conditions.*

This method was as follows: By a preliminary series of experiments, he proved that two hours' rest is required before every trace of fatigue disappears from the flexor muscles of the fingers after they have been exhausted by a series of contractions in the ergograph. This was the period of repose which Dr. Maggiora, for example, had to allow his muscles in order to annul entirely all the effects of the exhaustion. If he diminished this period, if, for example, he allowed only one hour instead of two to elapse between one series of contractions and another, it was only natural that the muscle should do less work because it was insufficiently rested.

Now, it might be thought that if the work were reduced by one half, the period of repose might also be reduced in the same proportion. But by experiment it was found that the period of repose might actually be reduced not to a half, but to a quarter; that is to say, if thirty contractions are required to exhaust a muscle completely, the period of repose necessary after fifteen contractions is only half an hour. These observations show that the expenditure of energy in the first fifteen contractions is much less than in those following; and that the fatigue does not increase in proportion to the work done. . . . We find that the work done during the first fifteen contractions is much greater than that done during the second. . . . If the energy of the muscle is not completely exhausted, that is to say, if the final contractions are not made, the fatigue is much less, and the muscle is able to perform more than double the amount of mechanical work which it would do if it worked to the point of exhaustion with the most favorable conditions for repose.

Every one who has made the ascent of a mountain is familiar with the fact that the last part of the climb, when the summit is almost attained, demands a much greater effort than that necessitated by greater difficulties when one was less fatigued. Our body is not constructed like a locomotive which consumes the same quantity of carbon for every kilogrammetre of work. When the body is fatigued even a small amount of work produced disastrous effects. (Pages 150–152.)

I have stated that our organism is more injured by work when it is already fatigued. One of the causes of this is that the muscle having consumed in normal labour all the energy at its disposal finds itself compelled by additional work to trench upon other provisions of energy which t has held in reserve; and thus it happens that the nervous system lends

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its aid with a greater intensity of nervous action. But though the nervous energy comes more into play the contractions of the fatigued muscle are weak. (Page 152.)

The workman that persists in his task when he is already fatigued not only produces less effective work, but receives greater injury to his organism.

The intervals between one effort and another should be longer when one is tired, because one's energies are restored less rapidly, the excitability of nerve and muscle having been diminished by fatigue. (Page 157.)

FRANCE

Étude sur l'Influence du Travail Quotidien sur la Santé Générale de l'Adulte. [*Study of the Effect of the Length of Working Hours upon the General Health of Adults.*] Ilia Sachnine. *Lyon, 1900.*

Maggiora, after numerous experiments, proved that, in order to obtain a series of tracings of normal fatigue in one and the same day and from one hand only, it was necessary to allow two hours to intervene between the tracings, while, if the experiment was made with a hand previously fatigued, it was necessary that a much longer time of rest be allowed in order that the strength of the hand be completely restored. Two hours did not suffice to restore the normal energy.

By the aid of the ponometer, Mosso showed that a much stronger stimulus is necessary to produce muscular contraction when the muscle is fatigued than when it is rested. While the output of work produced in a fatigued state is diminished, the nervous effort is progressively greater; the wearied muscle needs a more intense nervous action to make it contract. This physiological law is shown in all the acts of our daily life. . . . Every one knows what a fund of nerve energy must be expended to enable him to sustain with outstretched arms a weight which at first was hardly felt. (Pages 49–51.)

GERMANY

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. Conrad, *Professor of Political Science in Halle;* L. Elster, *Ober Reg. Rath in Berlin;* W. Lexis, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. Herkner, *Berlin. Jena, Fischer, 1909.*

A workman, in the morning hours, between 9 and 10, with an expenditure of energy (a), produces an output (x). In the last hour of the day, on account of fatigue which was plainly felt and required special exertions of will power, he produced an output of $\frac{x}{2}$, but not with the ex-

penditure of energy a, but with a $a+\frac{a}{2}$. It would therefore be a great mistake to think that, as x has cost one hour of work, $\frac{x}{2}$ has cost only half the work. It would actually correspond to an expenditure of energy, not of $\frac{a}{2}$, but $3\frac{a}{2}$. GERMANY

Precisely because a general relation between time spent, work, and output may be assumed, one can easily fall into the error of regarding all prolongation of working hours as economic advantage and all reduction as disadvantage. (Page 1219.)

If this error still persists it is because practical and easily utilizable methods of exact measurement are still new and of recent development. (Page 1220.)

(6) The Physiological Function of Rest

(*a*) Rest Needed to Repair Expenditure of Energy

During rest, fatigue disappears. Rest is thus a physiological necessity. With the intensity of modern industry, the individual worker can keep up efficient labor only on condition that the fatigue engendered on one day is completely repaired before the next day. If fatigue is not balanced by adequate rest, a deficit remains which may be little noticed at first, but which inevitably accumulates, and after a shorter or longer period results in physical breakdown.

When an individual has worked to exhaustion through excessive hours of labor, normal rest does not suffice for repair. He has literally "used himself up."

Die Menschliche Arbeitskraft. [*Human Energy.*] Dr. Gustav Jäger, *Professor of Zoölogy, Physiology, and Anthropology, Stuttgart. Munich, Oldenburg, 1878.* GERMANY

The incidents of the transformations of albumins in the tissues make it clear that repair after overfatigue is a very slow process, . . . and explain the more remote fact that overfatigue often results in a permanent ruin of the constitution by interfering with the regulatory apparatus. (Page 280.)

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Gesammelte Abhandlungen. Bd. III. [*Complete Works. Vol. III.*] *Die Volkswirthschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages.* [*The Economic Significance of a Shorter Working Day.*] ERNST ABBÉ. *Paper read before the Political Society, Jena, 1901. Jena, Fischer, 1906.*

Now, when an activity is repeated daily in the same grooves, in the same form, the individual concerned can keep up this activity day by day only on condition that the fatigue engendered on one day has been completely banished by sufficient rest and proper nutriment before the next day's work is undertaken.

If even the smallest deficit remains after the equalization of fatigue and rest,—a deficit that would not be noticeable on any one single day, but which is added to daily and accumulates little by little, then the inevitable consequence is that, after a more or less prolonged period of time, the individual goes to pieces physically. It is the same as when he spends daily ever so little more than his income. If he keeps this up, there comes a time when he inevitably becomes bankrupt. (Page 226.)

I can therefore say: every workman whose work is done under these labor conditions must be afforded daily recuperation for his expended energies, and the daily compensation of rest and food must wholly equal his average total of exertion. The daily average of fatigue and expended strength must be absolutely balanced by fresh strength and recuperation, because the least deficit will accumulate gradually and will finally have ruinous effects. (Page 226.)

Concordia: Zeitschrift der Zentralstelle für Volkswohlfahrt, Nov. 1, 1907. Arbeit, Ermüdung, und Erholung. [*Work, Fatigue, and Recuperation.*] Dr. F. RITZMANN, *Factory Inspector, Carlsruhe. Berlin, 1907.*

In a modern allegory of life the three fates, weaving the destiny of man, would bear the names Work, Fatigue, and Recuperation, for our whole being is so exclusively under the domination of these three entities that a life free from them is hardly conceivable. It is the more remarkable, then, to see how superficial a knowledge most men have of the actual significance of these three things. And yet an understanding of the relations between work, weariness, and reparative rest is no less important for mankind and for social betterment than the comprehension of other, definitely hygienic, questions of a general nature. The question of the relation between work, fatigue, and recuperation is pre-eminently a hygienic one.

The problem is: How must we arrange our work in order to remain, in the widest sense, healthy in mind, body, and spirit? What is Work?

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The science of psychology is concerned, roughly stated, with the study of every kind of mental process. Among these processes, again roughly stated, are to be reckoned every manifestation of life not arising exclusively from muscular movements; namely, the sensibilities, desires, variations of disposition, thought, judgment, and all such manifestations.

. . . Every alteration in the condition of the brain sets free a mental wave: every mental process brings about an alteration of the state of the brain, even as every physical process is inseparably bound up with an alteration of the muscular structure.

Physiological investigations have taught us that chemical transformations occur during these changes of nerve and muscular cells, and with the knowledge thus gained we are able to give a new definition of the term "Work."

By "Work" we mean every process which tends to destruction of tissue cells and the production of poisonous waste matter, and in contrast to this we define the term Reparation, or Recuperation, to signify all those processes which tend to a rebuilding of the tissue cells and the removal of poisonous wastes. Full and intimate knowledge of the nature of those chemical processes which I have defined as destruction of cells and production of poisonous substances has not yet been attained. We know, though, familiarly, that accompaniment of work which we call Fatigue.

This conception of the idea of work which we attain through physiology is the amplest that we can imagine. It includes all fatigue-producing activity, even when, as with Sport and Play, this activity is not classed in popular terms with work. It includes also, however, as well,—and this is essential for its usefulness,—every activity which, according to popular terms, whether in the physical or in the politico-economical sense of words, can be regarded as work.

Physiology gives us not only a useful definition of the term Work, but also of the terms "Fatigue" and "Recuperation," and this brings us measurably nearer to a solution of our problem—the hygienic regulation of work.

Fatigue is at once the inseparable companion and the bitterest enemy of work. The most important task of the Hygiene of Work is, therefore, to combat fatigue. (Pages 359–360.)

Fourteenth International Congress of Hygiene and Demography. Berlin, Sept., 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue resulting from Occupation.*] Dr. EMIL ROTH. *Berlin, Hirschwald, 1908.*

The increasing use of machinery as a substitute for handwork, and the rapid tendency toward subdivision of labor, are bringing about conditions

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that are more and more favorable for the employer, but for the worker, on the contrary, harder and less favorable, and especially more monotonous. Therefore, from the point of view of health preservation, it must be considered proper to regulate working hours in accordance with the principles enunciated by Abbé: viz.: The daily supply of energy required for daily labor must be gained by sufficiently long periods of rest and economical use of strength, and must not exceed the expenditure of energy required by the accelerated pace of industry. (Pages 593–594.)

A consideration of all the factors concerned in the study of overwork resulting in over-fatigue, shows that these factors are many. One of the most important of all, from the standpoint of prevention, and in the interest of the workers' health, is this: The intensiveness of the labor, or the relation of the energy expended in fulfilling the work's requirements to the length of time during which energy is so expended, must not overstep a certain fixed limit. That industrial establishments fail notoriously in meeting this first and fundamental requirement of labor protection, admits of no debate. (Page 604.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen, and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

Quotation from Pope Leo XIII. Encyclical on the Labor Problem:

"Justice and Humanity protest against demands upon laboring men, so excessive that the body gives way and the spirit is dulled. As in man all things have their limitations, even so is it with the capacity for labor, and no one can exceed the limits of his powers.

"Working strength is enhanced, it may be true, by practice and habit, but yet it attains its due efficiency only when, at proper times, rest is provided.

"In respect to hours of work the principle should be recognized that they should not be longer than is proportioned to the workmen's strength." (Page 1205.)

"In general it should be a fixed rule that as much rest should be granted the worker as is needed to restore his strength; for the release from work has the restoration of strength as its purpose." (Page 1205.)

These declarations are in so far noteworthy that they state with great clearness the fundamental principle that the time for rest after the day's

work must allow complete restoration of the expended strength. . . . On the other hand the laborer's right to a compensation that exceeds mere recuperation, his right to pleasure, enjoyment of family life, etc., is not recognized. (Page 1205.) GERMANY

It is a cause for thankfulness that some employers have with great pains voluntarily undertaken a methodical and unprejudiced presentation of material (relating to the problem of overwork), and, also, that the symptoms of fatigue are at present receiving a thorough-going investigation at the hands of factory hygienists and physiologists. In this way alone will it be possible to understand the causal relations of fatigue, and discriminate between typical and adventitious features described in individual observations. Then, too, for the first time it will become possible with exact estimates of fatigue symptoms (by instruments of precision) to agree upon the proper times for pauses for rest, and upon that duration and intensity of work which will yield the maximum of product, while at the same time the working power of the laborer is fully conserved. (Page 1212.)

The numerous instances of favorable results from reduced hours can no longer be ignored, even though all are not of equal value. Taken in connection with the most recent psychological and physiological researches, they strengthen the presumption that, where working hours exceed ten, . . . either the employer suffers from slack work or the worker from overfatigue. A reduction to ten hours would therefore, as a rule, not only work no injury to economic interests, but would further them in many cases. As to how far a progressive reduction to 9 or 8 hours could go without injury to commerce, this must also be learned by special investigations which should cover every detail and accessory circumstance in the case. Above all it must be shown, by perfected statistics and scientific methods of precision both physiological and psychological, whether, or why, with a 10-hour day a sober workman of normal physical and mental equipment should suffer fatigue which cannot be compensated for by the daily resting times.

(Length of work, heat, dust, nutrition, etc., must be estimated.) If it appears that the direct or indirect origin of this fatigue is to be found in the length of working hours, then, in such cases, in the interests of the general health, a reduction of hours must be sought, even if, economically, some risk is run. If this reduction cannot be assured by the contracting parties, then the state must take it in hand. Should there be no necessity on hygienic grounds, nevertheless from the standpoint of commercial progress it may appear desirable to approach the 9 or 8 hour limit. (Page 1216.)

ITALY

Revue Internationale de Sociologie, Nov., 1895. Le Travail Humain et ses Lois. [*The Laws of Human Work.*] FRANCESCO S. NITTI, *Professor, University of Naples. Paris, Giard et Brière, 1895.*

In every case it is certain that the workman disposes of a certain amount of potential energy, which, within certain limits, is capable of augmentation and of diminution.

A workman, even one sufficiently nourished, cannot produce, beyond a certain limit, without injury. Beyond this limit, if he continues his work, he exposes himself absolutely to fatigue and exhaustion and his productivity is gained at the expense of his own organism. (Page 1026.)

There is a cruel antithesis between the interests of the capitalist and of society. . . . If for the benefit of the former the workman must consume his own tissues and is not able to protect himself, then production proceeds along with the degeneracy of the worker. (Page 1026.)

The consequent loss of energy is a social loss. . . . Society sees the average strength of the workman diminishing, morbidity and mortality extending, the physical development of the masses retrograding. . . . It is therefore natural that society should awake to the need of interference. (Page 1027.)

It is certain that there is a work-limit which the average workman cannot exceed without danger, as beyond it he risks fatigue and degeneracy. (Page 1027.)

The physiological law that work done by a tired muscle injures it more than work done under normal conditions can be verified by every one from his own experience. (Page 1027.)

Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Sec. IV. Dans quelle mesure peut-on par des méthodes physiologiques étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel ou tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what argument can medical and physiological science present in favor of special methods of industrial organization?*] Dr. ZACCARIA TREVES, *University of Turin. Brussels, 1903.*

In answer to a political economist, who has said "the physiological limits of the duration of work have not yet been found and cannot easily be found," the physiologist replies that *the physiological limit of the dura-*

tion and the intensity of work is that limit beyond which the organism is reduced to the necessity of working wastefully. (Page 33.) ITALY

Royaume de Belgique. Conseil Supérieur du Travail, 6e Session. 1901–1902. T. I, Fasc. II. [*Higher Council of Labor, 6th Session. 1901–1902. Vol. I, Part II.*] *Note sur la Législation relative au Repos Hebdomadaire.* [*The Weekly Rest Day.*] *Brussels, 1902.* BELGIUM

M. Adolphe Prins (Member of Council):

To-day under present conditions of competition and production it is more than ever necessary to protect working men from overstrain. Rest is more and more indispensable as work becomes more intense. In every line of activity, only the regular alternation of work and rest is able to conserve energy, and those individuals and nations whose lives are so regulated will surpass others in economic rivalry. (Pages 81–82.)

M. Beco:

The man who works must have rest. Rest must alternate with work; this is a physiological necessity. The workman becomes incapable of any physical or mental work whatever if after a certain number of hours he is not able to rest. The desire for sleep, after a certain time, overcomes him. . . . Then in addition to rest during the day, the worker needs periodic rests. (Page 124.)

Every health regulation must have a scientific, exact, and acknowledged basis. . . . Thus the demands of hygiene justify the legal protection of workers against special dangers, poisons, and physical overstrain from excessive labor unreasonably prolonged. No one contests the legality of such legislation; . . . on such lines the police power is extensive and effectual, and its right to be so is not disputed. (Page 129.)

M. Denis (Member of Council):

. . . Man has a new right, the right to leisure and rest, as well as work. . . . The history of labor legislation can be given in two words: the right to rest is inherent in man's physiological structure. It involves an inflexible social necessity to do away with the exhaustion resulting from overwork, and to conserve working power, the most precious possession of a nation.

On this the most learned physiologist of Italy has said: "The prodigious development of industry and of machinery is resulting in extreme intensity of labor and the law of exhaustion must of necessity put a limit to greed for gain."

Science traces out a path for the modern lawmaker: his difficult but glorious mission is to accomplish the normal synthesis of these two in-

BELGIUM

alienable rights springing from the very laws of life—the right to employ one's working powers and the right to conserve them. (Page 169.)

When we compare the actual working day (in Belgium) with the most moderate requirements for rest endorsed by scientists, we find that there is an absolute necessity for a periodic rest day.

At the International Conference on Sunday Rest in 1889, Dr. Haegler's report justified the weekly rest day from the point of view of hygiene, as he said, "The labor of each day leaves an organic deficit, and the weekly rest day is essential for the purpose of restoring this loss." (Page 172.)

Maggiora has demonstrated that in order to obtain the same quantity of muscular work evenly throughout the day, the muscles must, from the outset, have their proper periods of rest, so that they can act each time with fresh energy and so that fatigue will not accumulate. This accumulation of fatigue is the most important phenomenon to consider now; it arises in the course of the day, from every breach of equilibrium between work accomplished and rest given to the muscles. As soon as work is in excess, or rest is insufficient, there is an accumulation of fatigue, and this, as Maggiora has shown, is displayed by a diminution of effectiveness. What is true of the different hours of the day is true from one day to another. Waste products of fatigue are carried over from one day to another with cumulative effect. Maggiora's writings contain a remarkable chart showing the effects of a sleepless night,—that is, a night without repair. From this chart we may gain an idea of the rapid cumulation of waste substances, and the gradual extension of the organic deficit. (Page 174.)

School children have been submitted to valuable tests. Intellectual fatigue is measured by tactile sensibility as recorded by the esthesiometer. This sensibility diminishes gradually as fatigue increases, and there is a veritable accumulation from one day to another. To return to the normal condition of tactile sensibility, a weekly rest day must be obtained. (Pages 173–174.)

Thus, the accumulation of fatigue which is favored by the modern industrial system and the intensive character of machine work takes place from day to day, and the weekly rest is a liquidation period—a necessary re-establishment of the physiological equilibrium. (Page 174.)

FRANCE

Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. II, Sec. IV. Die Ermüdung durch Berufsarbeit. [*Fatigue as a Result of Occupation.*] Prof. IMBERT, *Montpellier. Berlin, Hirschwald, 1908.*

An industrial machine works, but is not fatigued.
A muscle, on the contrary, works, and becomes fatigued.

FRANCE

Fatigue, essentially and exclusively a physiological phenomenon, characterizes the human organism when the latter is regarded as a working machine. Consequently, even from the economic point of view, the discussion of every question involving the factor of labor in industry is incomplete if the influence and the possible consequences of fatigue are not contemplated. Fatigue, on the other hand, disappears during rest, both as to its causes and effects, if the rest is as much prolonged as the labor has been exacting.

Rest is thus, quite aside from any social or humanitarian consideration, a physiological necessity. . . .

It is physiologically and, one may add, economically essential that the nights rest and the weekly rest should suffice to permit the human organism, which has been subjected to a period of labor, to return to its normal state. If this does not happen, the human machine deteriorates, as complained of by the worker, and the output suffers, which affects the employer, to say nothing of the charges upon society which may result from such deterioration.

Overstrain is present if, after the daily or weekly rest, at the moment of resuming labor, traces of fatigue still remain and the primal and normal productive capacity has not been restored. (Pages 634–635.)

AUSTRIA

Eighth International Congress of Hygiene and Demography. Budapest, 1894. Vol. III, Sec. IV. De l'Influence de la Durée du Travail sur l'État de Santé des Travailleurs. [*The Influence of Working Hours on the Conditions of Health of Working People.*] Dr. JULES FÉLIX, *Hungary. Budapest, 1895.*

Every being must obey the law of work, which is nothing else than the regular and harmonious functioning of the body . . . but there is also another law, that of the necessity of rest, the need of repair . . . for organisms, as well as for separate organs, all prolonged activity leads to exhaustion, and to effect repair, periods of rest from functioning are imperative. . . . The time needed for rest, and the materials required for repair must be proportioned to the organic expenditure, to the intensity and duration of work; or, in other words, the duration of rest and the reparative material of every organism must be proportioned to the length and intensity of its activity. (Page 2.) For civilized man sleep alone is not enough for rest. It is also necessary—even indispensable, if man is to preserve the plenitude of his physiological, intellectual, and moral faculties, and not degenerate—that he shall vary his work as well as his recreation. (Page 3.)

GREAT BRITAIN

History of the Factory Movement from the Year 1802, to the Enactment of the Ten Hours' Bill in 1847. "Alfred." (SAMUEL KYDD.) *London, Simpkin, Marshall, 1857.*

Rest of body is the first requisite for one who is habitually overworked; no evil can flow from this requirement being reduced to practice. Experience has proved that factory regulation has been beneficial in body, mind, and morals to those for whose good it was intended. Its promoters have not been deluded theorists, they have been practical statesmen. (Vol. I, page 268.)

Transactions of the National Association for the Promotion of Social Science. Vol. XI, 1867. On Public Recreation. WM. HARDWICKE, M.D. *London, Longmans, 1868.*

The necessity for lessening the hours of severe labour begins to show itself in many ways.

In former times when labour was not so ardent, holidays were many; now that civilization advances and labour begins to be more intense, the exhaustion is consequently greater, and the period of rest must be more frequent or more prolonged. (Page 476.)

The Lancet. Vol. I, March 4, 1905. "Overwork." (*Editorial.*) *London.*

Ingenious attempts have been made by Maschek and other writers to classify work under the three headings of effort, velocity, and duration, and to arrive at formulae which should show the proper relations of these three elements to each other. Such attempts have not been conspicuously successful, but they at least serve to call attention to the distinctness of the elements in question and to the necessity of taking each of them into consideration when endeavoring to estimate the output of an individual. They remind us that the spurt of a tired man may be more injurious to him, may, in common parlance, "take more out of him," than sustained efforts more deliberately accomplished. . . .

Maschek succeeded in establishing at least one formula which appears to show that the time occupied in strenuous endeavor should not greatly exceed one-third of the twenty-four hours.

. . . Of the three elements . . . that of duration is usually most under our command, and those who would retain health and attain longevity should see to it both that their efforts are not too prolonged and that

they are followed by corresponding periods of rest. . . . If we turn to the elements of velocity in work we shall find abundant reasons for the belief that its predominance implies an amount of strain greatly in excess of the actual accomplishment and calls for a corresponding equivalent of repose. The wise man who must spend his life in living will be all the more solicitous so to manage his expenditure that it may not be wasteful and he will be careful to guide his activities to this end. . . . He will realize that exceptional duration and exceptional speed of work should be avoided whenever possible, and that when they cannot be avoided, they should be followed by correspondingly exceptional periods of repose. (Pages 579–580.) **GREAT BRITAIN**

The Harvey Lectures. 1905–1906. Fatigue. FREDERIC S. LEE, Ph.D. *Philadelphia, Lippincott, 1906.* **UNITED STATES**

Mankind at present can administer no food or drug that can push the wearied cells up the metabolic grade, either simultaneously with their descent or quickly after the descent has ceased. Only the assimilation and detoxication that normally come with rest—and, best, rest with sleep—are capable of adequate restoration of working power. (Page 190.)

(*b*) REST NEEDED TO REPAIR THE DEFICIT OF OXYGEN

The injuries from excessive working hours are confirmed by medical observation and science, which has demonstrated that during over-exertion the expenditure of oxygen of any individual exceeds the amount respired, and must be met by the reserves of the organism, by the oxygen of the blood and tissues.*

Handwörterbuch der Staatswissenschaften, Bd. I. [*Compendium of Political Science, Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen; and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.* **GERMANY**

We distinguish Exhaustion from Fatigue.

In exhaustion there is a deficiency of reparative material for the restoration of the vital tissues. This is especially a deficiency of oxygen.

* See footnote on page 109.

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During work more oxygen is taken from the red blood corpuscles than can be normally replaced by them from respiration and food. (Verworn.) While fatigue can be banished by rest, exhaustion can only be overcome by fresh supplies of oxygen and organic tissue building material in food. Recuperation takes place in fullest extent only in sleep, as during sleep the consumption of oxygen is diminished.

Now it is to be remembered that consumption of energy takes place not only in work, but also in the vital processes themselves. We are continually losing heat (energy) to our environment. There is, however, a great difference. The organism at rest requires, in 24 hours, about 2770, the actively working organism 4550, calories.

The consumption of energy during work results from the mechanical and mental activities required by the occupation processes. To this is added further consumption by standing; certain postures of the body; strain of special senses; jarring of the body, by machinery, etc.

In this wise, fatigue of the muscular and of the nervous apparatus is brought about. In laborious work, involving the whole body, fatigue of the entire muscular apparatus appears. (Page 1215.)

FRANCE

Tenth International Congress of Hygiene and Demography. Paris, 1900. In one vol. Législation et Réglementation du Travail au point de vue de l'Hygiene. [*Labor Legislation and Regulation from the Standpoint of Hygiene.*] M. Édouard Vaillant, M.R.C.S. *England. Paris, Masson et Cie., 1900.*

Physiological researches have proved that if work has been pushed to exhaustion, normal aliment and normal rest no longer suffice for repair; that any work acts more injuriously upon a wearied muscle than even heavy work under normal conditions, that when the normal muscular energy has been expended, the nervous system is under excessive strain and becomes exhausted; that this nerve exhaustion, combined with physical work, increases with a rapidity proportionate to the expense of nervous force and attention demanded by the work; that all muscular work, however light, aggravates a condition of intellectual fatigue and nervous tension, and that rest must be sufficient to ward off fatigue.

It is most important to determine the physiological limits of work which the workman should not overpass. . . .

This limit contracts or expands with the physical and intellectual strength, the age, sex, general and technical education, training, the nature and surroundings of the work, and a number of other temporary or permanent conditions. (Page 509.)

FRANCE

The principle of organic protection is this: an individual, in no matter what category, should never exceed the physiological boundary of labor where, through duration, or intensity of effort, overwork and fatigue begin.

This limitation could be easily determined by simple hygienic and medical oversight of that kind now established in an elementary way by the German wage-earners insurance, if carried to completion and established generally throughout industry. (Page 510.)

But even now this physiological limit can be determined. . . .

Combustion, the principal source of energy, can be measured. The transformation of gases, the pulmonary respiration, being the sum of all partial respiratory processes and the amount of oxygen absorbed and of carbonic acid eliminated increasing directly with work, there is a disturbance of equilibrium and an organic deficit, whenever the expenditure of oxygen in the formation of carbonic acid has exceeded the amount respired, and has been met by the reserves of the organism, by the oxygen of the blood and the tissues. Intoxication then begins with stasis of carbonic acid.

The robust workman, turning the wheel of Pettenkofer and Voit, demonstrated how much he had surpassed this limit even in his nine-hour day, and despite his rest. (Page 511.)

The respiratory quotient . . . varies precisely with work, its factors increasing with work and diminishing with rest, for the relation of the carbonic acid produced to the oxygen consumed expresses exactly the expenditure of potential glycogen during work and its renewal during rest. (Page 511.)

The value of the preservative individual warnings of fatigue is evident.

This signal of alarm, from an organism that has, by overwork, or defect of training and education, arrived at the physiological limit of work, is not an uncertain psychic incident. It is a warning: in default of rest, physical effects will follow: morbid effects, menacing intoxication, organic alteration caused by overwork (surtravail) and fatigue. (Page 513.)

As the work of each day causes an organic deficit, the weekly rest, as shown by Dr. Haegler, is a necessity to make up this deficit: the effort is to add one half day of Saturday.

But even with this addition, the reparative rest is not sufficient, its effect is only apparent. The rest of the Sunday and Saturday half holiday should be entered upon without a deficit, without fatigue, and it should be a period of recuperation of strength and of the organic equilibrium, bringing it to a higher level, giving more moral and physical

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strength to man,—the active energy necessary to carry him without encumbrance of fatigue through his next period of work. (Page 514.)

For all these reasons overtime should be forbidden by law, as infracting the limitation of hours, causing overwork, and contributing to non-employment. (Page 517.)

Étude sur l'Influence de la Durée du Travail Quotidien sur la Santé Générale de l'Adulte. [*Study of the Effect of the Length of Working Hours upon the General Health of Adults.*] ILIA SACHNINE. *Lyon, 1900.*

During the night, and above all during sleep, man absorbs more oxygen than he exhales. According to Voit and Pettenkofer, this surplus oxygen is stored up to be used later in the exertions of the day. (Page 173.)

Dr. Haegler demonstrated, on the basis of Pettenkofer's experiments, that, as each day's work added a slight deficit of oxygen to the deficit of the day before, a weekly rest of 24 hours was necessary to replenish the normal sum of oxygen used in labor or continuous exertion throughout the week. (Page 175.)

De la Fatigue et de son Influence Pathogénique. [*Fatigue and its Pathogenic Influence.*] Dr. M. CARRIEU, *University of Montpellier. Paris, Baillière et Fils, 1878.*

It had been well established (by Lavoisier and others) that the organism consumed more oxygen during activity than in a state of rest, but the experiments of Voit and Pettenkofer necessitate some modifications of the results of previous experiments. (Zeitschr. f. Biol., 1866.)

Their researches put into evidence interesting differences in the same individual, accordingly as he was at work or at rest, awake or asleep. The subject of the experiment was a vigorous workman of 28 years of age. He had the same quantity of food whether working or resting except that when working he drank an additional 600 grams of water. The results are thus shown:

JULY 31, 1868. DAY OF REST

	ABSORBED	ELIMINATED			*O of* CO_2
	Oxygen	CO_2	*HO*	*Urea*	
From 6 A. M. to 6 P. M.	234.6	532.9	344.4	21.7	175
From 6 P. M. to 6 A. M.	474.3	378.6	483.6	15.5	58
Total for 24 hours	708.9	911.5	828.0	37.2	233

AUGUST 3, 1868. DAY OF WORK — FRANCE

	ABSORBED	ELIMINATED			O of CO_2
	Oxygen	CO_2	*HO*	*Urea*	
From 6 A. M. to 6 P. M.	294.8	884.8	1094.8	20.1	218
From 6 P. M. to 6 A. M.	659.7	309.4	947.3	16.7	44
Total for 24 hours	954.5	1284.2	2042.1	37.8	262

These numbers show that the excretion of carbonic acid is more considerable by day than by night, and that per contra the absorption of oxygen is more active by night than by day. (Page 14.)

Further the amounts of water and of carbonic acid excreted are much greater during work than during rest, whilst the oxygen absorbed does not vary to the same extent. Finally, a larger proportion of oxygen is inspired during the night following the day of work, whilst the amount of carbonic acid excreted was nearly the same in both cases.

The authors conclude from these experiments that oxygen inspired at night is stored up to be drawn upon next day to oxidize food materials. If one works, he exhales a greater amount of CO_2 and then oxygen must be inspired in greater amount during rest. (Page 15.)

Revue Internationale de Sociologie, Nov. 1895. Le Travail Humain et ses Lois. [*The Laws of Human Work.*] FRANCESCO S. NITTI, *Professor, University of Naples. Paris, Giard et Brière, 1895.* — ITALY

The workman, busy with his work, does not perceive the oncoming of fatigue, or, to speak more accurately, he only perceives it when it has attained a certain intensity. This is the principal reason why he does not and cannot protect himself: it is the principal reason why every society, which desires to prevent a wasteful loss of energy, must necessarily resort to regulation to protect him. (Page 1041.)

Variations between individuals, it is true, are very great, but . . . there is an average limit which may be found and applied in legislation. What shall this limit be? . . . In the experiments of Voit and Pettenkofer it was found that the workman at the end of nine hours' labor had expended, in the form of carbonic acid, 192 grammes of oxygen *more* than he had been able to inhale during this time. He had therefore had to give up 20 per cent of the supply of oxygen stored up in his tissues. We may

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ask, therefore, if the average limit of eight hours would seem altogether arbitrary. (Page 1041.)

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Text Book of Physiology. Wm. H. Howell, Ph.D., M.D.,LL.D., *Professor of Physiology in the Johns Hopkins University, Baltimore. Philadelphia, W. B. Saunders Co., 1907.*

Chemical Changes in the Muscle during Contraction and Rigor.—Perhaps the most significant change in the muscle during contraction is the production of carbon dioxid. After increased muscular activity it may be shown that an animal gives off a larger amount of carbon dioxid in its expired air. In such cases the carbon dioxid produced in the muscles is given off to the blood, carried to the lungs, and then exhaled in the expired air. Pettenkofer and Voit, for instance, found that during a day in which much muscular work was done a man expired nearly twice as much CO_2 as during a resting day. The same fact can be shown directly upon an isolated muscle of a frog made to contract by electrical stimulation. The carbon dioxid in this case diffuses out of the muscle in part to the surrounding air, and in part remains in solution, or in chemical combination as carbonates, in the liquids of the tissue. It has been shown by Hermann and others that a muscle that has been tetanized gives off more carbon dioxid than a resting muscle when their contained gases are extracted by a gas pump. This CO_2 arises from the oxidation of the carbon of some of the constituents of the muscle, and its existence is an indication that in their final products the changes in the muscle are equivalent in those of ordinary combustion at high temperatures, the burning of wood or fats, for instance. Moreover, the formation of the CO_2 in the muscle is accompanied by the production of heat, as in combustion; and for the same amount of CO_2 produced in the two cases the same amount of heat is liberated. It has been shown, however, in the frog's muscle freshly removed from the body, that the CO_2 is produced whether or not any oxygen is supplied to the muscle,—that is, when the muscle is made to contract in an atmosphere containing no oxygen, or in a vacuum. In this respect the parallel between physiological oxidation and ordinary combustion fails. Wood, oil, and other combustible material cannot be burnt at high temperatures in the absence of oxygen. We must believe, therefore, that in the muscle there is a supply of stored oxygen, and that the muscle will give off CO_2 as long as this supply lasts. The oxidation, instead of being direct, as in the case of combustions, is indirect. . .

The oxygen is absolutely necessary to the normal activity of the muscular tissue, but the tissue, by storing the oxygen, can function for some

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time when the supply is suspended. As Pflüger has expressed it, in a most interesting paper, the oxygen is like the spring to a clock—once wound up, the clock will go for a certain time without further winding. It must be borne in mind, however, that different tissues show considerable variation in the time during which they will function normally after suspension of their oxygen supply. The cortex of the brain, for instance, loses its activity,—that is, unconsciousness ensues almost immediately upon cessation or serious diminution in the supply of blood, and the same may be said of the functional activity of the kidney. In the cold-blooded animals, with their slower chemical changes, the supply of stored oxygen maintains irritability for a longer time than in the warm-blooded animals. (Pages 62–63.)*

BELGIUM

Du Repos Hebdomadaire. [*The Weekly Rest Day.*] ESTÈVE DE BOSCH. *Antwerp, 1907.*

Dr. Haegler has represented in an ingenious fashion the variations which occur in the entirety of our vital forces, in the form of a line, "*b*," which, instead of remaining on the same level at all times, rises or falls according to the alternations of work and rest. (Page 49.)

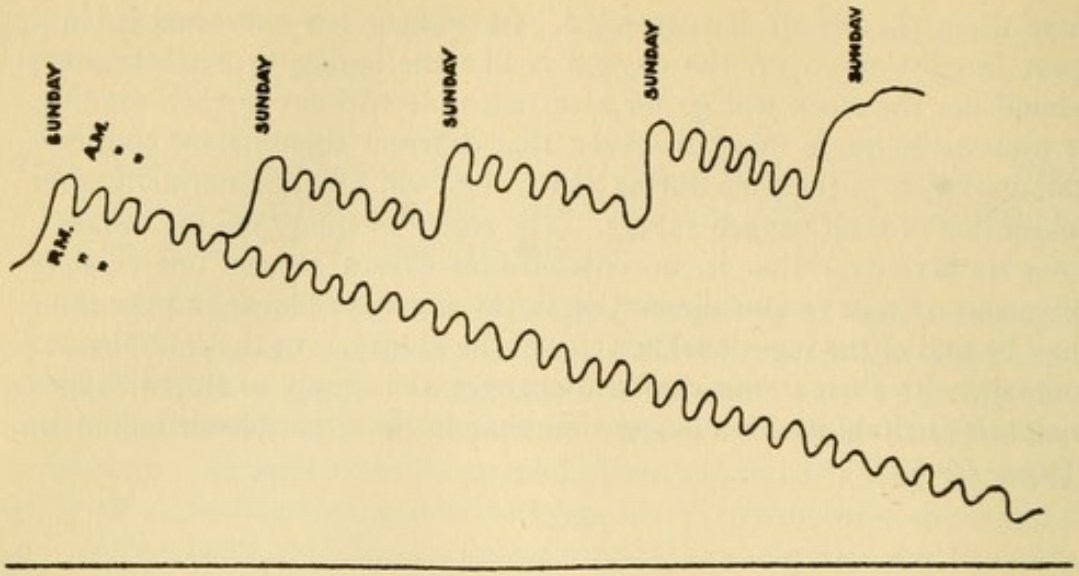
The night's sleep repairs a part of the losses which we suffer by day, but it is not sufficient to make up entirely for the deficit produced by the hours of work. The result is that the line is not found to be on the same level in the morning that it was 24 hours before, and the level of our energy is lowered slightly from day to day. (Page 50.)

This chart was shown by Haegler at the Swiss International Exposition in 1896 in Geneva. Another chart, also by Dr. Haegler, and shown at the same exhibition, shows that the length of life is longer with those who observe the custom of a weekly day of rest. (Page 51.)

* NOTE.—Since this brief was compiled and presented to the courts, the succeeding editions of Howell's Textbook of Physiology omit the passage quoted above and state instead:

"The fact that a muscle will continue to contract on stimulation even when in an atmosphere free from oxygen was formerly interpreted to mean that some oxygen had been stored previously by the muscle and that contractions were possible only as long as this supply held out. But since it has been found that the contractions under these circumstances are not accompanied by an output of carbon di-oxid, this supposition has been rendered doubtful. It has been suggested, on the contrary, that the energy for the contractions in these cases may be obtained from other than oxidative changes, for example, from the small amount of heat-energy liberated in the splitting of sugar into lactic acid." (Edition of 1911, Page 66.)

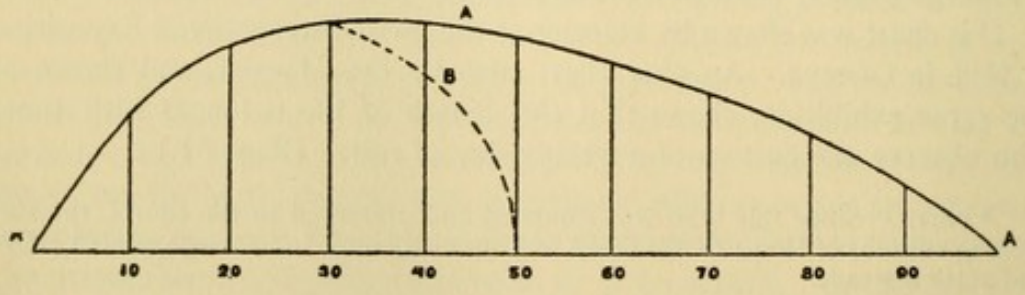
BELGIUM



HAEGLER'S CHART

Fatigue curves showing morning rise and afternoon depression. The upper line shows the effect of the weekly day of rest.
The lower line shows the gradual depression of strength with daily work and no time of rest.

(Page 50, in "Du Repos Hebdomadaire.")



HAEGLER'S CHART, Geneva, 1896

Line A shows the normal average of life with proper time of rest.
Line B shows the average life line under overwork and insufficient rest.

(Page 51, in "Du Repos Hebdomadaire.")

(c) Adequacy of Resting Time Allowed between Working Hours

1. In Ordinary Work

The adequacy of rest depends on the length of time allowed between working hours. Hence the shorter working day benefits the worker, not alone by requiring less expenditure of energy, but by allowing a more adequate period of rest before the next working day begins.

On the other hand, it is precisely after excessive working hours that the need of repair is greatest and the time allowed away from work is least.

Handbuch der Hygiene. Bd. 8[1]. [*Handbook of Hygiene. Vol. 8*[1].] *Edited by* Dr. Theodore Weyl. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. Emil Roth. *Jena, 1894.* **GERMANY**

. . . We may point out that the social condition of the worker, his home, nutrition, and conduct of life are highly important factors in the rate of sickness, and that, the longer the working hours, the less opportunity is left to him of utilizing these health-preserving forces. (Pages 27–28.)

Handbuch der Arbeiterwohlfahrt. [*Handbook of the General Welfare of the Working Classes.*] *Edited by* Dr. Otto Dammer. *Vol. II. Arbeiterschutz.* [*Protection of Working Men.*] Dr. Ascher. *Stuttgart, Enke, 1902.*

The injurious consequences of bad conditions upon health cannot, unfortunately, all be as clearly demonstrated [as that of dust in the experiments of Moritz and Ropke]; we know, however, that for the elimination of dangerous substances from the body a certain time—dependent upon the nature of the material and the constitution of the individual—is essential, and that therefore a shortened exposure to the unfavorable conditions has a double advantage—first, in that the probability of elimination of unhealthful material is increased and its unhygienic consequences more fully avoided. In this connection we must consider also the severer forms of fatigue or exertion of organs beyond the

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physiological limits of their endurance and the impossibility of repairing their waste and restoring them to normal conditions without ample resting time. (Page 78.)

Gesammelte Abhandlungen. Bd. III. [*Complete Works. Vol. III.*] *Die Volkswirthschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages.* [*The Economic Significance of a Shorter Working Day.*] ERNST ABBÉ. *Paper read before the Political Society, Jena, 1901. Jena, Fischer, 1906.*

I have briefly referred to the balance between expenditure and renewal of strength. Renewal of strength by nutriment and rest—upon what does it depend? For any one specific individual it is beyond a doubt that the length of resting time allowed is the paramount condition for recuperation of strength. There cannot be the smallest doubt that one who has 16 hours rest between his working hours can repair a greater amount of previous fatigue than he who has only 10. Every one can prove this for himself. (Page 231.)

Therefore, aside from the personal factors which one may call the intensity of metabolism or of the vital functions in different individuals, the important thing is the length of time permitted for rest. The day has only 24 hours; so the time for rest must be the difference between the working day and 24 hours. If the former is 8 hours, there are 16; if 10 hours, only 14 for rest. (Page 231.)

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Tenth International Congress of Hygiene and Demography. Paris, 1900. In one vol. Législation et Réglementation du travail au point de vue de l'Hygiene. [*Labor Legislation and Regulation from the standpoint of Hygiene.*] M. ÉDOUARD VAILLANT, M.R.C.S., *England. Paris, 1900.*

Professor Setschenoff has dealt cleverly with the physiological problem of the necessary relative length of rest and work so that the weariness of one day shall not be felt on the morrow. The normal heart with its regular rhythm of contraction and relaxation, gains sufficient rest during every second to work for a lifetime, its total rest being to its total work as 10 hours to 6 in 16 hours. Now, giving the industrial worker 8 hours of sleep, he has 16 left for work and rest.

It then seems that during the 16 hours of waking time remaining for the worker, his relative rest should not be less in duration than that of the

heart, especially as the skeletonic muscles are less richly supplied with blood than those of the heart and as physical rest is not complete in the waking state. (Page 512.) FRANCE

British Sessional Papers. Vol. XV. 1831–32. Report from the Select Committee on the "Bill to regulate the Labour of Children in the Mills and Factories of the United Kingdom." GREAT BRITAIN

Thos. Hodgkin, Esq., M.D., physician to the London Dispensary, Lecturer at Guy's Hospital:

10941. Is not the body in your opinion, in a very unfit state to renew its exertion when it has been insufficiently recreated by sleep, and when therefore labour has to be commenced at the beginning of the day with the feelings and signs of weariness still remaining?—Certainly, it is. . . .

10942. That accumulated fatigue you conceive to be peculiarly injurious to the constitution?—Yes; without the interposition of intervals sufficient to repair the demand which has been made on the system. (Page 549.)

John Morgan, Esq., surgeon to Guy's Hospital:

10998. Do you not think that the body is in a very unfit state to renew its daily labour when the preceding evening's sleep has been insufficient to remove a sense of weariness and fatigue?—Certainly, in a very unfit state. (Page 553.)

Joseph Henry Green, Esq., F.R.S., surgeon to St. Thomas's Hospital and Professor of Surgery at King's College:

11386. Do you not think that labour is peculiarly pernicious and prejudicial when it has to be commenced in the morning; the body not being sufficiently refreshed and recruited by the insufficient sleep of the preceding evening?—Certainly.

11387. And that fatigue perpetuated is peculiarly wearisome, of course, to the body, and pernicious to all the functions of life?—Yes, I do. (Page 588.)

Benjamin Travers, Esq., F.R.S., senior surgeon to St. Thomas's Hospital in Southwark:

11605. Is it not a strong indication that labour is pernicious when it has to be resumed in the morning with a great sense of remaining weariness and fatigue, which has not been dissipated by the rest of the preceding night?—Certainly.

11606. That, long continued, will be, in your opinion, pernicious to the constitution?—Certainly, especially so. (Page 606.)

2. In Work involving Absorption of Injurious Substances

Adequate resting time between working hours is particularly important in trades where injurious substances, such as dust, fluff, or industrial poisons may be absorbed by the worker. As all trades share these dangers in greater or less degree, the longer the period away from work, the greater the possibility that injurious substances may be eliminated from the body before another workday.

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Handbuch der Arbeiterwohlfahrt. [*Handbook of the General Welfare of the Working Classes.*] *Edited by* Dr. OTTO DAMMER. *Vol. II. Arbeiterschutz.* [*Protection of Working Men.*] Dr. ASCHER. *Stuttgart, Enke, 1902.*

When we arrange the medical testimony given in regard to the longer or shorter working time the following conclusion appears: in any or every trade when a substance injurious to health (poison) may possibly be taken into the body tissues of the worker, the danger is lessened by just so much as the time during which the worker is so exposed, is shortened. The longer the period of rest away from work, the greater the possibility of the injurious material being eliminated from the body. The same is true of mechanically irritant dust. Moritz and Röpke found that, when workmen were exposed continuously to breathe in the dust from polishing during a considerable period of time, the sensitiveness of the mucous membranes, larynx, and bronchi was so diminished that the in-breathed dust could not be coughed up and, instead, found lodging place on the delicate vocal cords. A short time of rest outside of the dusty air sufficed to restore to the tissues their normal irritability, so that the harmful dust acted as an irritant and could be expelled by coughing. On this ground they argued for longer rest periods and shorter working time. Similar reasons hold for shorter hours in all occupation where individual organs—eyes, muscles, bony structure, nerves, heart, lungs—are liable to overexertion. Naturally, then, the free time must be given to healthful exercise and recreation. . . . Through all these reports a gradual tendency to shorten the hours of labor may be accepted as a modern movement. (Pages 61–62.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen; and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.* GERMANY

. . . The more injurious any process of work is by reason of great heat, poison, dust, noise, etc., the more important does it become to provide some counterbalance to these harmful influences by shortening the time given to labor under these conditions. (Page 1204.)

An das Schweiz. Industriedepartement, Bern. Die Eidgenössischen Fabrikinspectoren. [*Report of the Swiss Factory Inspectors to the Swiss Department of Labor on the Revision of the Factory Laws.*] *Schaffhausen, 1904.* SWITZERLAND

Finally we must mention those arguments in favor of a shorter day which have been presented by medical men. A prominent hygienist, Dr. Ascher, declares: "In all those industries where more or less injurious foreign material is taken into the body of the workman, the danger is lessened in proportion to the brevity of the time during which he is exposed. The longer the periods of rest outside and away from his work place, the greater the possibility of the tissues of the body casting off the injurious substances. It has been found that, with long or continuous inspiration of dust, the irritability of the mucous membrances, larynx and bronchi is so much lessened that the inspired dust is no longer coughed up, and remains to find lodging place on the delicately sensitive vocal cords. For this reason longer periods of rest and shorter working hours are essential. Analogous reasons are in force for every occupation in which overexertion of special organs—eyes, muscles, bones, nerves, heart, or lungs—is necessitated by the work." (Page 26.)

Eighth International Congress of Hygiene and Demography. Budapest, 1894. Vol. VII, Sec. V. Über das Verhältniss der Dauer des Arbeitstages zur Gesundheit des Arbeiters und dessen Einfluss auf die öffentliche Gesundheit. [*The Length of the Working Day in its Relation to the Workman's Health and its Influence upon Public Health.*] Dr. E. R. J. KREJCSI, *Vice-Secretary of the Chamber of Commerce in Budapest. Budapest, 1896.* AUSTRIA

The longer the hours of work, the longer the organism is exposed to injurious influences;—the sooner bodily resistance is overcome, and conse-

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quently occupation diseases are early established which might have been avoided or at least postponed to a much later period if the hours of labor had been short. (Page 327.)

GREAT BRITAIN

Bulletin of the United States Bureau of Labor. No. 95. July, 1911. Industrial Lead Poisoning in Europe. Sir Thomas Oliver, M.D., F.R.C.P.

Increase of the hours of work has been found to be associated with a rise in the number of cases of plumbism. A change from six to eight-hour shifts of employment was in a Scotch factory found to be the only explanation of an outbreak of plumbism in a works which had hitherto been free. (Page 9.)

C. *Bad Effects of Long Hours on Health*

(1) General Injuries to Health

The fatigue which follows excessive working hours becomes chronic and results in general deterioration of health. While it may not result in immediate disease, it undermines the whole system by weakness and anæmia. Continuous overexertion has proved even more disastrous to health than a certain amount of privation; and lack of work in industrial crises has entailed less injury to health than long-continued overwork. The excessive length of working hours, therefore, constitutes in itself a menace to health.

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British Sessional Papers. Vol. XV. 1831–1832. Report from the Select Committee on the "Bill to regulate the Labour of Children in the Mills and Factories of the United Kingdom."

William Sharp, Esq., . . . surgeon to the Dispensary, Bradford, Yorkshire:

7097. Do you consider that excessive labour, or labour too long continued, has a direct tendency to produce disease and debility, and to shorten life?—Yes, I do.

7080. Do you not think the worst effects are produced by the terminating hours of a long day's labour?—Yes. (Page 302.)

Samuel Smith, Esq., . . . member of College of Surgeons and practising surgeon in Leeds:

10341. Do you consider the very uniformity of the exertion would, in all probability, occasion fatigue, and abate the energies of those who have to endure it?—Even supposing no labour whatever were required under such circumstances, the merely having to sustain the erect position of the body for so long a period is harassing in the extreme and no one can have an adequate idea of it unless he has himself been subjected to it. (Page 497.)

10493. Should you attribute part of the pernicious effects upon the constitution of those employed, to their being deprived of fresh air?—Certainly; the long-continued labour and the want of fresh air are the two principal causes of the general effects to which I have alluded. (Page 514.)

Sir Anthony Carlisle, F.R.S., . . . surgeon in the Westminster Hospital:

11035. Is it not an equally received opinion with medical authorities, that exercise or labour, so long continued as to produce great fatigue of mind and body, without affording due intermissions for meals, recreation, and sleep, is inconsistent, generally speaking, with the maintenance of health?—I think every one of the points of that question may be answered in the affirmative. I can, from my own experience and knowledge, affirm that it is so.

11036. Your affirmation in the respect is founded upon the principles of your profession as well as upon your personal experience?—Certainly. (Page 556.)

British Sessional Papers. Vol. XXI. 1833. Second Report of the . . . Commissioners for inquiring into the Employment of Children in Factories . . . and Reports by the Medical Commissioners.

Sir David Barry's report (Scotland):

Although both the young and the adult mill-workers may command more abundant food and better clothing than their unemployed neighbors, there are causes to whose operation they are exposed, which, in a sanitary point of view, counterbalance the advantage alluded to.

1. The first and most influential of all is the indispensable, undeviating necessity of forcing both their mental and bodily exertions to keep exact pace with the motions of machinery propelled by an unceasing, unwearying power.

2. The continuance of an erect posture for periods unnaturally prolonged and too quickly repeated.

3. The privation of sleep. (Page 72.)

GREAT BRITAIN

Hansards' Parliamentary Debates. Vol. LXXIII. 1844.

He [Lord Ashley] had been told by operative spinners that, under the present system of working 12 hours a day, their exhaustion was so great that it was absolutely necessary they should have at least 4 meals a day; but that, with a reduced period of labour, they would be content with 3 meals per day. They stated that under the existing system they were obliged to take food even without appetite as a stimulus to enable them to go through the closing hours of their days' work. . . . It was calculated . . . that, if the hours of labour were reduced from 12 to 10, it would have the effect of prolonging by at least 3 years the duration of the working life of the operatives. (Page 1386.)

British Sessional Papers. Vol. XIX. 1873. Reports of Inspectors of Factories for the half year ending 30th April, 1873.

The house surgeon of a large hospital has stated that every year he had a large number of cases of pulmonary disease in girls, the origin of which he could distinctly trace to long and late hours in overcrowded and unhealthy workrooms. (Page 43.)

British Sessional Papers. Vol. LV. 1873. Report to the Local Government Board on Proposed Changes in Hours and Ages of Employment in Textile Factories. J. H. BRIDGES, M.D., *and* T. HOLMES.

Experience afforded by residence in the worsted manufacturing town of Bradford, and extensive practice among its population during periods of from one to thirty-five years:

A. Amongst the *women* of factory operatives, much more than among the general population, derangements of the digestive organs are common, *e. g.*, pyrosis, sickness, constipation, vertigo, and headache, generated by neglect of the calls of nature through the early hours of work, the short intervals at meals, the eating and drinking of easily prepared foods, as bread, tea, and coffee, and the neglect of meat and fresh cooked vegetables. . . .

Signed on behalf of the Bradford Medico, Chirurgical Society, at a meeting held February 4, 1873.

Sub-Committee,
President, J. H. BELL, M.D.
P. E. MIALL, M.R.C.S.
Secretary, DAVID GOYDER, M.D.

(Pages 39–40.)

British Sessional Papers. Vol. XVI. 1875. Reports of Inspectors of Factories. GREAT BRITAIN

The breaking down of the health, the curved spine, the deformity of the extremities are not now to be met with; but we are confronted with a new evil which has come upon us in the development of the factory system which improved sanitary arrangements of dwellings, better water supply, purer air, more satisfactory drainage, are not sufficient to eradicate. I mean the increased and increasing employment of women in factories. . . . Evidence has been given again and again of the unhappy consequences to child-life and infant development of the working of the mothers in factories. A great deal has been advanced lately against the impolicy of placing any restrictions upon the labour of adult women and upon securing to them the power of making contracts as adult men, and even those who admit the force of these principles cannot shut their eyes to the evils which have existed and still exist in the employment of mothers in factories, and which from the demand for adolescent and adult female labour in factories are not likely to subside of themselves. The abstention from factory labour of women for a month or six weeks after confinement would to a small extent mitigate the evil as regards their more certain restoration to health, but it would not touch the evils of the loss to the infant of its natural food and of maternal care and love. . . . Here is a question which demands our most serious consideration, whether, either by means of legislation or by other less direct but as effective means, the health of the mother and well-being and physical development of the offspring can be protected, so as to prevent eventual deterioration, and to promote health and happiness in so large a population as our factory operatives. (Pages 25–26.)

British Sessional Papers. Vol. XXXIV. 1893. Royal Commission on Labour. Group C.

Mr. Kenneth M. Milligan, Scottish Shopkeepers' and Assistants' Union:

30962. . . . I have letters here from a good many eminent physicians in Glasgow proving that not only want of sanitary conveniences, but the long hours, and the long time that the girls especially have to stand, is very injurious to their health. I have one letter here from a doctor to whom I wrote, Dr. Yellowlees, from the Gartnavel Asylum, Glasgow. It says, "I am sure that the long hours of shop assistants are injurious to health, and that much might be done to lessen the evil. The mental disorders which I have observed in shop girls have been chiefly traceable

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to bodily weakness and poverty of blood, caused by confinement and long hours." (Page 434.)

British Sessional Papers. Vol. XII. 1895. Report of Select Committee on Shops (Early Closing) Bill.

Witness, Dr. Percy Kidd, M.D., University of Oxford, Fellow of the College of Physicians and Member of the College of Surgeons; attached to the London Hospital and the Brompton Hospital:

5281. . . . The most common effect I have noticed of the long hours is general deterioration of health; very general symptoms which we medically attribute to over-action, and debility of the nervous system; that includes a great deal more than what is called nervous disease, such as indigestion, constipation, a general slackness, and a great many other indefinite symptoms. (Page 215.)

British Sessional Papers. Vol. XII. 1902. Report of the Chief Inspector of Factories and Workshops.

Ten and a half hours sitting bent over stitching, requiring very careful attention, with two intervals so short that only a hasty meal can be eaten, that there is no time for exercise, even were the workers permitted to go out, and that day after day, might well try the strongest constitutions and ruin the best digestions and nerves. That its effect on the health is injurious is constantly brought before one, and anæmic and heavy-eyed workers who suffer from neuralgia who form too large a proportion of the whole number, make one feel very strongly that some reform is needed. (Page 176.)

British Sessional Papers. Vol. XXXII. 1904. Report of Inter-departmental Committee on Physical Deterioration.

147. Miss Anderson, Chief Lady Inspector of Factories, gave a classification of the sources of injury to health, life and limb, from factory employment as follows:

1. Accidents.
2. Poisoning and damage from toxic agents, or excessive dust, fumes, etc.
3. Overfatigue.
4. Defective ordinary hygiene.

As regards the first two, men suffer most, as regards the third, women.

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And on this head Miss Anderson as well as Dr. Scott thought there had not been a sufficient amount of scientific study. . . . In many cases hours are too long for women, and in some industries, especially the clothing trade and dressmaking, there are not sufficient pauses for food. Laundries and food-preserving industries give an example of too long hours; and excessive strain by carrying heavy weights takes place in food-preserving works, bleach and dye works, earthenware and china works, and various metal trades. (Page 28.)

The Pioneer of Progress. JOHN DENNIS. *London, Hamilton Adams, 1860.*

But close and prolonged confinement, at the desk or in the warehouse and shop, will enervate the strength of even the strongest constitution. The want of time for anything beyond the daily task-work, the monotony and hopelessness of toil which ceases not except on the Sunday, and often not then, and the stolid listlessness, and in many cases the dissipation, which are thus induced, very greatly affect the health, and as far as the evil extends destroy the high courage and athletic vigour which formed at one time the conspicuous heritage of Englishmen. (Pages 34–35.)

Hours of Labour. GEORGE J. ECCARIUS. *London, Office of Labour Representation League, 1872.*

The death rate settles all disputes as to the effect of overwork on health and life. On two recent occasions the death rate has proved that constant work, which is generally synonymous with overwork, is more dangerous to life than a certain amount of privation. During the cotton famine the death rate of Manchester fell, and when all work stopped in the East of London, and the distress of the poor was at its height, the death rate of St. George's in the East sunk to the level of the most favored districts. (Page 27.)

A general reduction of the hours of labour is necessary on social, economical, sanitary, and moral grounds, and is demanded by the working classes all over the world. (Page 29.)

The Hygiene, Diseases, and Mortality of Occupation. J. T. ARLIDGE, M.D., A.B., F.R.C.P., *Late Milroy Lecturer at Royal College. London, Percival, 1892.*

Excessive exertion may operate either over a long period and produce its ill results slowly, or be sudden and severe. . . . When such people are seized by some definite lesion, attention is so completely attracted to it

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that the antecedent over-toil laying the foundation for the malady is apt to be overlooked. (Page 16.)

The want of exercise of the body induces general torpidity of functions, reduces lung capacity and respiratory completeness, and the activity of the abdominal muscles, which aid both respiration and the functions of the digestive organs. Hence, the proclivity to venous stasis (congestion), particularly in the pelvis and lower extremities and in the rectal vessels, with the production of constipation,—and in women of menstrual difficulties,—add to these disorders of digestion in their multiform shape, debilitated muscular power, and a low vitality and vigor generally. (Page 19.)

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Jahres-Berichte der k. Preussischen Gewerberäthe. [*Report of the Royal Prussian Industrial Commission, 1894.*] *Berlin, 1895.*

While the legally restricted working day has been introduced throughout in establishments coming under the law, such is not the case in the smaller work places or in the laundries, where the health of the working women is still seriously endangered by the long hours of work frequently spent in unsanitary, ill-ventilated rooms. (Page 252.)

An excessive working day obtains in the laundries, where the hours are almost always from 12 to 14 . . . so long a work day as this, and under such conditions cannot but be regarded as ominous for health, and in fact its bad result is proved by the records of the laundresses' sickness funds. (Page 252.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. XXI. 1896. [*Official Information from Reports of the (German) Factory Inspectors.*] *Berlin, Bruer, 1897.*

Complaints are not lacking about the unhealthful influence of industry on physical development. The inspector for Dantzig writes: "On account of the predominatingly rural character of the region the women alternate between factory and outdoor work and seldom remain for a long time in the factory. Consequently their health is good even in comparatively unhealthy trades such as rag-picking, etc., and occupation diseases are not found here." (Page 246.)

The occupations of women show no ill results upon morals, but there are cases where physical development is injuriously affected and definite ailments fostered. In weaving rooms and other places where women are obliged to stand at their work varicose veins are more than commonly frequent and naturally enough occur more frequently among the married women. Zittau. (Page 249.)

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As to the effect of industrial work on health it is undeniable that when women can work out of doors (as in tile works) they always have a healthy and vigorous appearance. But in industries where they are compelled to sit for a long working day this is not the case. The workwomen of the large cities make a distinctly poorer impression in their appearance than those of country districts. Posen. (Page 250.)

Most of the working women who are no longer young, that is from about 30 years upward, give the impression of being chronically overtired. They look badly, worn and old. But the younger working women now have a fresher, more robust appearance than formerly. Here we see the good effects of the prohibition of child-labor and the improved hygiene of workrooms. True, during the years of youth the favorable and unfavorable influences of occupation, affecting the female organism, appear to balance each other, but the latter outweigh the former as time goes on. The long standing, in itself, causes serious disturbances of the female organism. There is no difference of opinion among the medical profession on this point. When first youth is past these injuries make themselves felt. (Page 251.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichts-beamten, XXII, 1897. [*Official Information from the Reports of the (German) Factory Inspectors.*] *Berlin, Bruer, 1898.*

. . . The results are shown in an incredible extent of chlorosis, tuberculosis, nervous diseases, and genital disorders. (Page 263.)

The inspector for Baden writes that a physician had called his attention to the inordinate length of working hours in laundries, where work is often carried on until late at night. The physician finds a shockingly large number of cases of swollen veins and varicose ulcers among these people, as well as conjunctival inflammations of the eyes.

The ironers had the appearance of utter exhaustion; they were anæmic, and tuberculosis was not unusual among them. The at times extreme length of hours in laundries is also specified in the report from Leipzig. (Page 264.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichts-beamten, XXII, 1897. [*Official Information from the Reports of the (German) Factory Inspectors.*] *Berlin, Bruer, 1898.*

The physicians connnected with the local insurance against sickness

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in Aachen, in reply to a question of the president as to how far they attributed ill-health among adult working men to extremely long hours of work, replied that the freedom of employers to work their men without legal restriction had certainly led to grave abuses, and that there were workmen who at times were subject to over-exertion that could not but be prejudicial to health. (Page 240.)

In the interest of the workingmen's health it is greatly to be regretted that such long hours are prevalent . . . especially as experiments have so often shown that product has not been lessened by reduction of hours of work. It is greatly to be desired that the physically broken down factory workers (of this region) might have the beneficent aid of a maximum working day.

Well-meaning and clear-sighted employers lament the conditions, but can do nothing individually.

One employer declares that "the very fact that weavers who have 3 or 4 looms to attend to cannot even stand up straight, because they must keep them continuously going—is reason enough for a shorter day." (Page 241.)

Bad conditions are prevalent in tailoring and shoemaking. . . . The results of excessively long hours and bad conditions are seen in the pale faces, round-shouldered attitude and low vitality of these workers. Their most apparent disease forms are articular rheumatism, eye troubles, chest and lung diseases, inflammation of the joints and of the abdominal organs. In order to overcome the evils of shoemaking and tailoring, there should be the same regulation of working time and pauses as in bakeries. (Page 259.)

Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1901. [*Reports of the Factory Inspectors in the Kingdom of Württemberg, 1901.*] *Stuttgart, Lindemann, 1902.*

Human physique has not progressed proportionately with the perfection of machinery,—on the contrary, there are signs that it is suffering deterioration, and it is therefore not surprising that the workman's body cannot for a long stretch of time keep pace with the machine and the extensive demands it makes upon his attention and vigilance, without suffering serious injury to health. The efforts made in consequence by the workers to preserve their health (their only capital) by attaining a reduction of working hours and a legal normal day are entirely justifiable. (Page 14.)

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Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1903. Bd. I. Preussen. [*Annual Reports of the (German) Factory and Mine Inspectors for 1903. Vol. I. Prussia.*] *Berlin, Decker, 1904.*

Although laundries are usually ample enough, yet the workwomen here incur dangers to health from the hot stoves . . . from the continuous standing, the strenuous character of the work and the unreasonably long hours, which even robust constitutions can hardly resist for any great length of time. (Page 58.)

Die Arbeitszeit der Fabrikarbeiterinnen. Nach Berichten der Gewerbe-Aufsichtsbeamten bearbeitet im Reichsamt des Innern. [*The Working Hours of Women in Factories. From the Reports of the (German) Factory Inspectors Compiled in the Imperial Home Office.*] *Berlin, Decker, 1905.*

The Inspector for Erfurt urges the introduction of the ten-hour day for women because "eleven hours' daily toil in a factory is extremely exhausting for the weaker physical organization of woman. Although perhaps under good sanitary conditions of work no direct injury to health may be traced to the eleven-hours day, still it is certain that women and girls who work in factories are worn out much sooner than those who do not. The factory worker who has most likely a poor physical inheritance to contend with, and is poorly nourished, is liable to frequent attacks of sickness."

Report for Cassel: The ill effects of factory work for women are most marked in those cases where long hours are joined to heavy work. The female frame is not strong enough to resist the harmful influence of such work for any length of time. Although the ill effects may not show themselves at once, it is not unlikely that injuries to health which manifest themselves years after may be traced back to former work in the factory. The total exclusion of women from the factories is not at present contemplated, but the introduction of the ten-hour day will tend towards reducing the harmful influence of factory work. (Page 107.)

From Württemberg:

The manager of a certain large factory which had shortened its working day considerably, found that the amount of sick time lost, as compared with the amount under the previous 11 hour day, showed a remarkable decrease. He came to the conclusion that the strenuous character of modern industry made the 10 hour day as much as working women could well endure, and that all over this time was directly destructive to good

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health. This view was corroborated by other employers who had adopted the 10 hour day. (Page 109.)

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1906. Bd. III. [*Reports of the (German) Factory and Mine Inspectors for the Year 1906. Vol. III.*] *Berlin, Decker, 1907.*

Elsass-Lothringen:

The efforts toward establishing shorter hours are so gratifying that it is all the more regrettable still to find a number of industries, even some which stand high, retaining the systematically long hours of work which are bound to exhaust prematurely the mental and physical power of the workers. (Page 26.[64])

Annalen des Deutschen Reichs. Bd. XXI. 1888. [*Annals of the German Empire. Vol. XXI. 1888.*] *Der internationale Schutz der Arbeiter.* [*International Labor Legislation.*] Dr. GEORGE ADLER, *University of Freiburg. Munich and Leipsic, 1888.*

The results to the worker of an unduly long working day are easy to perceive. His health, his energy, and working capacity are undermined. His body becomes more receptive to disease; his family life is ruined. His whole time is spent in work, except for the sleep that is necessary to maintain life—with the result that he is deprived of all that tends to culture and is reduced to a purely animal existence. (Page 482.)

Handbuch der Hygiene. Bd. 8[1]. [*Handbook of Hygiene. Vol. 8*[1].] *Edited by* Dr. THEODORE WEYL. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. EMIL ROTH. *Jena, 1894.*

Among the dangers of occupation in the more restricted sense those injuries that are induced by a too prolonged working time and by too heavy an amount of work take first place.

It is evident that the health of even the most robust workingman suffers if he is compelled to exceed the limits of his physical capacity—if wearied organs are denied the necessary reparation. There must be, therefore, in every case a relation between the length of working time and severity of work if occupation dangers are to be considered. (Page 26.)

Berichte über die Fabrikinspektion im Jahr 1879. [*Reports of the (Swiss) Factory Inspectors, 1879.*] *Bern, Stämpflische Printing House, 1880.* SWITZERLAND

It is a great pity that, in estimating the pros and cons of the "normal day of work," so little consideration is paid to the results of the long hours both on the physical and moral well-being of the worker.

In going about in the embroidery regions, one hardly thinks of physical drawbacks, when seeing the factories, which are usually clean, light, and airy; but when one meets men who, formerly robust, have lost their healthy looks after a few years of the excessively long hours of work and who are now worn out and unstrung; when one hears embroiderers of 48 years called old and invalid, one feels like inquiring further. It will be found that the work is in itself extraordinarily strenuous. . . . The physicians in these regions universally affirm the extreme danger to health in the unreasonably long hours of work. (Page 14.)

Berichte über die Fabrikinspektion im Jahr 1881. [*Reports of the (Swiss) Factory Inspectors, 1881.*] *Schaffhausen, Brodtmann, 1882.*

When the normal day was introduced by law for factory workers, it was first of all based on reasons of health. More and more numerous protests had been made as to the excessive labor imposed upon the worker, and the injury to health and strength that was being suffered by our people was emphasized on all sides. Measures of prevention against these abuses were regarded as counselled by nature, which provides men with the instincts of self-preservation. To these reasons were added others of a social nature. It was hoped to elevate the working classes morally and intellectually, to give them more time for family life, social amenities and education. (Page 13.)

Sixth International Congress of Hygiene and Demography. Vienna, 1887. Part XIV. Sec. on Hygiene. Fabrikhygiene und Gesetzgebung. [*Factory Hygiene and Legislation.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector, Vienna, 1887.*

In the factory inspection reports of many countries there may be found ample observation of the destructive influence of long hours. Thus a Saxon report says of glassmakers "they have high wages, and live well, but do not live to old age. They have excessive hours of work." (Page 35.)

SWITZERLAND

Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*Investigations into the Conditions of Health of the Swiss Factory Workers.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector, and* Dr. A. E. BURCKHARDT, *Prof. of Hygiene, Basle. Aarau, Sauerländer, 1889.*

Labor of an exacting kind, involving extreme muscular exertion, must, if it is long continued, have an injurious secondary effect on every part of the body. (Page 176.)

FRANCE

Étude sur l'Influence de la Durée du Travail Quotidien sur la Santé Générale de l'Adulte. [*Study of the Effect of the Length of Working Hours upon the General Health of Adults.*] Dr. ILIA SACHNINE. *Lyon, 1900.*

There is a weighty factor, over and above such external conditions as housing, nutrition, etc., etc., which exercises a widespread influence upon the health of the people. This is no other than the duration of the working hours of wage-earners. The day's work of the workman, the shop girl, . . . is too long. (Page 20.)

Revue d'Hygiene. T. 26, 1904. Enquête sur la Situation Sanitaire des Ouvriers du Textiles dans l'Arrondissement de Lille. [*Inquiry into the Sanitary Conditions in the Textile Trades in Lille and its Environs.*] Dr. D. VERHAEGHE. *Paris, Masson et Cie.*

The longer the working hours and the whole period of occupation in the mills the less probability is there that the textile worker may retain his health unimpaired. (Page 1066.)

42.08 to 100 of the textile workers had poor health. . . . Some ailments were due to bad hygienic conditions, . . . the others were due rather to physical overstrain. (Page 1078.)

ITALY

La Réglementation Légale du Travail des Femmes et des Enfants dans l'Industrie Italienne. LIONEL BAUDOIN. [*Labor Legislation for Women and Children in Italian Industry.*] *Paris, Paulin, 1905.*

At the International Congress at Milan, on accidents among the laboring class, in May, 1894, Mr. Luigi Belloc (Factory Inspector of the Department of Labor) represented Italy. He stated that the continuous motion of the body taxes the nervous system, causing the gravest troubles. The sewing-machine, which requires of the operator 40,000 movements a

day, causes in the long run abdominal and renal troubles, disarrangement of the menstrual function, and falling and deviations of the uterus. Functional weaknesses and paralysis are the result of the continual performance of the same movement. The necessity of standing or sitting for the whole day causes malformation of the body or curvature of the spine, as a result of the strained position. The attention required in watching a machine, especially an automatic one, is very fatiguing, on account of the large number of wheels operating at the same time which need attention. . . . ITALY

Tuberculosis spreads with alarming rapidity, especially among cotton and wool weavers. Those whom tuberculosis spares drag along with anæmia, the most common malady of the women factory workers, especially the textile workers, who are subject to long hours of labor. . . .

For the cotton industry in particular Mr. Luigi Belloc demands the ten-hour day. (Pages 14–16.)

Bericht der k. k. Gewerbe-Inspectoren über ihre Amtstätigkeit im Jahre 1895. [*Reports of the (Austrian) Royal and Imperial Factory Inspectors for 1895.*] *Vienna, 1896.* AUSTRIA

The most frequent cause of diapproval by the inspector lies in the employment of girls between 14 and 16, not indeed on account of hard work, but because of excessive hours of work. This is found in many lines of industry . . . (flower-making, etc.). The adult women, too, in these lines are excessively overstrained by the unreasonably long hours, and their health is severely injured thereby, the more so because of artificial light, etc., etc. (Page 38.)

Ibid., 1896. Published 1897. It is greatly to be desired that these (jute) factories, where mostly women and very young men are employed, and where extreme attention must be continuously given to the machinery; where, moreover, the work requires almost continuous standing and where dust and jarring are especially marked,—should establish a shorter working day. By reason of the disadvantages mentioned, the hours of work ought to be diminished. (Page 14.)

Ibid., 1888. Published 1899. (General remarks.) In close relation to the efforts made for the protection of life in industrial occupations are all those special provisions for minimizing special dangers arising from heat, dust, etc., for it must be remembered that all influences that are in themselves injurious, such as the constrained bodily posture, dampness, etc., assume a vastly greater dangerous quality by reason of the very considerable proportion of his life during which the workman is exposed to them. (Page 11.)

AUSTRIA

Eighth International Congress of Hygiene and Demography. Budapest, 1894. Vol. VII, Sec. V. Über das Verhältniss der Dauer des Arbeitstages zur Gesundheit des Arbeiters und dessen Einfluss auf die öffentliche Gesundheit. [*The Length of the Working Day in its Relation to the Workman's Health and its Influence upon Public Health.*] Dr. E. R. J. KREJCSI, *Vice-Secretary of the Chamber of Commerce in Budapest. Budapest, 1896.*

All accumulated experience and evidence fully justify the conclusion that the length of working time is of weighty importance to the workman's health and that overwork is accompanied by most harmful consequences to the organism.

As a matter of fact, practising physicians observe among persons with excessive hours of work, such as bakers, tailors, sewing women, shop girls, etc., definite disturbances of health for which they hold the long hours directly responsible. And yet a direct proof of every injury resulting from overwork is almost unattainable. For, connected with the overwork are other and related factors that are injurious, such as a fixed artificial posture, or dust, or poisons, insanitary shop and factory, or insufficient nutrition, and it is often almost impossible to separate their effects. Other complicating factors might also be adduced in many cases, such as insufficient sleep, great haste at meals, imperfect safety appliances in the lesser industries. Nevertheless the relation of long working hours to health is, in certain forms of ill health, easily demonstrable. So, for instance, in certain trades, definite maladies result from too long standing. . . . Others equally definite are caused by too long sitting. . . . and others are conspicuous as resulting from excessive muscular over-exertion. . . . Now, though we may say, in such cases, that the injuries to health are the direct results of standing, sitting, or lifting, there can scarcely be room for disagreement when we take it to be a settled fact that the *underlying relation* of the length of the working hours to the state of the health is clearly established.

Taking for granted that all other conditions (nutrition, housing, general sanitation, etc.) remain unchanged, this difference of time in the occurrence of sickness must be attributed to the *excessive hours of work, which reach beyond the limits of endurance.* (Pages 326–327.)

UNITED STATES

New Hampshire. House Journal. June, 1847. Report recommending Shortening Hours of Labor, Regulating Child Labor, and Establishing 10-hour Day.

Their duties do not generally require great exertion of physical strength,

but are rendered fatiguing by the constant attention required by the rapid and increasing motion of the machines, attended by a constant noise and jar which are distracting to persons unaccustomed to the mills.

It seems certain to the undersigned that labor of this nature cannot be continued any great length of time without serious injury to the health of the operatives. . . . If the slow and fearful diseases which this mode of life tends to bring on are escaped, a loss of strength and activity must ensue from it, which may result in the perpetual evil of a sickly and enervated population in all the large manufacturing towns. (Page 476.)

Massachusetts House Documents. No. 153. 1850. Minority Report Re Limitation of Hours of Work.

Excessive labor not only debilitates the body, and thereby exposes it to disease, but also tends to exhaust the mental powers, and thus expose the whole moral and intellectual character to undue and dangerous depression. To this evil and danger the factory operatives—that large and valuable class of the population of this State which by their labor produce so large a portion of its material wealth—are especially exposed. (Page 19.)

Massachusetts House Documents. No. 98. 1866.

Dr. Jarvis, physician of Dorchester, says:

Every man has a certain amount of constitutional force. This is his vital capital, which must not be diminished. Out of this comes daily a certain and definite amount of available force, which he may expend in labor of muscle or brain, without drawing on his vital capital. He may and should work every day and expend so much force and no more, that he shall awake the next morning and every succeeding morning until he shall be threescore and ten, and find in himself the same amount of available force, the same power, and do his ordinary day's work, and again lie down at night with his . . . constitutional force unimpaired. (Page 36.)

Judging by this standard, there can be no doubt of the serious injury often resulting from overwork, even when no palpable evidence appears. (Page 36.)

Dr. Ordway, practising physician many years (in Lawrence), has no hesitation in saying that mill work, long continued, is injurious to bodily and mental health, and materially shortens life, especially of women. (Page 63.)

UNITED STATES

Massachusetts Legislative Documents. Reports of Commissioners on the Hours of Labor. House. No. 44. 1867.

Workmen and . . . women are held under the present customs and ideas to at least five hours each half day of continuous work, often in the most tedious, minute, and monotonous employ. It is assumed . . . that they have no lower limbs to ache with swollen or ruptured veins, no delicacy of nerve, or versatility of mind, to revolt from such severity of application. (Pages 66–67.)

Report of the Massachusetts Bureau of Statistics of Labor. 1870–71.

"The 11th hour was the worst—we are worn out and we feel that we can't get off as much work. That hour is a great deal worse than the first hour. I feel faintly when I come out of mill at night, and I did not when I worked 10 hours. That last hour is dreadful bad." An operative. (Page 499.)

"Has lived in twenty different factory towns, and has observed that young women who work in the factories are many of them ruined in morals and nearly all in health. A rosy-cheeked girl put in a mill will begin to fade in three months." G. Bootcutter. (Page 606.)

Report of the Massachusetts Bureau of Statistics of Labor. 1872. Domestic Labor and Woman's Work.

In the cotton mills at Fitchburg the women and children are pale, crooked, and sickly-looking. The women appear dispirited, and the children without the bloom of childhood in their cheeks, or the elasticity that belongs to that age. Hours, 60 to 67¾ a week. (Pages 94–95.)

Rhode Island. Governor's Message. 1875.

Governor Henry Howard:

It seems to me that the time has come for considering the question of regulating by legislation the hours of employment of women and children in our factories. . . . I know that many regard it as wisest to leave such matters to their own adjustment. Protracted observation and some experience lead me to an opposite conclusion. Work in our factories is largely made up of the labor of women and children. The disposition of the former to sacrifice enjoyment, comfort, health, nay, even life itself, to the pressing demands of family necessity, is well known. . . . In trades which are mainly occupied by men, ten hours is allowed

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to constitute a day's work. Why should women and children be compelled to labor at an employment quite as trying both to brain and body, and more confining than almost any other, for a longer period of time? Experience shows that impaired health is most frequent in those mills which run the greatest number of hours daily. (Pages 16–17.)

Report of the Massachusetts Bureau of Statistics of Labor. 1884.

We secured the personal history of these 1032 of the whole 20,000 working girls of Boston, a number amply sufficient for the scientific purposes of the investigation. (Page 5.)

Long hours, and being obliged to stand all day, are very generally advanced as the principal reasons for any lack or loss of health occasioned by the work of the girls. (Page 69.)

Report of the New Jersey Inspector of Factories and Workshops. 1885.

Dr. Gledden, the town physician, testified that the employees of the mills were not as healthy as those outside, and this he fairly attributed to the long hours of labor. (Page 46.)

Report of the New York State Factory Inspector. 1887.

Inquiry among those females above the statutory age who worked twelve and fifteen hours a day in printing offices, candy factories, woolen, mills, and other manufacturing establishments, elicited the information that the women who labor these long hours were more subject to fits of nervous prostration and debility than those who worked the normal day of ten hours. (Page 28.)

Report of Pennsylvania Factory Inspector. 1895.

Great is my disappointment when advised of overtime, in visiting the premises in question, to find, out of a force of upward of a hundred or more, from four to ten minors are employed. Their time is at once curtailed, while the other goes merrily on grinding out the very lives of these beings called women. It may be that they were intended to fill the places of such, but their very industrial environment, being utterly slavish, soon makes of them subjects not for home grace and beauty, but rather a physically degenerating class fit only for treatment in the hospital and home. It would be interesting to secure an exact statistical record

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based upon this particular question, the effect of overtaxation upon women's physical health caused by long hours and arduous labor. (Pages 17–18.)

Report of the New York Factory Inspector. 1897.

In our opinion there seems to be no good reason why there should be any age limit at all placed on the hours of labor of any working woman. The restrictive clause limiting the hours of toil to sixty per week should apply to all females irrespective of their age.

Any woman employed at manual labor for ten consecutive hours per day and constantly employed, is performing a task beyond her strength, whether she is just under or over twenty-one years of age. (Pages 25–26.)

Report of the Michigan Bureau of Labor Statistics. 1898.

The long working hours, the close air of the shop, with the cold lunch hastily eaten, are no small factors in the rapid change of appearance and health many of these women and children undergo in the first few years of factory life. (Page 77.)

Report of the New Jersey Bureau of Statistics of Labor and Industries. 1902.

The weak, physical condition of the operatives, especially the females, is very noticeable. (Page 378.)

The long hours of labor, frequently ten or twelve, and the foul air of the workroom is most marked in its effects upon the female operatives. In addition to throat and lung diseases, which are almost equally prevalent among both sexes, the suffering of the female operatives from causes peculiar to the sex is very greatly aggravated by the conditions under which they work. (Pages 377–378.)

A physician of high standing whose practice is largely among the operatives of these mills is authority for the statement that a large majority of female mill-workers are sufferers from some one or more of the organic complaints brought on or intensified by the conditions under which they work. If no such disease existed before entering the mill, it was almost sure to develop soon after beginning work; if it did exist before, it was aggravated to a degree that made them easy victims of consumption.

The long hours of labor, being constantly standing, the foul air of the workroom, and, more than all, the ceaseless vibration of the floor from the

motion of the great mass of machinery are the prime factors in producing these diseases. (Page 378.) UNITED STATES

Report of the Minnesota Bureau of Labor Statistics. 1901–1902.

A writer in the British Medical Journal (September 2, 1899), in discussing the influence of prolonged standing in the production of women's diseases, declares that while only a comparatively small number of factory and shop girls break down at an early age, forty per cent of married women who have been factory or shop girls "come under medical attention for pelvic troubles under thirty years. The girls are broken down and wearied, but keep at their work by force of circumstances." (Pages 339–340.)

(2) Injuries to the Female Functions and Childbirth

The evil effect of overwork and continuous standing before as well as after marriage is marked and disastrous upon the female functions and childbirth.

British Sessional Papers. Vol. XXI. 1833. Second Report of . . . the Commissioners for inquiring into the Employment of Children in Factories . . . and Reports by the Medical Commissioners. Dr. Hawkins (*Lancashire district*). Elizabeth Taylor, *Midwife . . . . 9th May, 1833.* GREAT BRITAIN

. . . Are miscarriages more common among factory women than among others whom you attend?—Much more frequent among the factory women. . . .

Do you find the children of factory women are as healthy when first born as those of other women?—No, certainly not; they are more delicate. . . . You often examine the persons of factory wives; do you often find any hurt or blemish?—I often find their feet and legs swelled. . . .

Whom do you find most lean, the factory wives or the others whom you attend?—The factory wives are a good deal more lean. (Page 14.)

Hansard's Parliamentary Debates. Vol. LXXIII. 1844.

Lord Ashley:

Many anatomical reasons are assigned by surgeons of the manufacturing towns, that "the peculiar structure of the female form is not so well

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adapted to long-continued labour and especially labour which is endured standing." Mr. Smith of Leeds declares:

"This [the operation of the factory labour] occasionally produces the most lamentable effects in females when they are expecting to become mothers."

On the anatomical difficulty of parturition, he states:

"It is often the painful duty of the accoucheur to destroy the life of the child. I have seen many instances of the kind, all of which, with one exception, have been those of females who have worked long hours in factories. (Pages 1089–1090.)

He (Mr. Saunders) often witnesses the effect of so much standing when parturition comes on, adding:

"Work in the night is the most injurious; it is unnatural, and not adapted to the constitution of women."

Another surgeon of great experience in Lancashire, writes to me that . . .

"The effects of long-continued labour in factories become more apparent after childbirth. The infants are at birth below the average size, have a stunted and shrivelled appearance. . . . Miscarriages very frequent, and all the physical and surgical mischiefs of mistreated pregnancy —varicose veins produced by the continued evil practice—aggravated greatly in pregnant women. Again troublesome ulcers of the legs, arising from varicose veins which, in some cases, burst, and bring on a dangerous and sometimes fatal hemorrhage. The practice of procuring abortion is very frequent even among married women."

I have, moreover, the personal testimony of several females to the truth of these statements they speak of—the intolerable pain in their breasts by such long absences from children, and the suffering of returning to work within ten days of confinement. (Page 1093.)

"Very young children (says Dr. Johns) are, by the existing system, not sufficiently taken care of by their mothers; as regards themselves during gestation, and their offspring, after childbirth—the women during pregnancy continue as long as possible at their work." (Page 1094.)

British Sessional Papers. Vol. LV. 1873. Report to the Local Government Board on Proposed Changes in Hours and Ages of Employment in Textile Factories. J. H. BRIDGES, M.D., *and* T. HOLMES.

Experience afforded by residence in the worsted manufacturing town of Bradford, and extensive practice among its population during periods of from one to thirty-five years:

A. Amongst the *women* of factory operatives, much more than among the general population. . . . Other deranged states of a still worse character are present, *e. g.*, leucorrhœa and too frequent and profuse menstruation. Cases also of displacement, flexions, and versions of the uterus, arising from the constant standing and the increased heat of and confinement in the mill. (Pages 39–40.)

Signed on behalf of the Bradford Medico-Chirurgical Society, at a meeting held February 4, 1873.

Sub-Committee,

President, J. H. BELL, M.D.

P. E. MIALL, M.R.C.S.

Secretary, DAVID GOYDER, M.D.

(Pages 39–40.)

Artisans and Machinery: The Moral and Physical Condition of the Manufacturing Population. P. GASKELL, Esq., *Surgeon. London, John Parker, 1836.*

That the physical energies of the factory women are injured is proved by the fact that miscarriages are exceedingly common amongst them. We have had many opportunities of noting this circumstance in girls engaged in both silk and cotton mills. (Page 189.)

History of the Factory Movement, from the Year 1802 to the Enactment of the Ten-hours' Bill in 1847. "Alfred." (Samuel Kydd.) Mr. SADLER'S *speech before the House of Commons, March, 1832. London, Simpkin, Marshall, 1857.*

. . . But again taking with me the highest medical authorities, I refer to the consequences of early and immoderate labor; especially at the period when the system rapidly attains its full development and is peculiarly susceptible of permanent injury. Still more are the effects felt when they become mothers, for which, I fear, their previous pursuits have little qualified them. It is in evidence that long standing has a known tendency—how shall I express it?—*contrahere et minuere pelvem,* and thereby to increase greatly the danger and difficulty of parturition, rendering embryotomy—one of the most distressing operations which a surgeon ever has to perform—occasionally necessary. I have communications on this subject from persons of great professional experience; but still I prefer to appeal to the evidence before the public; and one reference shall suffice. Dr. Jones, who had practised in the neighborhood of certain mills, in favor of which much evidence was adduced, which

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indeed it is rarely difficult to procure, states that in the eight or ten years during which he was an accoucheur, he met with more cases requiring the aid of instruments (that circumstance showing them to be bad ones), than a gentleman of great practice in Birmingham, to whom he was previously a pupil, had met with in the whole course of his life. Abundance of evidence is before me. But I forbear. (Vol. I, Page 181.)

The Hygiene, Diseases, and Mortality of Occupation. J. T. ARLIDGE, M.D., A.B., F.R.C.P. *London, Percival, 1892.*

Continuous standing for hours together is a strain especially upon the arch of the feet and the ankle joints; a cause of weary spine and spinal curvature, favoring also pelvic fulness, and in the female sex, productive of derangements of the uterine functions and of uterine displacements. (Page 170.)

Condition of the Working Class in England in 1844. FREDERICK ENGELS. (*Originally issued in Germany, 1845.*) *Translated by* FLORENCE KELLEY. *London, Sonnenschein, 1892.*

The influence of factory work upon the female physique also is marked and peculiar. The deformities entailed by long hours of work are much more serious among women. Protracted work frequently causes deformities of the pelvis, partly in the shape of abnormal position and development of the hip bones, and partly of malformation of the lower part of the spinal column.

"Although," says Dr. Loudon, in his report, "no example of malformation of the pelvis and of some other affections came under my notice, these things are nevertheless so common that every physician must regard them as probable consequences of such working hours, and as vouched for besides by men of the highest medical credibility."

That factory operatives undergo more difficult confinement than other women is testified to by several midwives and accoucheurs, and also that they are more liable to miscarriage. (Pages 160–161.)

GERMANY

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten, XXII, 1897. [*Official Information from Reports of the* (*German*) *Factory Inspectors.*] *Berlin, Bruer, 1898.*

The inspector in Hesse regards a reduction of working hours to ten for women in textile mills as "absolutely imperative," as the continuous standing is very injurious to the female organism. (Page 241.)

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Die Beschäftigung Verheiratheter Frauen in Fabriken. Nach den Jahresberichten der Gewerbe-Aufsichtsbeamten für das Jahr 1899 bearbeitet im Reichsamt des Innern. [*The Employment of Married Women in Factories. From Reports of the (German) Factory Inspectors for the Year 1899. Compiled in the Imperial Home Office.*] *Berlin, Decker, 1901.*

The harm from continuous standing or sitting was repeatedly emphasized. It was stated that continuous standing was extremely injurious for all women in the years of developing maturity, as it caused uterine relaxation and malpositions (falling of the womb).

. . . The inspector from Dresden wrote: "It is an undisputed fact that prolonged standing as required in many lines of manufacture as well as continuous sitting (sewing and many trades), is a cause of impairment to health. Unmarried women are as liable as married ones to the ill results of long hours of sitting or standing." (Page 101.)

In Württemburg, where anæmia and disturbances of the abdominal organs (intestines, etc.) were widely characteristic of working women in all the various lines of industry, "it was found that the bent attitude standing up in the mills, and the equally bent attitude sitting down in the lace curtain factories, etc., both promoted illness. Sometimes still other unhealthful influences were added to these, such as continuous standing on wet and cold stone floors, as was the case in certain mills.

In the report from Anhalt it was stated as an accepted fact that, if continuous standing or continued sitting while at work was combined with *long hours of work*, definite impairment of the health of women followed (varicose veins, uterine disorders, etc.). (Page 101.)

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Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*Investigations into the Conditions of Health of the Swiss Factory Workers.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector, and* Dr. A. E. BURCKHARDT, *Prof. of Hygiene, Basle. Aarau, Sauerländer, 1889.*

The high morbidity of women is not a little influenced by the frequency of uterine disorders. It is known that, on the whole, women are more subject to diseases of the genitalia than men, yet the difference shown in the statistics of the sick benefit funds cannot be regarded as normal. These disorders are not equally prevalent in all occupations, nor do they always appear in the same varieties. Next to the kind of employment it is important to know whether the workers are married or single, and have

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borne children or not. Among young unmarried workers one finds lower figures, chiefly of menstrual disorders and slight catarrh. (Cotton mill and silk mill operatives.) The figures rise as the genital organs are more directly affected by the kind of work. Again, in certain industries (weaving, cotton print works), we find figures which call for serious consideration. Here the forms of disease become more threatening. Miscarriages are frequent, displacements and chronic metritis take a prominent place. If we wish to apply a remedy we must study all the circumstances which contribute to these abnormalities.

First of all, as already stated, the kind of work and way in which it is done must not be overlooked. Pre-eminently must continuous standing, jarring of machinery, whirling dust, and direct or indirect pressure upon the abdominal organs be condemned. By the utmost possible avoidance of bad conditions much improvement may be reached even without excluding women from their share of industrial work. (Pages 170–171.)

International Congress for Labor Legislation, Zurich, 1897. Official Report of the Organization Committee. Die Beurteilung der Folgen der Kinderarbeit vom Standpunkte des Arztes. [*The Results of Child Labor as judged from the Physicians' Standpoint.*] Dr. F. GEHRIG, *in Wiener Staatswissenschaftliche Studien, Bd. V., 1903.*

We may place special injuries in two groups, accordingly as work requires the sitting or standing position.

In the first group stasis is promoted in abdominal organs by the obstructed circulation and chronic constipation, hemorrhoids, and, in women, uterine disorders follow. The fixed position leads to scolioses and asymmetrical thorax, curvatures of the spine, etc. The obstacles to free, unconstrained respiration induce pulmonary tuberculosis. With the overuse of certain groups of muscles distinct neuroses arise.

It is to be borne in mind that these diseases by no means always declare themselves in youth; the seeds only of many ills are planted by overexertion in youth, and from them develop later disease or invalidism. (Page 190.)

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Report of the Massachusetts Bureau of Statistics of Labor. 1871.

Exhaustion from overwork. In consequence of the long hours of labor, the great speed the machinery is run at, the large numbers of looms the weavers tend, and the general overtasking, so much exhaustion is produced in most cases that, immediately after taking supper, the tired

operatives drop to sleep in their chairs. . . . 10. Predisposition to pelvic disease. There appears, as far as my observation goes, quite a predisposition to pelvic disease among the female factory operatives, producing difficulty in parturition. The necessity for instrumental delivery has very much increased within a few years, owing to the females working in the mills while they are pregnant and in consequence of deformed pelvis. Other uterine diseases are produced, and, in other cases, aggravated in consequence of the same. (Pages 505–506.) UNITED STATES

Report of the Massachusetts Bureau of Statistics of Labor. 1875.

Profuse, difficult, deficient, or retarded menstruation, anæmia, chlorosis, anasarca and œdema of feet, pains of back and limbs, nervous headaches, hacking coughs, by-and-by tubercular symptoms, and more or less early decline, is the usual list and order of complaints that our errors of industrial employment are establishing with this proportion of our working world, and with their results are grafting upon our nationality to its steadily progressive decline and decay. (Page 70.)

It seems to be the back that gives out. Girls cannot work more than eight hours, and keep it up; they know it, and they rarely will,—and even this seems to "pull them down," so that it is extremely rare that a girl continues more than a few years at the business. (Page 91.)

Mr. B——, foreman of a large printing establishment, says: "Girls must sit at the 'case.' I never knew but one woman, and she a strong, vigorous Irishwoman, of unusual height, who could stand at the case like a man. Female compositors, as a rule, are sickly, suffering much from backache, headache, weak limbs, and general 'female weakness.'" (Page 91.)

Miss——, for several years in charge of the female department of one of the largest telegraph offices in the country, testified: "One year is as long as one can work in a busy office without a good vacation. The confined position, constipation, heat, and dizzy headache, I think, are the most noticeable troubles of 'lady operators' who are 'grown up.' The hours are too long for such strained employment. From 8 A. M. to 6 P. M., with only an hour for dinner, makes too long a day for the kind of work." (Page 96.)

Miss J——, a lady compositor, says: "We cannot stand at the 'case.' It increases back and head ache, and weakness of limbs, as well as a dragging weight about the hips. I have been at this work five years, but have been frequently obliged to give up for vacations from peculiar troubles and general debility. I began to menstruate when fourteen; I am now twenty-

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two. I was well until I had set type for a year, when I began to be troubled with difficult periods, and have been more or less ever since. When I go away I get better, but, as often as I return to my work, I am troubled again. Have wholly lost color, and am not nearly as fleshy and heavy as when I began work. I have now a good deal of pain in my chest, and some cough, which increases, if I work harder than usual. I am well acquainted with many other lady compositors who suffer as I do." (Pages 91–92.)

Miss S——, a lady long in charge of the "composing-room" (female department) of a large printing establishment testifies: "I was myself a compositor, and have had scores of girls under me and with me, many of whom I have known intimately. I have no hesitation in saying that I think I never knew a dozen lady compositors who were 'well.' Their principal troubles are those belonging to the sex, and great pain in back, limbs, and head." (Page 92.)

(3) Injuries to the Feet and Legs from Long Standing

Long hours of standing result in injuries to the tissues of the legs and feet, often persisting for years, occasioning much pain and in some cases total disability. Varicose veins and flat foot are the most common injuries.

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British Sessional Papers. Vol. XV. 1831–1832. Report from the Select Committee on the "Bill to regulate the Labour of Children in the Mills and Factories of the United Kingdom."

James Blundell, Esq., M.D. (Lecturer on Physiology and Midwifery in the School of Guy's Hospital):

10850. Is not the exertion necessary to sustain the erect position of the body for a great length of time more fatiguing than any other natural position ordinarily maintained, or moderate exertion equally and alternately exercising the various muscles of the body?—Decidedly it is. . . .

10851. According to physiological principles, might the excessive fatigue that a person endures who has to maintain an erect position for a great length of time be explained and accounted for?—I think it might, inasmuch as the movements of the body in locomotive exercise tend effectually in man to help circulation, and further, the standing position implies that the same muscles are kept continually in action, while in

the locomotive movements there are alternate changes of the operative muscles.

10852. Is there not alternate rest and exercise in the varied movements of the body, which is not the case in the standing position so fully?—Exactly so, alternate rest and exercise of different sets of muscles. (Page 542.)

Thos. Hodgkin, Esq., M.D. (Physician to the London Dispensary, Lecturer at Guy's Hospital):

10928. It has been asserted by witnesses before this committee, that diseased and ulcerated legs, especially among the female part of the operatives, have been produced; should you conceive that long standing at the labour in question might produce that effect?—Certainly, by interfering with the circulation. (Page 548.)

John Morgan, Esq. (Surgeon to Guy's Hospital):

10990. Should you be prepared to expect that diseases of the legs, especially in the female sex, would result from very long standing at their labour?—I should consider it as a necessary consequence. (Page 553.)

Benjamin Collins Brodie, Esq., F.R.S. . . . (Surgeon of St. George's Hospital):

11098. Is not the maintenance of the erect position of the body fatiguing when continued for a great length of time?—It is more fatiguing than a recumbent or sitting posture, inasmuch as more muscular exertion is necessary to maintain it. (Page 565.)

11110. Many of the operatives, it is said, especially the females, suffer from this labour other effects, namely, diseases in the legs?—Diseases in the legs generally, and especially varicose veins and ulcers of the legs are more likely to occur in persons who are constantly in an erect posture. I observe in this town those who are a great deal in an erect posture, especially if they carry weights, become flat-footed, which is a very distressing complaint. (Page 566.)

Sir William Blizard, F.R.S. (Surgeon to the London Hospital and Lecturer on Surgery, Anatomy, and Physiology):

11200. May the committee ask you, appealing now to the principles of your profession, whether it does not require some considerable degree of muscular exertion to maintain the erect position for a great length of time together?—No doubt of it, and it is a position which, if long maintained, is unfavorable in many respects, and leading to consequences very serious. (Page 572.)

Sir George Leman Tuthill, F.R.S. (Physician to the Westminster Hospital and Bethlem Hospital):

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11307. Is the muscular effort to sustain for a great length of time together the erect position of the body very fatiguing?—Certainly. (Page 580.)

11308. So that such labour, so pursued, would be still more exhausting?—I think it would. (Page 580.)

Joseph Henry Green, Esq., F.R.S. (A surgeon of St. Thomas's Hospital and Professor of Surgery at King's College):

11375. Does not the maintaining of an erect position of the body itself induce considerable fatigue if long endured? In order to maintain an erect position of the body, it is necessary that a muscular action should be constantly exerted, therefore it necessarily induces fatigue. (Page 587.)

James Guthrie, Esq., F.R.S. (Vice-President of Royal College of Surgeons, surgeon to the Westminster Hospital and to Westminster Eye Hospital):

11474. Is not the exertion necessary to sustain the erect position for a great length of time more fatiguing than any other natural posture ordinarily maintained, or moderate exertion equally and alternately exercising the muscles of the body?—Unquestionably. (Page 595.)

British Sessional Papers. Vol. XXI. 1833. Second Report of the . . . Commissioners for Inquiring into the Employment of Children in Factories and . . . Reports by the Medical Commissioners.

Sir David Barry's report (Scotland):

In examining the feet and ankles of mill girls, I find, that in reference to their being swelled or otherwise a good deal depends upon the hour of the day at which they are examined. Most of them acknowledge that their feet are more or less swelled towards night, particularly in the summer months. (Page 8.)

Both adult males and females whose work obliges them to stand constantly are more subject to varicose veins of the lower extremities, and to a larger and more dangerous extent than ever I have witnessed even in foot soldiers. The females are more subject than males to evening swellings of the feet and ankles. (Page 73.)

British Sessional Papers. Vol. LV. 1873. Report to the Local Government Board on Proposed Changes in Hours and Ages of Employment in Textile Factories. J. H. Bridges, M.D., *and* T. Holmes.

Experience afforded by residence in the worsted manufacturing town of Bradford and extensive practice among its population during periods of from one to thirty-five years:

. . . Oedema and varicose veins of the legs are common amongst female mill-workers of middle age.

Signed on behalf of the Bradford Medico-Chirurgical Society, at a meeting held February 4, 1873.

Sub-Committee,

President, J. H. BELL, M.D.
P. E. MIALL, M.R.C.S.
Secretary, DAVID GOYDER, M.D.

(Pages 39–40.)

British Sessional Papers. Vol. XII. 1895. Report from the Select Committee on Shops (Early Closing) Bill.

Witness, Dr. Percy Kidd, M.D., of University of Oxford, Fellow of College of Physicians and Member of the College of Surgeons. Attached to London Hospital and Brompton Hospital:

5284. Would prolonged standing have an injurious effect upon the female constitution?—I have no doubt it has. . . . I have no doubt it causes varicose veins. (Page 215.)

The Hygiene, Diseases, and Mortality of Occupation. J. T. ARLIDGE, M.D., A.B., F.R.C.P., *Late Milroy Lecturer at Royal College. London, Percival, 1892.*

When insufficient muscular activity is associated with almost constant standing, the increased difficulty to the return of the blood from the lower limbs is the most pronounced feature, and productive of varicose veins, and ulcers and thickened knee and ankle joints. (Page 19.)

Workpeople obliged to stand long, and especially when this happens in early youth, lose the arch of the foot and become flat-footed, with deformed ankles and often "knock knees." (Page 558.)

British Association for the Advancement of Science. 1903. Women's Labour: Third Report of the Committee . . . appointed to Investigate the Economic Effect of Legislation Regulating Women's Labour.

In so far as the law has checked, and this it certainly has done in a considerable degree, the excessively long night and day turns of work (in laundries) at the middle and end of the week, gain must have accrued to the workers in lessening the number of cases of complete exhaustion.

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. . . Greater liability of laundresses, as compared with women of occupations treated in those infirmaries, to ulcerated legs and to phthisis. . . . The figures supplied by the records of the cases attended by the Kensington District Nursing Association show a large proportion of ulcerated legs and of forms of internal disease aggravated by standing for long hours. (Pages 359–360.)

GERMANY

Die Beschäftigung Verheirateter Frauen in Fabriken. Nach den Jahres-Berichten der Gewerbe-Aufsichtsbeamten für das Jahr 1899 bearbeitet im Reichsamt des Innern. Berlin, 1901. [*The Employment of Married Women in Factories. From Reports of the (German) Factory Inspectors for the year 1899. Compiled in the Imperial Home Office.*] *Berlin, Decker, 1901.*

Other inspectors emphasized the injurious effects of continuous standing. The frequent occurrence of flat foot was ascribed to this, and the frequency of displaced uterus in working women was also attributed largely to this cause.

The inspector from Alsace, who personally interviewed the women operatives, found that "varicose veins were frequent, rubber stockings were often necessary, and weariness and inability to do the household work after returning from the factory were almost universal even among the younger women. This weariness, often accompanied by backache . . . often developed into positive incapacity for work and physical disability." (Page 102.)

Jahresbericht der Grossherzoglich Badischen Fabrikinspektion für das Jahr 1902. [*Reports of the Factory Inspectors of Baden, 1902.*] *Karlsruhe, Thiergarten, 1903.*

The direct injuries to health from industrial work are unmistakably shown in certain individual kinds of work, though ordinarily difficult to prove.

Thus the factory physician of two large mills states that the employees suffer much more from flat foot and other troubles of the feet than other classes of the population, and he ascribes it to the long-continued standing and walking during work, which is too much for young people in the period of development, and which, aside from specified troubles, undoubtedly causes the rapid fading of the women. (Page 26.)

GERMANY

Handbuch der Arbeiterwohlfahrt. Bd. I. [*Handbook of the General Welfare of the Working Classes. Vol. I.*] *Edited by* Dr. OTTO DAMMER. *Beschädigung der Arbeiter bei der Arbeit.* [*Injuries of Occupation.*] *Dr. Ascher. Stuttgart, 1902.*

Widely prevalent is the inflammation of the instep leading to flat-foot, the result of continuous standing or walking, and found especially among waiters, shopboys, bakers, etc. Continuous standing, especially when united to severe exertion, as by smiths, laundresses, etc., produces also varicose veins. Through the long-enforced standing only certain muscle groups are brought into action, while the large muscles of the lower extremities are inactive. There follows an enlargement of the spaces between skin and muscles, a knotting of the large veins of the legs; resulting in congestion of the blood and tedious inflammatory process. (Leg ulcers.) Another result of great exertion of the abdominal muscles is rupture (hernia). (Page 493.)

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Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*An Investigation of the Health of Factory Workers in Switzerland.*] Dr. F. SCHULER, *Factory Inspector, and* Dr. A. E. BURCKHARDT, *Prof. of Hygiene, Basle. Aarau, Sauerländer, 1889.*

Continuous standing must always be regarded as injurious to health. (Page 131.)

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National Child Labor Committee. New York. Proceedings of the Fifth Annual Conference. Chicago, Ill. 1909. Some Effects of Improper Posture in Factory Labor. ALBERT H. FREIBERG, M.D., *Cincinnati, Ohio.*

Muscular exercise is beneficial. Exercise is our only means of strengthening the muscles, of encouraging their development, but the building up of a muscle which is actively growing and developing must be accomplished by exercises which are not too severe, which are not too long continued, and which are of constantly varying character.

Furthermore, the muscle which carries out exercises must be given frequent periods of rest, during which it may recover; it should be given an opportunity to build up again that which has been consumed by use. . . .

. . . That which is unfortunate in factory employment as far as purely physical effects upon the muscles are concerned, is the fact that a muscle must perform its functions for a long period of time without the

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opportunity of relaxing, without the opportunity of recovering. When a muscle has performed its function up to a certain point, we experience the sensation which we speak of commonly as fatigue. Fatigue means that there is an accumulation in the muscle of the waste products of its use, which have not yet been carried away and replaced by new material. If we continue to use a muscle far beyond the point of fatigue repeatedly, there results in that muscle in the course of time instead of further upbuilding, a degeneration and the result of such excess fatigue is the final weakening of a muscle which, if treated properly, would on the contrary grow stronger continuously. (Page 106.)

(4) Injuries to Eyesight

Serious injury to the eyes results also from excessive working hours. The danger of eye-strain from overlong hours and close application is intensified by the lack of proper and adequate lighting of workrooms. Shorter working hours not only relieve the strain upon the eyes, but diminish the necessary time for working with artificial light.

ITALY

Fatigue. A. Mosso, *Professor of Physiology, University of Turin. 1896. Translated by* Margaret Drummond, M.A., *and* W. B. Drummond, M.B., *Extra Physician, Royal Hospital for Sick Children, Edinburgh. New York, Putnam, 1904.*

Rest has such an effect upon vision that some workmen, such as printers, tailors, and shoemakers, after their Sunday rest, see very well for several days; but in the middle of the week the symptoms of asthenopia recommence; and so troublesome are they that the sufferers have to cease work and go to the doctor, complaining not only of obscurity of vision, but of pain extending from their eyes to the frontal and occipital regions of the head. (Page 139.)

Fatigue of the eyes in perception of the colour has been thoroughly studied by Goethe (Zur Farbenlehre, 1812).

From his work on colours I shall quote some paragraphs which deal specially with ocular fatigue.

We have all tried the experiment of looking at the sun, or gazing fixedly on the flame of a candle, and then shutting our eyes. We are

all aware that the eye retains an image of a circle, which is at first bright with a pale-yellow centre, but quickly becomes rose-coloured around the edges. ITALY

After a time, this red increasing towards the centre covers the whole circle and at last the bright central point. No sooner, however, is the whole circle red than the edge begins to be blue and the blue gradually incroaches inward upon the red. When the whole is blue the edge becomes dark and colorless. The image then becomes gradually fainter and at the same time diminishes in size. (Pages 229–230.)

Goethe has likewise pointed out the effect of debility upon vision: "In passing from bright daylight to a dusky place we distinguish nothing at first; by degrees the eye recovers its susceptibility: strong eyes sooner than weak ones; the former in a minute, while the latter may require seven or eight minutes."

This observation of Goethe's as to longer duration of fatigue phenomena in enfeebled persons is of great importance in our present study. (Page 230.)

British Sessional Papers. Vol. XXII. 1864. Report of Commissioners on Children's Employment. GREAT BRITAIN

. . . Medical testimony to be found in the evidence in the Second Report of the Children's Employment Commissions, on the effects of late hours amongst all sorts of female employments, on the eye, where vision has to be concentrated on minute objects under artificial light:

"After long work," says Mr. Lawson, "the eye becomes fatigued, the strain is relaxed, and the image, being thrown slightly out of focus, appears indistinct. A continuance of work without resting the eyes, causes a complete loss of the object on which the eye is fixed." (Page 186.)

Étude sur l'Influence de la Durée du Travail Quotidien sur la Santé Générale de l'Adulte. [*Study of the Effect of the Length of Working Hours upon the General Health of Adults.*] Dr. ILIA SACHNINE. *Lyon, 1900.* FRANCE

Bocci has studied the influence of fatigue on human vision. He holds that in fatigue of the eye and its attachments there are two distinct factors, namely, purely muscular fatigue and weariness of the nerve centres. In a series of experiments with normal individuals who were fatigued he found a diminution of keenness of vision, of refraction, of accommodation, of impressionability of the retina, of equilibrium and of muscular co-ordination. (Page 59.)

GERMANY

Handbuch der Arbeiterwohlfahrt. Bd. I. [*Handbook of the General Welfare of the Working Classes. Vol. I.*] *Edited by* Dr. OTTO DAMMER. *Beschädigungen der Arbeiter bei der Arbeit.* [*Injuries of Occupation.*] Dr. ASCHER. *Stuttgart, 1902.*

Over-exertion of different organs:

The eye:

Puddlers, glassblowers, and others whose eyes are continually exposed to extreme heat and light not only suffer greatly from inflammation of the connective tissues of the eyes, but also frequently from cataract. . . . Shortsightedness was found in a great number of cases among the darners of a worsted mill the result of the spasmodic accommodation of the eyes, as well as inflammation of the conjunctiva; that is the result of overstrained eyes in many occupations, especially those carried on in artificial or in poor light—the remedy lies in improving lighting facilities and in shortening the working hours. (Page 492.)

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Report of the Massachusetts State Board of Health. 1906. Report on the Sanitary Conditions of Factories, Workshops, and other Establishments.

Poor light is itself a factor of no mean consequence in reducing the physiological resistance to disease. It may be a concomitant of a number of other unsanitary influences which affect the health of the worker, as, for example, in the weaving and spinning rooms; or it may be the principal factor, as in web drawing. Apparently too little thought has been given, in mill construction, to providing for light in accordance with the kind of work to be done in a given room. Many rooms are of old construction, with comparatively low ceilings, small windows, and small panes of glass. Some of these rooms are narrow, and admit fair light from the sides; but some are wide, and some are basement rooms, which lack both an ample supply and an even distribution of light.

Aside from the question of mill construction, two important factors contribute to poor light in a large number of rooms, viz.: (1) neglect to keep the ceiling and walls clean and white; and (2) infrequent washing of windows, allowing them to go unwashed in some instances for several years. It is frequently the case that prismatic glass of different kinds and sizes is introduced into poorly lighted rooms; but unless this glass is kept reasonably clean, it is of little value. In poorly constructed and neglected rooms, with or without prismatic glass, artificial light is not uncommonly used even on bright, sunny days in the late morning or early afternoon hours; and in such rooms gas jets are as likely to be found as incandescent bulbs. Even if artificial light is not used until the late after-

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noon hours, there is then much variation as to the time and method of lighting and the kind of light in use. In some instances the light should be turned on half an hour, or longer, before the engineer sees fit to do so; yet the employees during this time are supposed to continue their work with the same degree of accuracy and rapidity as with good light.

It is a well-established fact that either the overuse of the eyes, or the use of eyes under bad conditions, may give rise to eye fatigue or to eye strain; and many eye specialists believe that at least 80 to 90 per cent of headaches are dependent upon eye strain.

With these facts in mind, it is impossible to ignore the probability that many individuals working by gas light, or even electric light, in dirty, unpainted, overheated rooms, with impure air and excessive moisture, for ten hours a day or merely for the last two hours during the day, use up a great deal of nervous energy, and suffer from eye fatigue, or eye strain, and its consequences. (Pages 470–471.)

(5) Injuries to other Organs

Whenever the nature of a worker's employment or the position required by the work makes particular demands upon any organ of the body, that organ or part of the body first tends to become overstrained.

Excessive length of hours intensifies such overuse of particular organs or parts of the body in the different trades, and only the establishment of shorter hours can lessen the danger of such overstrain.

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Sixth International Congress of Hygiene and Demography. Vienna, 1887. Part XIV, Vol. I–XIV. Sec. on Hygiene. Fabrikhygiene und Fabrikgesetzgebung. [*Factory Hygiene and Legislation.*] Dr. Fridolin Schuler, *Swiss Factory Inspector. Vienna, 1887.*

Far less conspicuous is a third set of factors which exert a deleterious influence on health and so threaten the well-being of workers, namely, the excessive muscular exertion demanded by modern forms of industry, the strain on special organs, the one-sided muscular activity resulting from continuous performance of the same motions. These are especially noticeable in their effect upon women. (Page 19.)

There can be no doubt that factory work for women is, broadly speak-

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ing, undesirable, and must be regarded as an evil resulting from the social adjustment. (Pages 29–30.)

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Handbuch der Arbeiterwohlfahrt. Bd. I. [*Handbook of the General Welfare of the Working Classes. Vol. I.*] *Edited by* Dr. OTTO DAMMER. *Beschädigungen der Arbeiter bei der Arbeit.* [*Injuries of Occupation.*] Dr. ASCHER. *Stuttgart, 1902.*

Overexertion of muscles, sinews, and joints leads to rupture of muscles and ligaments, or to acute or chronic inflammations such as the "housemaid's knee," etc. Continuous overexertion of single groups of muscles induces permanent deformities of the skeleton (wry-neck, spinal curvature). (Page 493.)

General overexertion of the body, and insufficient nourishment, rest, and sleep, repairing only imperfectly the expended energy, lead to anæmia, or to nervous disorders and insanities. Overexertion of individual parts brings atrophy of the part in question, with or without preceding affections of the nervous system. (Pages 495–496.)

Zeitschrift für Gewerbehygiene, Unfallverhütung, und Arbeiterwohlfahrts Einrichtungen. Bd. XIV. 1907. Gewerbehygiene und Unfallverhütung. [*Industrial Hygiene and the Prevention of Accidents.*] Dr. WERNER HEFFTER, *Medical Officer. Vienna, Steiner, 1907.*

The injuries arising from physical overstrain are of quite another kind than those previously described (dust-poisons, etc.), as they may lead to general physical enfeeblement and also to definite local damage, as in the case of individual organs. Dangers of the kind first mentioned arise from excessive length of working hours, and are especially ruinous to youthful workers and to women. Hard work, such as lifting and carrying heavy loads, injures the body by promoting herniæ, straining muscles, and bringing on cardiac disorders and lung diseases. Continuous pressure on some one part of the body induces swellings, inflammations, boils, and abscesses. A bent, or tense, or unnatural position of the body develops spinal deformities and alterations of internal organs; continuous sitting or standing result in abdominal disorders among women. (Page 56.)

Fourteenth International Congress of Hygiene and Demography, Berlin, 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue resulting from Occupation.*] Dr. EMIL ROTH. *Berlin, Hirschwald, 1908.*

During the activity of work the blood current is so distributed that the muscular fibres in action, also the brain and the skin, receive a larger blood

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supply than usual. The abdominal viscera, and especially the intestines, on the contrary, become anæmic, as the intestines part most readily with their blood supply, and the increased demands of the active muscles are met by a corresponding diminution of the intestinal circulation. It follows that, at a time of continuous physical exertion, the secretions of the intestinal glands and the processes of absorption of the contents of the digestive tract into the blood are retarded, and, if physiological limits in this process are overpassed, permanent injury to the digestive organs results, and anæmia, chlorosis, neurasthenia, or other ills are permanently and unavoidably established. (Page 595.)

Fatigue, which, as has already been said, is the natural sequence of all exertion, shows itself first locally and then generally. The local effects are not confined entirely nor even chiefly to the muscular structures that are directly in use, but occur pre-eminently in those accessory muscles which are overstrained by work. This is to be ascribed to the fact that static work is more fatiguing than dynamic activity. The baker who has kneaded bread all night in a bent attitude, complains of pains in the legs; the shoemaker, of pain in the back; the violin player, of cramps in the left hand, etc., etc. (Page 598.)

When fatigue becomes more intense it is overfatigue. This is also, at first, of local extent. So may acute inflammatory processes result from the overuse of single muscles, tendons, and joints . . . such are the rheumatic disorders of miners. . . .

As a result of local overstrain may be found many abnormal conditions . . . here must be included dilatation and hypertrophy of the heart . . . the right side of the heart, by reason of its thinner walls, is especially affected. (Page 600.)

Finally, overfatigue involves the whole body sympathetically, manifesting itself chiefly in disturbances of the digestion, anæmia, neuroses of various forms, and chronic diseases, especially of the heart. It may also be accepted as positive that physical overwork encourages the premature development of arterio-sclerosis. (Page 601.)

As, in the case of poisonous trades the most important thing is to recognize the earliest symptoms of poisoning, so, in regard to physical and mental strain it is of the utmost importance to detect at the outset symptoms of overstrain; first the disturbances of nutrition and of individual organs, next the anæmia, neuroses, etc., etc. (Page 611.)

BELGIUM

Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Section IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel on tel mode d'organisation du travail? [*To what extent may fatigue, its forms and degrees in different occupations, be studied by physiological methods? What arguments may physiological or medical sciences bring to bear in favor of various modes of industrial organization?*] Dr. JEAN DEMOOR, *University of Brussels. Brussels, 1903.*

Labor accelerates greatly the respiratory processes: it produces breathlessness by a true poisoning process, and may, with more or less complete persistence of this condition, bring on pulmonary emphysema.

Muscular or neuro-muscular fatigue reacts upon the digestive tract; it provokes loss of appetite and various functional disorders; it influences thermogenesis and easily induces hyperthermia (excessive rise of body temperature). Physical overwork favors the invasion of pathogenic bacteria, as human experience proves and as Charrin and Roger's experiments have demonstrated. It also lowers human resistance to sunstroke and to the action of extreme cold. (Page 9.)

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Sixty-fifth Annual Meeting of the American Institute of Instruction. Portland, Me., 1895. The Relation of Fatigue to Social and Educational Progress. HENRY S. BAKER, Ph.D. *Boston, American Institute of Instruction, 1895.*

In cases of long-continued and extreme fatigue the condition of the system resembles that of typhoid fever in its weakness, without, of course, the characteristic lesions of that disease. But fever may exist, and also what is known as irritable heart. Many times the fever of fatigue is erroneously classed as abortive typhoid, bilious, etc. (Pages 34–35.)

Nervous and Mental Diseases. ARCHIBALD CHURCH, M.D., *Professor of Nervous and Mental Diseases and Medical Jurisprudence in the Northwestern University Medical School, etc., and* FREDERICK PETERSON, M.D., *President of the State Commission in Lunacy, New York, etc. Philadelphia, 1901.*

Many occupations requiring the constant repetition of certain precise muscular movements may, eventually, through overuse and fatigue, give

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rise to disturbances of muscular control, for the manœuvre in question. The conditions may be manifest as pain, tremor, weakness, or cramp, but usually these are variously combined in different cases. This group of motor disturbances is also called occupation spasms or occupation neuroses. (Page 544.)

Among the occupation spasms more commonly encountered are the cramps of violin and pianoforte players, telegraphers' cramp, seamstress' cramp, and hammer cramp in smiths and artisans using the hammer. Artists, flower-makers, turners, watchmakers, knitters, engravers, masons in using the trowel, sailors from pulling on ropes, treadlers, compositors, enamellers, cigarette-makers, shoemakers, milkers, money-counters, letter-sorters, and players on various musical instruments including drummers, comprise the list given by Gowers.

It has been noted in a shoe salesman from the stooping position needed in putting on shoes, . . . and in various factory employees who incessantly use the same movement in feeding or attending some machines. (Page 551.)

Bulletin of the United States Bureau of Labor. No. 75. March, 1908. Industrial Hygiene. GEORGE M. KOBER, M.D., LL.D.

Occupations Involving Constrained Attitudes.

The effects of a constrained position, combined with a sedentary life, are very injurious. This is especially seen in weavers, shoemakers, engravers, watchmakers, tailors, lithographers, etc., all of whom are obliged to assume a more or less constrained attitude, which interferes with a proper distribution of the blood supply and is liable to be followed by internal congestions. But perhaps the greatest harm results from deficient movement of the chest and consequent interference with normal respiration. As a matter of fact, many of these artisans suffer from phthisis, constipation, dyspepsia, and hemorrhoids, and all have a low average duration of life. (Page 522.)

(6) Relation between Fatigue and Diseases

(a) General Predisposition

Exhaustion from excessive working hours not only lowers the general health and vitality of overworked persons, but renders them peculiarly susceptible to general diseases.

Since immunity from disease is due chiefly to the organism's powers of resistance, it follows that overtaxed individuals must succumb more readily than those who are not handicapped by overstrain and unrepaired fatigue.

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British Sessional Papers. Vol. XV. 1831–32. Report from the Select Committee on the "Bill to regulate the Labour of Children in the Mills and Factories of the United Kingdom." CHARLES TURNER THACKRAH, Esq., *General Practitioner in Medicine and Surgery at Leeds, author of "On the Effects of Arts and Trades on Health and Longevity."*

10485. . . . Mills in general do not produce immediate and direct mortality; their chief effect on the operatives, in my opinion, is the undermining the health, the destroying the constitution, and the rendering people liable to attacks of disease to which they would not have been subject, or under which they would not have succumbed if they had been in other situations. With few exceptions, the diseases developed in mills are chronic rather than acute. (Page 513.)

10489. Will you please to state to this committee what you conceive to be the general effects of labour too long continued in the atmosphere of mills and factories, generally considered, leaving out of the question any particular dusty manufacture?—I should say, a reduction of vital power proportionate to the length of that confinement, and with this reduction of vital power a series of evils to the constitution; chronic maladies, and an inability to resist acute ones, and a shortening of life. (Page 514.)

10490. And in the case of attacks of acute disease, you do not think the constitution under such circumstances is as capable of resistance?—Decidedly not. (Page 514.)

British Sessional Papers. Vol. XXI. 1833. Second Report of the . . . Commissioners for inquiring into the Employment of Children in Factories . . . and Reports by the Medical Commissioners. Medical Reports by Dr. LOUDON.

Evidence of Francis Sharp, at Leeds, member of College of Surgeons in London, student of medical profession for fourteen years, house surgeon of Leeds Infirmary for nearly four years:

"The nervous energy of the body I consider to be weakened by the very long hours, and a foundation laid for many diseases. . . . Were it not for the individuals who join the mills from the country, the factory people would soon be deteriorated." (Pages 12, 13.)

British Sessional Papers. Vol. VI. 1901. Report from the Select Committee of the House of Lords on Early Closing of Shops. GREAT BRITAIN

6. . . Sir W. MacCormac stated that "There is no doubt in my mind that such long hours (it speaks of an average of fourteen hours per day) must contribute to the incidence of disease; that it must lower the general vitality of persons so engaged and render them more liable than they otherwise would be to attacks of different forms of disease. These hours, too, for the most part, are worked in an atmosphere very prejudicial to health, and we know how largely the air so contaminated contributed to the production of various forms of disease in which tubercle, for instance, and manifold forms of disease in which tubercle manifests itself, and that other disease of great cities (rickets) has some part of its origin from this cause."

7. Furthermore, he urged on us that the evil is one which increases as time runs on; "it is gradual and progressive in its effects, and it goes on, I am afraid, in a cumulative degree."

8. Sir W. Selby Church, the president of the College of Physicians, gave similar evidence. (Pages v–vi.)

. . . Dr. Shanks writes: "Of the diseases met with in practice here amongst shopkeepers and their assistants, chest diseases are the most common. The next in order of occurrence is that of sore throats, and the third flat feet and weakening of the ankles. These three conditions are certainly aggravated by the long hours spent at work. The chest ailments are invariably tuberculosis such as apical phthisis. This condition is most obstinate to treat, and nothing short of total suspension of work enables any progress in combating this terrible disease. Of the cause of such a disease there can be no doubt whatever that long hours spent in shops . . . prone or not to such complaints, tend to bring about a condition of the body suitable to the inroads of the tubercle bacilli." (Pages 75–76.)

Witness, Sir W. MacCormac, President of the Royal College of Surgeons:

2466. . . . The physical fatigue, as well as other causes, induces various forms of disease, especially in younger women, which I should think such hours as you mention would largely contribute to. . . . (Page 120.)

Revue Internationale de Sociologie. Nov. 1895. Le Travail Humain et ses Lois. [*The Laws of Human Work.*] FRANCESCO S. NITTI, *University of Naples. Paris, Giard et Brière.* ITALY

It may be that the workman can continue working for a long time without feeling the harmful effects of fatigue. But, after he has lost a

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certain amount of his organic substance he no longer possesses the necessary resistance to external conditions and he is exposed to all sorts of ills. *Fatigue constitutes a permanent predisposition to all diseases.* . . . (Page 1035.)

Many prevalent maladies arise from nothing else than a genuine overstrain, the result of exhausting and burdensome toil, which predisposes the worker to fall a victim to disease.

Too much importance has at times been attached to exterior conditions of work, and too little to the power of resistance of the worker. The reports of factory inspectors have, however, often pointed out that, whereever the work is too prolonged and degenerates into fatigue, the salubrity of the surroundings does not suffice to guard the worker against the results of overwork and exhaustion. (Page 1035.)

Crichton, even in his time, showed in what a sinister fashion fatigue acted upon the sensibility and upon alertness, and proved that it was the predisposing cause of disease. (Page 1037.)

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De la Fatigue et de son Influence Pathogénique. [*Fatigue and its Pathogenic Influence.*] Dr. M. CARRIEU, *University of Montpellier. Paris, Baillière et Fils, 1878.*

The pathogenic rôle of fatigue is so imperfectly known and so differently estimated that in beginning its study it is necessary to reach a clear idea of what fatigue is before going on to examine those diseases in whose origin it is concerned. (Page 59.)

Like many other causes, fatigue does not always act in an identical way in the production of disease, nor play the same pathogenic part. In brief, the result depends also on the illness that develops and upon the organism in question; it is therefore evident that it will vary according to the kind of illness and condition of the patient.

It is not, indeed, that transitory state, to which the cessation of activity puts an end, that induces illness. This state simply indicates the need of rest, as hunger indicates the need of food. But if these appeals are not attended to, if these needs are not satisfied or only partly so, then it comes about that we have morbid troubles, provoked on one hand by an exaggerated functional over activity, and on the other by defective reparation. (Page 60.)

A special pathogenic cause does not always give the same results, nor always act in the same way: an entire regiment is subjected to cold; it might be supposed that this would have an identical effect on all the men, but two will have pneumonia, ten bronchitis, fifteen rheumatism, and the

greatest number will not be affected. This comparison serves to show how, under the influence of fatigue, we may expect to see a variety of diseases appear. FRANCE

In some cases it will be simply a predisposing cause; its part is reduced to a minimum. Nevertheless it is there; compare for instance the resistance of the vigorous individual to malarial poison with that of the unfortunate, exhausted by severe toil; whose excessive tissue waste cannot be repaired even by an ample food supply. There we have a general predisposition to disease. (Page 61.)

Fatigue seems sometimes to have closer connections with the outbreak of illness, without its influence being precisely definable. Again, there are cases where the pathogenic rôle of fatigue is more precise and important, so that one may even say, given certain personal predispositions, that fatigue will determine the development of definite diseases. . . .

But in general, a thorough study of pathogenesis shows that fatigue is not one of those etiological agents whose powerful action imprints upon the organism such an injury that a definite disease is sure to follow. How far removed, for instance, is the insidious effect that we have traced, from the active and almost certain effect of poisons? . . . That the germ of smallpox alone is capable of producing smallpox no one will deny. Yet how different are the variolas that occur in exhausted overworked individuals and those which are not complicated by fatigue or any other depressing secondary cause. (Page 63.)

If fatigue is not a powerful cause in the production of disease, it is so in engendering superadded elements which are sometimes of capital importance.

Disease is not an entity always identical with itself. The simplicity of doctrinal description is often lost in the presence of the patient. And it is upon the patient and not on the illness, that fatigue exerts its action. (Page 63.)

Handbuch der Hygiene. Bd. 8[1]. [*Handbook of Hygiene. Vol. 8*[1].] *Edited by* Dr. THEODORE WEYL. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. EMIL ROTH. *Jena, 1894.* GERMANY

It is an uncontested fact that all detrimental conditions of factory work—whether they arise from length of working hours or burden of work, or from the close proximity of many persons in one room, or from the special so-called occupation diseases,—become obvious just so much the sooner and so much the more permanently as the individuals in ques-

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tion are less resistant. Thus, of all the individuals engaged in a certain industry (no matter whether it is a question of handling poison or dust-creating materials or of working with irritants, or of the weather and bad air, or of unnatural positions or overexertion of special groups of muscles) —of all these persons some will not suffer in health, while others will suffer after the lapse of some years. Still others in a much shorter time display all the well-known mischievous effects in typical forms, either as poisoning or as diseases of specially taxed or specially weak organs, or as characteristic crippling and deformity.

The explanation of this is, *not* that the first and second groups were less exposed or knew better how to avoid the dangers, but that they were better protected than the last group. This protection is partly inherited and constitutional, based on the strength of individual organs, and is partly the result of the whole standard of living. . . . The more favorable these social factors and the more obedient to hygienic laws the whole mode of life, the greater the resisting power of the whole organism and its separate organs will be. The more unfavorable those conditions are, the less resistant is the organism. . . . (Pages 1–3.)

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Massachusetts House Documents. 1866. No. 98. Report of Special Commission on the Hours of Labor and the Condition and Prospects of the Industrial Classes.

(Specific) cases are not necessary to show the injurious effect of constant labor at long hours. . . . There may be serious evils from constant and exhausting labor, that do not show themselves in any positive, clearly defined disease; while nevertheless the vital forces of the whole man, physical and mental, are very greatly impaired. (Pages 35–36.)

Bulletin of the United States Bureau of Labor. No. 75. March, 1908. Industrial Hygiene. GEO. M. KOBER, M.D., LL.D.

Measures for the Protection of Wage-earners:

One of the important predisposing causes to disease is overwork or fatigue, because the accumulation of waste products in the blood, from muscular wear and tear, together with the expended nervous energy, combine to render the system more susceptible to disease. Excessive work is inimical to health, and long hours and hard work are calculated to diminish the general power of resistance, and thus bring about physical deterioration. Hence the necessity of laws regulating the hours of labor and the enforcement of a day of rest as contemplated by the Sunday laws. (Page 536.)

(*b*) Fatigue and Infectious Diseases

Since overfatigue predisposes to the infectious as well as to general diseases, it constitutes a danger to the public health through the spread of such infections. Excessive working hours, therefore, which induce overfatigue, are a menace not only to the individual but to the public.

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Eighth International Congress of Hygiene and Demography. Budapest, September, 1894. Vol. III, Sec. IV. Über den Einfluss der Arbeitszeit auf die Gesundheit der Arbeiter im Allgemeinen. [*The Influence of Working Hours on the Health of Workers in General.*] Dr. Emil Roth, *Potsdam. Budapest, 1895.*

All overwork—no matter whether it is such by reason of its severity or excessive degree of exertion or of its continuance beyond the normal length of time—may either cause illness: (1) Directly; as shown by bad effects on the digestion or the circulation. This results in a general disturbance of nutrition with consequent impairment of function or disease of individual organs. Or (2) indirectly, in depressing the normal power of resistance of the tissues, and thus favoring the invasion of infectious bacteria. The lowered resisting power increases predisposition to disease. (Page 94.)

Handbuch der Arbeiterwohlfahrt. Bd. II. [*Handbook of the General Welfare of the Working Classes. Vol. II.*] *Edited by* Dr. Otto Dammer. *Arbeiterschutz.* [*Injuries of Occupation.*] Dr. Ascher. *Stuttgart, Enke, 1903.*

Such overworked individuals are not only completely incapable of obeying the laws of hygiene, they are also, on account of their lowered resistance to every form of disease, especially the infectious forms, a standing menace to society, a menace which is also serious in regard to sexual diseases (venereal diseases) both as to their immediate and remote environment. . . .

The diminution of working time is a measure of self-protection demanded by the state. The fear of lessened production under shorter hours has, moreover, never been realized, hence this argument is without force. (Page 79.)

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Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Sec. IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel on tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what arguments can medical and physiological science present in favor of special methods of industrial organization?*] Dr. ZACCARIA TREVES, *University of Turin. Brussels, 1903.*

One of Lagrange's chief services has been in being one of the first to point out that the wastes due to excessive consumption or the poisonous materials due to insufficiently repaired muscular work, accumulate in the body, and that this causes a greater predisposition and a lowered resistance to disease, especially infectious maladies. In especially grave cases this accumulation may manifest its presence by a characteristic symptomatology. (Page 31.)

Il Ramazzini. Giornale Italiano di Medicina Sociale. Anno I. Fasc. 1. [*Italian Journal of Social Medicine. I, 1. January, 1907.*] *Antagonismi igiemico-economici.* [*The Conflict between Hygiene and Industry.*] Prof. ANGELO CELLI, *Director of the Institute of Experimental Hygiene at Rome.*

Fatigue also predisposes to infectious diseases. Typhoid for instance is much more easily taken after excessive and exhausting labor. It has even been proved that the poison of fatigue predisposes to disease individuals who might be able to resist infection under other circumstances. (Pages 36–37.)

Il Ramazzini. Giornale Italiano di Medicina Sociale. Anno I. Fasc. 12. [*Italian Journal of Social Medicine. I. 12. December, 1907.*] *Nuove ricerche e nuove conquiste nel campo della Patologia e dell' Igiene.* [*New Researches and Acquisitions in the Pathology and Hygiene of Labor.*] Dr. G. Y. GIGLIOLI.

The influence of overfatigue in inducing predisposition to disease even in organisms capable of resisting infection under more favorable circumstances has been again demonstrated by Ronzani in some experiments showing the diminution of bactericidal power exhibited by the lungs of overfatigued animals or of those exposed to other deteriorating conditions.

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On the other hand the part which fatigue plays in bringing about morbid local conditions and in rendering the organism more susceptible to the influence of the poisons used in manufacture has not received as much attention as the importance of the subject demands. The fact of such increased susceptibility is confirmed by many clinical observations especially as regards toxic neuroses. (Page 704.)

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Bulletin de l'Inspection du Travail. Fasc. 1–2. Ministère du Commerce, de l'Industrie, des Postes, et des Telegraphes. Travaux originaux des Inspecteurs. [*Bulletin of the Labor Department. Leaflets, 1–2. Original Contributions of the Inspectors.*] *Le Repos Hebdomadaire.* [*The Weekly Rest Day.*] M. DE LAS CASAS. *Paris, Imprimerie Nationale, 1907.*

Physicians and hygienists declare that the man who does not rest sins against his own health; that he is guilty of slow suicide and shortens appreciably the years of life that nature meant him to have. Doctors say, too, that the man who works but does not rest, is more susceptible than others to the epidemic diseases which are prevalent in industrial centres, and they add, finally, that such a man, if he is actually attacked by such maladies, offers less resistance to them and is more likely to succumb. (Page 146.)

Travail et Plaisir. [*Work and Enjoyment.*] CHARLES FÉRÉ, *Doctor of Medicine. Paris, Alcan, 1904.*

Fatigue, no matter how produced, plays an important rôle in the development of numerous diseases by diminishing resistance to infectious or toxic agents. (Page 442.)

(*c*) LIABILITY OF WORKING PEOPLE TO NERVOUS DISEASES

Overfatigue from excessive working hours not only renders overtaxed workers susceptible to general and infectious diseases, it predisposes them effectually to more subtle nervous disorders, especially neurasthenia in its various forms. Nervous exhaustion, considered until recently an ailment of brain workers and the well-to-do solely, has

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been found by physicians and physiologists to be alarmingly prevalent among industrial workers, subject to the strain of overlong hours. Overexertion from excessive work, combined with the strain of continuing at work after fatigue has set in, brings on such nervous derangements, which exhibit among working people exactly the same clinical appearance as among other classes of society.

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Thirteenth Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Sec. IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel on tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what arguments can medical and physiological science present in favor of special methods of industrial organization?*] Dr. ZACCARIA TREVES, *University of Turin.*

¶ Physicians have long insisted that neurasthenia, once supposed to be exclusively characteristic of intellectual overexertion is extending widely among workers whose labor is mechanical and material. (Page 36.)

Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue as a Result of Occupation.*] Dr. ZACCARIA TREVES, *Turin. Berlin, Hirschwald, 1908.*

Does what physicians call "exhaustion" (surmenage) really exist in the working population? This question, which was not thought of in the earliest studies of neurasthenia, since neurasthenic conditions were supposed to be ailments of the liberal professions and those engaged in intense intellectual application exclusively, has to-day been answered by the medical profession in the affirmative; the daily observation of workers in hospital and dispensary has led to this conclusion. Above all what has led us to it is that the observation of well-established morbid conditions, the study of their etiology and course, has disclosed among workers who might easily pass for normal a variety of circumstances favorable to the invasion of these maladies and to general morbidity; circumstances, all of which are ultimately linked with the problem of fatigue.

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From this knowledge have proceeded all the efforts made by hygienists to ameliorate the general conditions of existence in and out of the factory, to plan for insurance, etc. . . . to shorten hours of labor, to limit the work of women and, above all, of children.

Thence have resulted all those ameliorations which, as proved by statistics, have had substantial results for good. To-day, in fact, we possess, in the practical field of industrial enterprise, extensive proofs that it is possible to introduce along with technical improvements a more logical organization of hours and wages, which allows a certain improvement of the physical, moral, economic, and mental conditions of the worker, or, in other words, an increase of his productive capacity, and the output of industry.

The reports which we have heard (Roth and others) here prove conclusively that overstrain resulting from occupation does exist; that it is also entirely possible to combat it: there is, in short, a problem of overwork. (Pages 626–627.) This overstrain which physiologists, psychologists, clinicians, and above all nerve specialists and alienists, encounter so often as to be no longer deceived by it, does not present a well-defined morbid picture; but it is a slow deviation, often obscured by its very slowness, and predisposing to illness of any nature; it is the borderland of illness.

There are physical manifestations of general or localized muscular weakness; signs of incertitude or of awkwardness in rapid and rhythmical movements; insomnia or troubled restless sleep; atony of digestive organs, irregularity of pulse, vertigo, nausea, pain, troubles of motor and vaso-motor reflexes; there are the most capricious manifestations in the psychic realm. . . .

The differences in objective symptoms will depend on the organ that may be especially overtaxed in the overworked individual under consideration, but such differences must not deceive us as to the essence of overstrain, which is always the result of insufficient nutrition—in the earliest phases insufficient only, in the advanced stages abnormal. We must keep this general proposition before our eyes always, in order to understand the phenomenon of overstrain, especially in order to comprehend it in the working class, more particularly in those attached to highly specialized industries. For in these persons one does not observe such extreme evidences of fatigue in the physiological meaning of the word as can be experimentally exhibited in the laboratory, and consequently we shall fail to explain the chronic symptoms of fatigue in them if we do not recall their whole mode of life, as determined by their occupational environment, as well in the mill or factory as out of it. (Pages 627–628.)

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We will endeavor to decide in accordance with the laws of voluntary work, what are the physiological sources of overstrain. Acute as well as chronic fatigue cannot be gauged solely by the output of workers. I agree (with a previous speaker) that one is not struck by signs of overfatigue or exhaustion among workers in shops and factories, and that such workers do not reach such a point that they absolutely cannot control their motions or concentrate their attention—excepting those in certain lines of work which demand very rapid motions. . . . But it must be recalled, from the physiological standpoint, that the production of voluntary work, whether mental or manual, follows a curve essentially different from the curve of organic fatigue. . . . The oscillations of the will (urging on a fatigued workman) varying with the interest which work inspires, have the effect of intensifying application and minimizing the sensation of effort, thus concealing fatigue. I believe that these volitional curves—oscillations of the will—which have to-day a more definite significance than formerly in experimental psychology, constitute in their entirety the complete psychic personality of the individual and the reason for different capacities of production and of resistance. In the exaltation or the depression of this personality, with resultant changes in the organs, and the subjective ills which warn the individual of these organic changes, is found the complete picture of overstrain; that is to say, of work done in a state of exertion where there is a more or less marked and persistent disproportion between the usefulness of the work in itself and in the worker's estimate, on the one hand; and the amount of energy and will power expended on it, on the other hand. When, however, in the industrial field, such a degree of fatigue is reached that the workers can appreciate it by a difference in output, it cannot be concluded that they have the power of instinctive self-protection to guard against the premonitory onset of fatigue; that depends, obviously, on the conditions of the contract of labor. As a physiologist, I believe that even if these fatigued workers produce less, this production, diminished as it is, costs the workers more dear than their previous labor; the more so because a moderate degree of fatigue has the effect, with many persons, of a general stimulus of the nervous factors involved in work. Here we have indeed the crux of the whole question. If the physical cost of the long hours and overstrain which characterize unintelligent industrial organizations were directly and proportionately evident, both in the sensation of fatigue and in the output of the industry individual and collective, the problem of fatigue, as a result of industrial labor, would in my opinion have been solved long ago, instead of being obscured by the illusory profits of long hours and insufficient wages. (Pages 629–630.)

Zeitschrift für pädagogische Psychologie, Pathologie und Hygiene. IV. Der Einfluss des Grossstädtischen Lebens und des Verkehrs auf das Nervensystem. [*The Influence of the Life and Rush of Great Cities on the Nervous System.*] ALBERT MOLL. *Berlin, 1902.* GERMANY

Nervous diseases are not unknown among laborers and all those whose work is with their muscles; indeed, they occur here more frequently than is often supposed. It is to be remembered that the nervous system shares in every act of muscular exertion—muscles cannot act without nerves. As, however, the ordinary day laborer does not make as intensive or as strenuous a demand upon his nervous system as does the brain worker, the more frequent occurrence of nervous diseases among the latter is readily explainable. Ordinary working men are rendered more liable to nervous disorders by being exposed to definite conditions which are harmful to the nervous system, and long hours of work must be placed in this category because, as weariness becomes more pronounced, the nervous effort induced by the will power must be constantly greater in order to overcome or resist fatigue.

Numerous cases of neurasthenia may be observed among the workers in home industries, either in town or country.

Whenever an unremitting home industry is carried on where men, women, and children toil not only all day, but part of the night in close, narrow quarters, . . . there we shall find miserable, anæmic bodies with every symptom of nervous enfeeblement, in the greatest numbers.

In general, many cases come under observation where sleep has been insufficient, or, by nature of the occupation, irregular, as with waiters and railroad men. And also, as Möbius has correctly pointed out and emphasized, those workers are especially liable to nervous disease whose tasks require an excessive precision, excessive attention to fine details, this making exhausting demands upon the nervous centres. (Page 127.)

Über die Ursachen der Neurasthenie und Hysterie bei Arbeitern. [*The Causes of Neurasthenia and Hysteria among Working People.*] PAUL SCHÖNHALS. *A Study of 200 Cases in the Workingman's Sanitarium at Schönow Zehlendorf. Berlin, 1906.*

The opinion that nervous affections resulting from mental overstrain are confined to the well-to-do classes has long been disproved by practical experience. It was however, for a long time, not easy to bring ample proofs that the lower working classes shared to a considerable extent in the distribution of nervous diseases, because such data lay solely in the

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hands of private practitioners or hospitals. The State compulsory insurance has now given the needed opportunity. (Pages 5–6.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. XXII. 1897. [*Official Information from Reports of the (German) Factory Inspectors.*] *Berlin, Bruer, 1898.*

Hours of work in the industrial establishments of Reuss i. L. are, on an average, 11½. Nervous diseases and lung diseases are stated to be the results of occupation. The same diseases have been observed by the officers of the sickness insurance department in Chemnitz to be the consequences of the long hours (amounting to 13) of the mill hands; in this connection a workman said that the prolonged hours of work were senseless, when one considered the inevitable destruction of strength. The establishment of a maximum day was a mandate of hygiene. (Page 242.)

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Il Ramazzini. Giornale Italiano di Medicina Sociale. Anno I–Fasc. 1. [*Italian Journal of Social Medicine, I. 1. January, 1907.*] *Antagonismi igienico-economici.* [*The Conflict between Hygiene and Industry.*] Prof. ANGELO CELLI, *Member of Parliament, Director of the Institute of Experimental Hygiene at Rome.*

In normal work, an equal balance between assimilation and elimination is maintained in the muscular system. When this limit is passed fatigue results. Fatigue develops an actual and active poison, and its influence is manifest not only in the muscular system, but in the respiratory, circulatory and nervous system. Excessive labor may lead to neurasthenia. It is to be noted that the result may follow excessive muscular labor, as well as intellectual effort. The nervous system is more slowly influenced by fatigue, which increases the danger of neurasthenia. In many cases indeed the effects harmful to the muscular system are combined with those affecting the nervous system when the gravest results follow. Many trades lead to muscular and nervous exhaustion, which is in fact one of the most serious evils of our civilization. (Page 36.)

Il Ramazzini. Giornale Italiano di Medicina Sociale. Anno I–Fasc. 12. [*Italian Journal of Social Medicine, I–12, December, 1907.*] *Nuovo ricerche e nuove conquiste nel campo della Patologia e dell' Igiene.* [*New Researches and Acquisitions in the Pathology and Hygiene of Labor.*] Dr. G. Y. GIGLIOLI.

In a critical study of the first International Congress on the Diseases of Labor, I have described the evolution of the medical study of health

conditions as they concern the wage-earning classes. I attempted to show how the first vague Ramazzinian conception of trade diseases has developed into the wider and more definite theory of the pathology of labor. This most important division of social medicine has developed in a very short time into a well organized and distinct study. It is not, nor does it tend to become, what is popularly called a "specialty," but it has the dignity of being considered the most modern branch of medical study, and has its ardent expounders, clinics, laboratories, and students. ITALY

It is a very modern development, stimulated by the most recent scientific researches and acquisitions in hygiene, economics and politics. Through it, new methods of study have developed, by which not only the typical "diseases of labor," but all the factors which bear upon the health conditions of wage earners are estimated and studied clinically and experimentally.

. . . Modern pathology thus unites studies of fatigue and nutrition with the most recent theories of predisposition to infection induced in formerly healthy organisms. It reconciles the very latest theories of neuro-pathology with the latest ideas about the neurasthenics of labor. While it does not attempt to invade the other branches of medicine, it does draw from them facts and data with which to reinforce its own postulates on social economic matters. This most modern development may appear to some too vague and general, to others too restricted, but it is certainly gaining ground and growing continually more complete and definite.

There have been many valuable contributions to the pathology and hygiene of labor of an experimental, clinical, and legislative nature in the last few months. (Pages 699–700.)

(*d*) Nervous Diseases and Statistics of Foreign Sickness Insurance Societies

The close causal relation between overfatigue and nervous diseases is illustrated by the statistics of foreign sickness insurance societies. Close medical observation of working people receiving state treatment or sick pay in Germany has shown that nervous diseases have increased alarmingly among them during the last decade. Medical study of individuals shows further that among the causes of nervous breakdown the most effective is precisely the

ITALY strain of industrial occupations, characterized, as they are, by speed and monotony of repetition. The prevalence of neurasthenia and nervous disorders is so widespread that they are designated by physicians abroad as modern occupation diseases. Curtailment of excessive working hours is declared a physiological necessity.

Since speed and specialization are admittedly greater in American industry than in any other, it is certain that medical observation of working people in this country must disclose an even greater prevalence of nervous exhaustion.

GERMANY *Über die Wachsende Nervosität Unserer Zeit.* [*The Increase of Nervousness in our Times.*] Dr. WILHELM ERB, *Heidelberg University. Heidelberg, Koester, 1894.*

In all grades of society . . . among the poor and wretched, also, neurasthenia is clearly a more widespread evil than formerly. It is to be found in shocking frequency not only among educated men, officials . . . railroad and telegraph employers . . . but also among factory workers, sewing women, etc. (Page 15.)

It only needs a superficial survey to teach us that everything which overstrains, fatigues, and exhausts the nervous system is capable of inducing that condition which I have characterized as a pathological fixation of fatigue,—as irritable weakness and exhaustibility. (Page 15.)

Deutsche Medizinische Wochenschrift, Nr. 21, 25. Mai, 1905. Die Neurasthenie in Arbeiterkreisen. [*Neurasthenia in the Working Classes.*] Dr. P. LEUBUSCHER *and* Dr. W. BIBROWICZ, *formerly of the Beelitz Sanitarium of the State Old Age and Invalidity Department of Berlin. Berlin, 1905.*

The increase of diseases of the nervous system among working people in the last decade is a fact that is now firmly established by extensive and carefully conducted statistical inquiry. This is most clearly evident in respect to the psychoses; but there is also no doubt, in the minds of the most informed authors, that neurasthenia—which, though less menacing than insanity to the efficiency and labor capacity of the worker is still sufficiently serious in this respect—is also steadily increasing in frequency and in severity. (Page 820.)

Whatever different causes of neurasthenia may be brought forward by

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different authors since Beard depicted its general features, there is one point on which all are agreed; namely, that the modern organization of industry with all its factors and sequels is a most prolific source of neurasthenia. Though, for some years, not only the laity, but also the chief medical experts on neurasthenia, as Löwenfeld and Binswanger, overlooked the working classes in relation to this disease, this attitude is now radically changed. On all sides, in the clinics and physicians' offices, and by the managers of the large insurance funds, proofs of the enormous increase of neurasthenia as a cause of inability to work are being presented. There are two reasons for this change: 1. The observation of chronic diseases of working people has become vastly more far-reaching and exact. 2. Altered conditions in the labor world have created an unusual liability to acquired nervous troubles. We are inclined to think that both of these factors contribute, though not in the same proportion, to the explanation of the fact.

It is certain that the question of diseases of working people has come more prominently to the front than was the case in the past. And employers are learning that the health and strength of the people is an advantage to them as well. (Page 821.)

. . . How frequently delay in seeking medical advice may have formerly happened is of course not possible to estimate. Frequently enough, without doubt, and yet we regard our second explanation of increased neurasthenia, the altered conditions of life and labor, as of much greater weight. Work has become very different. Piece work has indeed obtained larger wages, but has developed an impetus and speed and intensity of effort that used to be unknown, and this invariably crushes the weaker workers, those for whom all work is a heavier burden than for the strong. Continuous anxiety is felt by these lest they fall behind. Then sometimes voluntarily, sometimes compulsorily, overtime is undertaken, and so it turns out that the working hours, instead of being comparatively shorter than the usual day, are really much longer, and by reason of the irregularity far more exhausting. (Page 821.)

Thorough and ample observation bearing on the forms and etiology of neurasthenia among working people has been made possible only by the creation of the great Sanitaria of the State Insurance Department. When the first one, that at Gütergotz, was built in 1894 for about 100 chronic male cases, the applications were so numerous that the large sanitorium for 220 men and 110 women at Beelitz was next erected.

Of the patients treated in these establishments on an average, 26% have been neurasthenics, and the percentage for individual years has risen from 18% in 1897 to about 40% in the past few years. (Page 821.)

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CLASSIFICATIONS ACCORDING TO OCCUPATION. AMONG 1564 CASES

Typesetters 246 = 15.75% of the cases
Carpenters 148 = 9.45% " " "
Locksmiths 77 = 5.00% " " "
Mechanics 30 = 1.09% " " "

(Page 821.)

The whole number of typesetters insured is about 1% of all insured persons; the whole number of carpenters, about 5%. When this proportion is considered, the percentage of neurasthenic cases among typesetters —15.75% of all neurasthenic cases—is most striking, while that of the carpenters,—9.45%,—though high, is not quite so disproportionate. Oppenheim also points out the frequency of neurasthenia among newspaper typesetters. (Page 822.)

We wish to suggest that a key to explain the great increase of neurasthenia among workers generally in our great cities may be found in the unusually large number of cases in the above-mentioned trades. We have here to do with classes of workmen who stand perhaps highest among their associates.

. . . The typesetter must follow with strained attentiveness an occupation of indescribable monotony, for the speed to which he is forced destroys all meaning of what he sets.

It is the same with the work of many mechanics, who never see a completed piece of work go out of their hands, who only make a part of some whole. But here we have to do with the best of our modern city workingmen and their growing claims, not only for material but also for spiritual things. What to the common workman is only work, should be a calling to every true craftsman, and this can no longer be the case. (Page 822.)

He who is not strong and enjoying the vigor of health must under these conditions become neurasthenic. When workingmen have an occupation which brings with it a certain pleasure there is, according to our observations, little trace of neurasthenia to be found. Such is, for instance, the case with painters, who in spite of the distinctly unfavorable circumstance of liability to lead poisoning are seldom neurotic.

The influence of uncongenial work is naturally intensified by cares, illness—troubles to which the worker and his family are constantly exposed—and yet, contrary to what one might expect, the latter causes alone have been, in our experience, insignificant in accounting for neurasthenia. But almost always in answer to the question, "What caused your illness?" comes the reply, "The hard work." (Page 822.)

We must here state plainly that as to clinical appearances we have found nothing to differentiate the neurasthenic workingman from the

neurasthenic patient of any other social class. The symptoms and conditions are the same for both. (Page 824.) GERMANY

The most important curative factors for our city wage-earners, as well as for the patients of the middle and higher classes, are, removal from the monotony of their work, often also from painful family conditions, the opportunity to enjoy from time to time the pleasures of a fairly comfortable existence, freedom, air, and light. (Page 824.)

The dangers threatening the health and well-being of the nation from the increase in nervous diseases, though not recognized by all, have yet been emphasized by many experts, in recent years.

Pelman, Möbius, Grohmann, Laehr, Determann, Cramer, and Windscheid have energetically promoted the combating of neurasthenia among workingmen, and the influence of the State Insurance Department and the large private benefit societies tends to agitate the question more and more generally. (Page 825.)

Verwaltungsbericht der Landes-Versicherungsanstalt Berlin, für das Jahr 1906. [*Report of the State Invalidity and Old Age Insurance Department for Berlin, for 1906.*] *Report of the Physician-in-Chief of the Beelitz Sanatorium.* (*Tuberculosis not included.*)

In the course of the year, 1655 men and 824 women were treated. . . .

By far the largest number of the patients were nervous cases, and those suffering from gouty diathesis and articular rheumatism, cardiac and stomach diseases also took an important place. Of the cardiac cases, aside from valvular troubles, most suffered from myocarditis, hypertrophy of the heart, weakness of heart, dilatation or a complication of the last two disorders, that naturally presented a markedly severe type of illness. . . .

Forty per cent showed simple, idiopathic hypertrophies, 35 per cent were neuroses of the heart, 10 per cent dilatations, and 10 per cent primary weakness of the heart.

Along with the major cardiac neuroses there is also seen, among the working people of Berlin, as a result of overwork, an extremely prevalent neurasthenia, which is more or less a concomitant of heart disease; the features of this latter reveal the frequency of maladies to which special trades, such as typesetters (compositors) are specially predisposed. . . . (Page 61.)

Of the 1450 (1410) men patients who were discharged, 748 (684) or 52 (49) per cent—over one-half—were nervous cases, whose breakdown was in the majority of cases directly due to their overworking in their

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various occupations; . . . Of the women discharged one-fourth were anæmic or chlorotic, or, in exact figures, 176 (194) in 734 (682) patients. Nervous exhaustion and nervous diseases were even more prominent, namely, 299 (261), or over one-third of all the female patients belonged in this class. (Page 67.)

Ibid. For the year 1909.

During the past year the patients discharged from the Beelitz Sanitarium numbered, men 1815, women 803. Of this whole number 1707 men (94 per cent) and 762 women (95 per cent) were restored to earning capacity.

As was the case last year, nervous ailments predominated among the men, the most frequent form of nervous illness being neurasthenia.

Of the 1815 male patients 1206, in round numbers almost 70 per cent, were nervous cases, and, while in some the exciting cause of breakdown might be variously explained, in by far the largest proportion it arose from the overstrain of their daily labor.

Of the female cases more than one-seventh, or 128 of 803 were anæmic and chlorotic, and one-half of all the women suffered from nerve strain, whatever other complications were present. (Page 112.)

The seriousness of nervous disorders to wage-earners may be seen in the following figures showing the entire number of days lost from work by sickness. The total number, which is here reproduced, includes all the time from when the patients first stopped work, and the time spent in sanitarium. To emphasize the figures, a few only of the other most serious disease groups are shown in comparison.*

Disease Groups	Whole Number of Working Days Lost from Time of Cessation of Work to Time of Discharge from Sanitarium	
	Men	*Women*
Infections	60	373
Poisonings	1,259	..
Malnutrition	2,773	7,861
Skin, muscles, joints, etc.	5,177	935
Digestive troubles	3,425	2,057
Nervous disorders	44,965	25,075

*The whole table is not reproduced. (Page 112.)

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Zeitschrift für Klinische Medizin. Bd. 60. 1906. Aus dem Sanatorium der Landes-Versicherungsanstalt Berlin in Beelitz. Über Herzerkrankungen in der Berliner Arbeiterbevölkerung. [*Heart Disease among the Working People of Berlin.*] Dr. LÜBENAU, *Assistant Physician in the Beelitz Sanatorium of the Old Age and Invalidity Insurance Department of Berlin. Berlin, 1906.*

. . . Of the cardiac cases here treated, the number of neuroses of the heart and of simple, idiopathic hypertrophies preponderated greatly, being 35 per cent for the former, and 40 per cent for the latter. Dilatations of the heart followed, some of them primary, a few resulting from cardiac hypertrophy, other cases of primary weakness of the heart (Debilitas cordis) with 10 per cent.

The essential purpose of this work is to show how cardiac diseases develop in working people as a result of injurious conditions of labor, and therefore, beside hypertrophies and dilatations, only those diseases are considered in whose origin occupational and industrial dangers play a more or less leading part, and which, therefore, according to this origin, may be properly designated as genuine working-class diseases.

Dilatations resulting from the drink habit are excluded. (Pages 134–135.)

In coming to the class of cardiac neuroses it is to be remarked that nervous affections of the heart among Berlin workmen are very common, as may be inferred from the extraordinary prevalence of neurasthenia. (Page 136.)

It has been found that when these workers are removed from the enormous competition and rush of the city, overstrained working energy soon fails. This continuous overwork is the cause of the general and often grave neurasthenia, as has been recently shown in an instructive article. (Leubuscher und Bibrowicz, "Die Neurasthenie in Arbeiterkreisen.") (Page 137.)

In most of these cases of simple neurasthenia, nervous affections of the heart are the rule. There is the sensation of palpitations, pain in the region of the heart, a feeling of great anxiety, and shortness of breath after exertion. Such diseases have serious importance for workers on account of cardiac complication. (Page 137.)

The cases described above are limited to those in which the heart symptoms of nervous origin present the dominating features and which, therefore, may be regarded purely as cases of cardiac neuroses.

The causative factors of such maladies, as in general neurasthenia, may be admittedly of manifold kinds; yet it is worthy of especial mention,

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in considering cases here reported, that the cause of sickness was repeatedly ascribed to the definitely injurious influences of the patients' work, to physical or mental overstrain or anxiety of one kind or another in connection with occupation. (Page 137.)

The tendency of cases of cardiac neuroses to relapse must be pointed out: Certain of our cases show this tendency very interestingly. With some, after treatment in the sanatorium, light employment was permitted, and by the strict avoidance of physical overstrain the disease then followed a favorable course. In other cases invalidism was declared, and the invalidity pension secured. These, also, showed a gratifying improvement as the result of relief from exertion and the saving of strength.

Mental as well as physical overstrain frequently results in cardiac neuroses. The patients of this class are recruited from salesclerks, bookkeepers, secretaries, machinists, and telephone clerks.

Printers (typesetters) especially are numerously represented in this category, for the acuter forms of neurasthenia in general are extraordinarily widespread among them. The night work necessary in this occupation, and the ever more exacting piecework, exhibit a steady tendency to strain the nerve-energy of the individual to its very uttermost limit. (Page 139.)

Über die Ursachen der Neurasthenie und Hysterie bei Arbeitern. [*The Causes of Neurasthenia and Hysteria among Working People.*] PAUL SCHÖNHALS. *Berlin, 1906. A Study of 200 Cases in the Workingman's Sanitarium at Schönow Zehlendorf.*

. . . Another group of injurious factors is to be found in the work itself. In all, 45 cases, or almost 22.5 per cent, gave physical overstrain from work as the prime cause of illness, and here the piecework system seemed to play an especially injurious part. In 15 cases I concluded that piecework was the original cause of the breakdown, and in 10 of these cases I could discover no other contributory factor. Four of the others had some slight hereditary predisposition, and the overstrain here acted as the excitant of disease. The fifth had returned to piecework after several brief illnesses, until he finally became permanently overstrained.

Thus, to repeat, 5 per cent of all the cases of neurasthenia were traceable entirely to the overstrain of piecework, with no other discoverable cause for illness.

This is a high figure, but whoever has been inside of a factory and has observed the prodigious rapidity of the pace of work there, and the foresight and attention which each worker must exercise, will be able to esti-

mate correctly the wearing nature of piecework. It is not alone the physical strain, but in a high degree the psychic factor that must be taken into consideration. It is the nervous tension and strain that is felt by the workers themselves to be the hardest feature of their work. Few can long endure such work. One patient had done piecework from his eighteenth to the forty-sixth year. He was an exception. Most workers can only keep it up for four to five years, then seek something easier.

Even night work is not quite as harmful. In eight cases I found it (night work) as one cause, but only three cases where night work was the exclusive cause of disease. In the other five, it was, it is true, the chief cause, yet other slightly predisposing conditions were also present. (Pages 14–15.)

Among twenty-two cases caused by unfavorable conditions of work, fourteen showed that overstrain in work, especially where overtime was required, was chiefly responsible for the breakdown, while other less prominent factors had also had some injurious influence, and had helped in the result. (Page 16.)

We find then three specially dangerous factors in the life of the worker: Trauma (accident), Alcohol, and Overstrain. Other dangers, such as ordinary illness, etc., threaten all classes alike.

What is to be done? The State is making provision for accident: a campaign is being waged against alcohol: there remains the question of overstrain to be dealt with. (Pages 22–23.)

It is now generally recognized that the combination of physical and mental overstrain is especially dangerous for the nervous system: Artisans will therefore show a higher percentage of nervous disease than laborers, and the skilled artisan will suffer more than the casual worker or man of all trades whose work is largely mechanical. In fact, my inquiries showed that 57 per cent of the cases were skilled artisans, to 43 per cent of the others. (Accident cases are not included.)

The difference is even sharper when we compare the liability to nervous diseases among artisans, and the more skilled workers with such liability among common laborers. The relation is then 74.0 : 26.0, as seen by the following table:

1. Artisans, highly skilled		57.0%	
2. General Workers 43%	skilled	17.0%	74.0%
	unskilled	26.0%	

(Page 24.)

In the endeavor to find out what employment was most injurious I distinguished between factory work and ordinary business employment;

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further, between public transportation, and ordinary day labor. I then found that of the artisans, 21.0 per cent of the cases of illness were in small businesses, to 36 per cent in factories. (Page 25.)

Of the general workers, again, 18 per cent were factory workers, while transportation showed 7.0 per cent, and day laboring work 6.0 per cent.

These last figures are by many writers found to be higher, but the differences may be accounted for by the localities where their observations are made. (Page 25.)

It seems indubitable that factory work considerably outweighs other occupations in the sense that it provides the greatest number of factors tending to produce the neuroses of work in the industrial populations, and I am compelled to conclude that modern industry, continually developing as it is on more and more colossal lines, constitutes a dangerous and potent cause for a continuous increase of neurasthenia and hysteria. (Page 26.)

Fourteenth International Congress of Hygiene and Demography. Berlin, September, 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue resulting from Occupation.*] Dr. EMIL ROTH. *Berlin, Hirschwald, 1908.*

Beside the intensity of work and other factors, . . . there is still another factor to be considered, whose importance is universally underestimated; that is the psychic factor. Mosso, in his investigations of the law of fatigue has shown ergographically the influence of psychic weariness on muscular strength, by demonstrating that whenever there is fatigue of the psychic centres there is always a resultant corresponding condition of the motor centres. In proportion as physical work is, at the same time, mentally fatiguing, the greater the attentiveness that it requires, so much sooner does fatigue appear.

This is the case in all occupations which are linked with special dangers, and where especial demands are made upon the responsibility of the worker, or where an extreme and unremitting attentiveness is required. In this latter respect shop girls must again be cited, for as a result of the unfailing attention and readiness demanded of them, they often fall a prey to chronic fatigue, and this the more readily accordingly as they were, to begin with, unsuited for their duties.

The psychic factor is furthermore of decisive importance for the working capacity as such. Even the skilled workman does not work as evenly as the machine, but his capacity displays certain regular, recurrent variations due to the psychic factor. (Page 611.)

The researches of Pieraccini into the curve of work showed that, with

the calling of a muscle or nerve into activity, the extent and certainty of its functioning first gradually increased, and in the second period of work was lowered. The second and third hours displayed, with manual workers (handworkers), the highest point of achievement, which was not exceeded through the rest of the whole day.

With this the results of a large steel and rolling mill agree, as it was there shown that of the average output of 40 *t*, 23 *t* belonged to the morning, and 17 to the rest of the day.

The psychic factor is also important in another respect. With the progressive division of labor, work has become more and more mechanical. . . . A definite share of overfatigue and its sequels, especially neurasthenia, must be ascribed to this monotony; to the absence of spontaneity or joy in work. How alarming the increase of anæmia and neurasthenia among working people has been in the past ten years is shown by the records of the sick benefit funds, the polyclinics, and the hospitals. Many medical and scientific authorities have emphasized the increase of neurasthenia in the working classes. The ample materials of the Berlin State Insurance Sanitarium at Beelitz have more particularly served to prove the steady increase of neurasthenia,—actually from 18 per cent in 1897, to 40 per cent in 1904. Similar figures are shown by the sanitarium at Zehlendorf, where the highest percentage of neurotic patients were handworkers and skilled workers, with whom the combination of physical and mental strain reacted destructively on the nervous system. . . . (Pages 613–614.)

But that monotony is also of importance in so far as it nullifies pleasure in work, thereby favoring the onset of fatigue, must also be admitted from a part of the statistics. So, according to a factory inspector, the effect of certain light work with corset steels, admitting of no break for several hours, was distinctly fatiguing; the remedy was a periodical change of work for the employees in question. (Page 615.)

Of greater importance is the excessive overstrain of piecework, which indeed pays better, but at the cost of a speed and intensity of work which was formerly unknown. That these injurious effects first assail the weaker part of the working population is self-evident. My own observations, especially in textile mills, confirmed the frequency of anæmia and neurasthenia, especially among young women. (Page 615.)

To estimate more correctly the influence of kinds of work, we may observe the results noted as to pulse and respiration in a large electric works. Here, in no case was heightened pulse or respiration observed at the end of work. The difference between this and textile factory work is that in the latter the worker is to a great extent dependent on the machine.

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and must keep up with its speed, while in the electric establishment the workers are, as a rule, dependent on the machinery only to an extent which they determine for themselves. (Page 617.)

As the textile workers are dependent, at the mercy of the machine, so the clerks in the big stores are at the mercy of the public, and it is this unremitting attention, coming and going, and nerve strain that explain the high percentage of anæmia that is continually found among shop girls in these places. (Page 617.)

In a sanitarium where the members of the sick insurance included shop girls, machine sewing and dressmaking women and maids in hotels and public houses, among 145 who were chiefly suffering from anæmia, chlorosis, or neurasthenia, 110 were to be regarded as overworked.

Of the 145 cases 58, not including home workers, had a sedentary occupation; 44 of these were overworked; 87 had work involving a standing position; 66 of these were overworked. (Page 618.)

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Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. III, Sec. VIII. Berufs Morbidität und Mortalität. [*The Morbidity and Mortality of Occupations.*] ALFRED R. VON LINDHEIM, *Vienna. Berlin, 1908.*

Sources of information: 1897–01 inclusive. The Vienna District Sickness Insurance Societies; General Workingmen's Insurance and Relief Society; Electric Street Railways Insurance Society; eleven Steam Railways Insurance Funds.

I have endeavored to elucidate the question of how far the increasing nervousness of modern life is connected with occupation. The question is, indeed, not a new one. (Page 1293.)

I selected two occupations, railroading and electric works. . . . The number investigated reached about 98,480 members of the sick benefit funds. . . . (Summary. The number of these investigated, 98,480 in the two modern industries, railroading and electricity—including in the latter only those whose work was in some way related to the electric current—was compared with about 388,000 members of other occupations. Relation of former to latter, 98,480; 388,000—about 1 : 5.) . . . It was evident that the respiratory organs of those engaged in the railroad service were much less endangered than those of the industrial workers in more sedentary occupations in Vienna.

From various tables relating to the two occupations under examination it may be asserted that these two modern callings show a persistently greater contingent of nervous diseases than do other occupations. To

this is to be added that nervous diseases must be recognized as occupation diseases in all great modern industries. (Page 1297.) AUSTRIA

These disorders may with perfect right be truly designated as modern occupation diseases. (Page 1299.)

. . . Nervous diseases are to be recognized as most characteristic phenomena of our modern industries. (Page 1299.)

(*e*) Ages of Incidence

The need of protecting health by restricting working hours is often supposed to be limited to children and young girls. The greater liability of adults to neurasthenia and nervous diseases (being highest between the ages of twenty and forty-five years) shows that, as regards these diseases, adults are even more susceptible than young girls. Excessive working hours, therefore, which engender overfatigue and nervous exhaustion should be as carefully limited for mature women as for the young.

Die Pathologie und Therapie der Neurasthenie. [*Pathology and Therapeutics of Neurasthenia.*] Dr. Otto Binswanger, *Professor of Psychiatry, and Director of the Psychiatric Hospital, Jena. Jena, Fischer, 1896.* GERMANY

Finally, in considering the importance of age, it is to be said that certain stages of the physical and mental development are uncommonly perilous to the nervous system in individuals with a hereditary handicap and constitutional predisposition to nervous disorders. Even healthy persons are more liable to neurasthenic ills in certain periods of life than in others. Still more important than the time of puberty, when the physical growth has increased claims made upon it, is the age between 20 and 30, for then the physical and mental strength is put forth most strenuously and incessantly in the struggle for a livelihood. Yet even in the period of mature manhood, 30 to 40, neurasthenia frequently occurs. . . .

Hosslin's statistics showed that among 828 neurasthenias 83 per cent occurred between the ages of 20 to 50 years.

My own experience is, that of 131 cases, in whom I was able to locate exactly the *starting point* of the disease as to the time it began, the relation to age was as follows:

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Began in the first decade of life— 4 cases
" " " second " " " —46 "
" " " third " " " —43 "
" " " fourth " " " —32 "
" " " fifth " " " — 3 "
" " " sixth " " " — 2 "
" " " seventh " " " — 1 " (Page 46.)

Deutsche Medizinische Wochenschrift. Nr. 21; 25. Mai, 1905. Die Neurasthenie in Arbeiterkreisen. [*Neurasthenia in the Working Classes.*] Dr. P. LEUBUSCHER *and* W. BIBROWICZ. *Formerly of the Beelitz Sanitarium of the State Old Age and Invalidity Department of Berlin. Berlin, 1905.*

Our reasons for the age groupings in our tables are as follows: Age up to 20 years is, for various reasons, unimportant in the consideration of neurasthenia, . . . We therefore end one period here. The next five years we regard as the period of completed growth. The time between 26 and 35 years seems to be the most serious epoch,—that of founding and supporting the family, of care and responsibility, of intensive work. Almost equally important is the period from 36th to 45th year. We chose the latter as a limit because after this the organic changes of age, arteriosclerosis, emphysema, etc., begin to make themselves evident. Following this grouping we find the following figures:

I. (16–20 years) 3.8% of the Neurasthenics
II. (21–25 ") 11.0% " " "
III. (26–35 ") 40.0% " " "
IV. (36–45 ") 31.0% " " "
V. (over 45 ") 14.0% " " " (Page 822.)

In these statistics we have not shown the period of the onset of neurasthenia, but that stage where the gradually developing symptoms had reached a degree that seriously threatened the working capacity, a criterion that is justified by practical considerations.

Our results correspond closely with those of Löwenfeld, who found most cases fell between the years of 20 and 45. Krafft Ebbing's figures at Aethaus were also similar. (Page 822.)

Verwaltungsbericht der Landes-Versicherungsanstalt Berlin, für das Jahr 1906. [*Report of the State Invalidity and Old Age Insurance Department for Berlin, for 1906.*] *Report of the Physician in Chief of the Beelitz Sanatorium.* (*Tuberculosis not included.*) *Berlin, Loewenthal, 1907.*

As regards age most of the male patients, 59 per cent, were in the prime of manhood—between 30 to 50 years, whilst patients under 20 or over 60 were only two per cent each. (Page 72.)

The women, on the other hand, showed that the largest numbers of patients came from the age-group between 16 and 19 years, and between 20 and 29, . . . partly explainable by the withdrawal of women after marriage from industrial occupations. (Page 72.) GERMANY

(*f*) Nervous Disease and Heredity

The limitation of excessive working hours for women is required for the preservation of the race because nervous debility generated by overfatigue is transmissible, and causes nervous weakness and predisposition to nervous disease to a marked degree in the second generation.

Die Pathologie u. Therapie der Neurasthenie. [*Pathology and Therapeutics of Neurasthenia.*] Dr. Otto Binswanger, *Prof. of Psychiatry and Director of the Psychiatric Hospital, Jena. Jena, Fischer, 1896.*

(Having studied the subject of heredity) what does this inherited predisposition signify? What influence will it have upon the future development of the individual? As we have seen that the neuropathic predisposition is exhibited by a general diminution of the efficiency of the nervous system as the result of, apparently, insignificant hindrances to development, its importance from the clinical standpoint is not hard to state.

Such detrimental factors as those to which human society as a whole or individual members of individual occupations or of social classes are all equally exposed, will have the effect of producing insanity and nervous diseases with distinctly greater frequency in individuals of neuropathic predisposition. (Page 37.)

Grenzfragen des Nerven und Seelenlebens, Bd. IV. [*Borderland Problems of Nervous and Psychic Life.*] *Edited by* Loewenfeld *and* Kurella. *Berufswahl und Nervenleben.* [*The Choice of Occupation and Nerve Life.*] Dr. August Hoffman. *Wiesbaden, Bergmann, 1904.*

It is universally agreed by physicians that diseases of the nervous system have become inordinately more frequent in the last few decades than in an earlier period. Even granting a more faulty diagnosis of nervous disorders in former years, and admitting that the attention of physicians was less drawn to such disorders then than now, it is nevertheless

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certain that insanity and nervous diseases did not formerly take the frightfully prominent place that they take to-day. . . .

The causes are varied. In the foreground stands the rush of modern civilization, and, when one generation has become permeated with nervous affections, the next one suffers these ills, through inheritance, in doubly distilled strength. (Page 5.)

Deutsche Medizinische Wochenschrift. Nr. 21. 25. Mai, 1905. Die Neurasthenie in Arbeiterkreisen. [*Neurasthenia in the Working Classes.*] Dr. P. LEUBUSCHER and W. BIBROWICZ, *formerly of the Beelitz Sanitarium of State Old Age and Invalidity Department, Berlin.*

Neurotic diseases, if not counteracted, are often the first step in the direction of organic disease or severe mental disorders.

But our generation is not alone in being menaced with the grave dangers of these diseases. A terrible question is involved, that concerns the future —the question of heredity. We shall not attempt here to answer the query as to the inheritance of acquired characteristics. . . . But one thing is undeniable; the influence exerted upon the sensitive and impressionable natures of children by neurotic parents is inexpressibly unfavorable. (Page 825.)

Verwaltungsbericht der Landes-Versicherungsanstalt Berlin, für das Jahr 1906. [*Report of the State Invalidity and Old Age Insurance Department for Berlin, for the year 1906.*] *Report of the Physician in Chief of the Beelitz Sanitarium. (Tuberculosis not included.) Berlin, Loewenthal, 1907.*

A considerable proportion of the cases, of both sexes, and especially those belonging in the category of nervous patients, were handicapped by inherited disease on one or on both sides of their parentage. Such cases usually exhibited the gravest symptoms, ran the most unsatisfactory course, and showed a uniform tendency to relapse. The inherited taint was evidenced by epilepsy, insanity, love of drink, general nervousness or migraine. (Page 70.)

According to our tables as shown, out of 5538 (4665) men, there were 1859 (1596) or over one-third (34 per cent) who had inherited taints, and of 1128 (816) women there were 729 (565), or 65 (69) per cent with inherited taints.

Of those suffering from diseases of the lungs, 14–15 per cent had inherited the diathesis; of the nervous patients, 20–29 per cent; of those

suffering from cancer, ulcers, and abscesses, 5–7 per cent, and of gouty-rheumatic cases, 6–11 per cent. (Page 71.) GERMANY

Über die Ursachen der Neurasthenie und Hysterie bei Arbeitern. [*The Causes of Neurasthenia and Hysteria among Working People.*] PAUL SCHÖNHALS. *A Study of 200 Cases in the Workingman's Sanitarium at Schönow Zehlendorf. Berlin, 1906.*

Predisposition plays an important part in all internal diseases, but is specially menacing in the case of nervous diseases. Those persons in whose families nervous diseases have occurred are more inclined to similar disorders than those who are not hereditarily so burdened.

Such predisposition may be variously described—Binswanger defines it as "a molecular inferiority of the nervous system." Inherited weakness being present, some external exciting factor is usually required to precipitate actual disease. (Page 7.)

It is clear that the more pronounced the heredity, the more easily will an insignificant cause be capable of bringing on illness; and *vice versa*, in a person of better heredity, external influences must be more intense and harmful to cause illness. (Page 8.)

Such hereditary handicap I found beyond question in 9.5 per cent of 200 cases in the Workingman's Sanatorium at Schönow Zehlendorf. This figure is without a doubt too low, but the difficulty of getting family histories from these patients is great. Binswanger gives 49 per cent of men and 35.5 of women as hereditarily predisposed. Binswanger's figures are not confined to working people. Leubuscher and Bibrowicz state it at 21.5 per cent. (Page 8.)

(*g*) NERVOUS DISEASES AND OVERSTIMULATION

The onset of nervous exhaustion is often unperceived. A special danger to health arises when, after excessive work, this form of overfatigue shows itself in unnatural stimulation, which conceals fatigue and creates a false exhilaration. Only after health is seriously threatened, does the overstrain become apparent, overstimulation being succeeded by reaction and exhaustion.

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Thirteenth Congress of Hygiene and Demography. Brussels, Sept. 1903. Vol. V, Sec. IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel on tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what arguments can medical and physiological science present in favor of special methods of industrial organization?*] Dr. ZACCARIA TREVES. *University of Turin.*

Lagrange observes that the intensity and rapidity of modern industry are attained rather by making excessive drains on nervous force than by the use of muscular power. "There results a special form of fatigue" (says Lagrange), "not that kind which inclines us frankly to rest,—which gives a sensation of well-being or content after work well and thoroughly done, with sufficient time to do it in, but a species of exhaustion accompanied by an abnormal nervous irritability,—an enervation—perhaps appearing in the form of depression, perhaps as excitation and impressionability."

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Die Pathologie und Therapie der Neurasthenie. [*Pathology and Therapeutics of Neurasthenia.*] Dr. OTTO BINSWANGER, *Prof. of Psychiatry and Director of the Psychiatric Hospital at Jena. Jena, Fischer, 1896.*

Simple fatigue is the natural consequence of every considerable expenditure of energy. . . . If this simple weariness is intensified beyond a certain limit . . . as in climbing mountains, a condition of overstimulation occurs.

One is temporarily capable, apparently, of a still more considerable exertion, the sensation of fatigue disappears, the general flagging gives way to an unnatural elasticity of movement, so that one pursues his aim with accelerated speed. As soon, however, as the wished-for goal is reached, the artificial tension vanishes, the unstrung condition asserts itself. In this state, it is often impossible to sleep, for the overfatigue is combined with a peculiar unnatural overstimulation of the senses. . . . But with healthy individuals, such symptoms also disappear after a short time (1 to 2 hours) and deep sleep finally banishes all trace of fatigue. (Page 20.)

Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. III, Sec. VIII. Berufs Morbidität und Mortalität. [*The Morbidity and Mortality of Occupations.*] ALFRED R. VON LINDHEIM, *Vienna. Berlin, Hirschwald, 1908.* AUSTRIA

Of these victims of modern speed and rush, the neurasthenics, Professor Erb has rightly said, "They appear to be capable of doing everything that the robust can do; but as soon as they are tired, exhaustion comes on, and their incessantly increasing irritability intensifies their fatigue." (Page 1300.)

The Mental Symptoms of Fatigue. (Reprinted from the Transactions of the New York State Medical Association.) EDWARD COWLES, M.D., *Medical Superintendent of the McLean Hospital, Somerville, Mass. New York, Fless and Ridge, 1893.* UNITED STATES

The sensory function by which the complex normal feelings of fatigue are appreciated, may itself be over-exercised to exhaustion. There is *tire* of the power to *feel the tire.* This condition may be called *fatigue anæsthesia,* and, beginning with the early stages of pathological fatigue, there is usually some degree of it. Every physician has experienced this when, after a night of anxious professional work, with loss of sleep, he has had a day of excitable alertness of mind and body, and there is a sense of nervous strain, with, perhaps, undue mental facility and physical irritability. Many hours' sleep may be gained in the following night, but instead of feeling refreshed he has a sense of *malaise,* languor, and fatigue. The real fatigue was greater the day before, but he could not feel it as such. It is not until the second day after the excessive effort that he has recovered his exhausted power to feel the fatigue. In a lesser degree this fatigue anæsthesia becomes a constant accompaniment of the neurasthenic condition. Overworked women, professional and business men "work on their nerves" and say they don't feel tired, and "nothing is the matter." They "feel better" when actively exercised in their customary labors. This condition comes on insidiously and is a most dangerous one. The patient is neurasthenic before any one suspects it. (Pages 22–23.)

The Harvey Lectures, 1905–1906. Fatigue. FREDERIC S. LEE, Ph.D. *Philadelphia, Lippincott, 1906.*

. . . The chief sign of fatigue is, in a word, depression—depression of irritability, wherein a given stimulus calls forth a response of less intensity

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than before; and depression for the total capacity for work, whatever the intensity of the stimulus; its early stages may show, however, a temporary heightened irritability and an apparent, not real, heightened capacity for work. (Page 169.)

(*b*) Fatigue and Nervous Diseases

Neurasthenia and other nervous diseases are due to overstrain of the nervous system. Since the central nervous system regulates all the vital functions, nervous exhaustion or neurasthenia may affect all organs and functions of the body.

Intense and long lasting fatigue is a characteristic of the disease. Disorders of the heart, circulation, the special senses and the digestive apparatus are common symptoms. When nervously overtaxed persons continue to work for excessive hours the functional mechanisms may become totally impaired.

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Über die Wachsende Nervosität Unserer Zeit. [*The Increase of Nervousness in our Times.*] Dr. Wilhelm Erb, *Professor of Medicine, Heidelberg University. Heidelberg, Koester, 1894.*

The neurasthenic may appear at first to be as capable as a healthy person, but he wearies quickly, is easily exhausted, and cannot shake off his fatigue; moreover, he is unduly susceptible to all stimuli, and this in turn reacts unfavorably upon his fatigue and capacity for exhaustion.

Thus it is quite relevant . . . to compare neurasthenia with fatigue and to define it as a pathological excess and fixity of fatigue. (Page 11.)

Heightened irritability, then, on the one hand, and great weakness, fatigue, and tendency to exhaustion, with the resultant loss of efficiency, on the other, make up the picture of neurasthenia.

These conditions may affect every part of the nervous system—brain, mind and spirit, organs of sense, spinal cord and sympathetic nerves, circulatory, digestive, and generative organs—in short, the entire body; but as they are by no means of identical extent in all organs, there results the inexhaustible variety of symptoms of neurasthenia. (Page 11.)

Without a doubt, one of the most important fundamental requirements

of health is found in the correct alternations of work and rest. (Pages 28–29.) GERMANY

Die Pathologie und Therapie der Neurasthenie. [*Pathology and Therapeutics of Neurasthenia.*] Dr. OTTO BINSWANGER, *Professor of Psychiatry and Director of the Psychiatric Hospital at Jena. Jena, Fischer, 1896.*

(To the comprehension of neurasthenia) we must first clearly define a process which absolutely controls the pathogenesis of neurasthenia. This is fatigue, which, under pathological conditions, may be characterized by the terms "chronic fatigue" (Dauerermüdung) and exhaustion. . . .

There will be complete reparation of the state of overfatigue which has not gone beyond physiological limits, while complete reparation or compensation for chronic fatigue can only be attained with difficulty after long periods of recuperation or, in many cases, it can never be fully attained. (Page 20.)

If exertions are demanded of the chronically fatigued persons which bear no relation to his remaining supply of energy, a condition finally comes on in which the functional mechanism involved absolutely refuses to work. This condition we call exhaustion. It may be only transitory, or may remain fixed for a long time. (Page 21.)

Pathological conditions of activity of the nervous system rest upon disturbances of the molecular mechanism which are capable of injuring, either temporarily or permanently, the legitimate play of forces—the physiological equilibrium between synthetic processes and those of oxidation. (Page 23.)

Diseases of the Nervous System. H. OPPENHEIM, M.D., *University of Berlin. Authorized translation by* EDWARD E. MAYER, A.M., M.D. *Philadelphia and London, J. B. Lippincott Company, 1900.*

Neurasthenia, or Nervous Exhaustion, is a very common disease to-day, especially in the large cities. Even though it may have occurred at all times (and had been known for a long time as nervousness), it has without doubt increased in extent in the last years by the extra demands that have been made on man in his struggle for existence and in his social life. (Page 703.)

Those who work at night, even though they have plenty of time during the day for sleep, very often become neurasthenic. This refers to tele-

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graph operators, night watchmen, compositors, etc. Working in overheated rooms is also a cause. (Page 704.)

Symptomatology.—The chief symptom of neurasthenia is the irritable weakness,—*i. e.*, the abnormal excitability accompanied by exhaustion, the latter being predominant. The patient is irritable and easily excited; but the excitement, whether pleasurable or otherwise, soon leads to exhaustion, producing and leaving a feeling of weakness and apathy. (Page 704.)

Fatigue, however, easily results, his ability for work is markedly abridged, and the least exertion exhausts him. The intensity and duration of this fatigue are characteristic. It may be so marked that all mental work is rendered impossible. Occasionally the ability to conduct visual memory pictures to the brain, to remember the appearance of a certain person, place, or object, is greatly impaired. (Page 705.)

Disorders of the special senses are also found and likewise bear the marks of increased sensitiveness and exhaustion. The eye and ear are particularly often affected. Seeing stars or spots (mouches volantes), a mist before the eyes, fatigue in reading ("the letters seem to swim or run together or dance before the eyes"), increased sensitiveness to noises, buzzing in the ears, ringing, whistling, or murmuring in front of the ears, etc., are frequent and painful and stubborn disorders. (Page 706.)

Many of the "asthenopic disorders"—especially the onset of fatigue of the sight—are probably to a great extent due to an increased exhaustion of the muscles of accommodation and of the recti interni. Sight and hearing are not weakened, and an ophthalmoscopic examination never reveals any disease of the optic nerves. A moderate contraction of the visual field is also occasionally observed in cases of pure neurasthenia. A neurotic impairment of hearing may likewise be combined with it. (Page 707.)

Of the motor disorders, the common symptoms are weakness (not paralysis), tremor, and slight fatigue. (Page 707.)

The vasomotor disorders deserve special attention, being found in many patients. . . . The disturbances of the heart are closely allied to these vasomotor disorders. They may be subjective or objective. Palpitation of the heart is an important subjective symptom. . . . Acceleration of the heart may also be recognized objectively. (Page 709.)

Digestive Disorders.—These are prominent symptoms. *Nervous dyspepsia* is not an independent disease, but one of the most frequent forms in which neurasthenia expresses itself. (Page 712.)

Proceedings of the First International Convention on Industrial Diseases. Milan, 1906. Frenastenia e delinquenza in rapporto a taluni ordinamenti del lavoro. [*Imbecility and Criminality in Relation to Certain Forms of Labor.*] Prof. CRISAFULLI. ITALY

Mental fatigue with its two fundamental factors (excess of work and of excitation; insufficiency of rest and of recuperation) contributes largely to the pathogenesis of nervous industrial diseases.

Excess of work (overwork) surrounds the nervous cellular tissue with the products of disintegration accentuating the auto-poisoning phenomena and, with them, the functional exhaustion and insufficient reintegration of the nerve cells: in such a condition the whole metabolism changes, with evil consequences to the entire nervous organization especially because the gray matter of the nerve centres "in the physiological state has a most active material metabolism." (Luciani.) (Page 151.)

The Mental Symptoms of Fatigue. (*Reprinted from the Transactions of the New York State Medical Association.*) EDWARD COWLES, M.D., *Medical Superintendent of the McLean Hospital, Somerville, Mass. New York, Fless and Ridge, 1893.* UNITED STATES

Normal fatigue from the discharge of tissue energy is shown to be inseparably accompanied by toxic products that contribute to the effects of fatigue. Pathological fatigue represents a further development and persistence of this condition in the organism. Stimulation too soon repeated, without giving time for rest and repair, finds nerve cells in fatigued areas having less power to act because of inanition from deficient rest and nourishment; they are also hindered in action by the incomplete removal of the toxic products of previous action. Then assimilation is further hindered, first, by the lessened nutritive quality of the blood from the presence of non-eliminated toxic materials; and second, by the probable toxic weakening of the cells' power to assimilate the nutrition that is furnished to them. The development of a manifestly morbid condition may be very slow and insidious, or more rapid, according as the balance of the processes of constructive and regressive metabolism are more or less on the side of impoverishment, exhaustion, and weakness. From the gradually failing elimination, the local inanition may become more general, and the first results are an increased excitability from weakened resistance and inhibition, with a quick exhaustion of the nervous system under exercise. These are the constant characteristics of neurasthenia. Thus, as Knowalewsky says, "a locally limited over-strain of a certain part of

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the nervous system may lead to general exhaustion and neurasthenia." Hence neurasthenia has been defined by Ziemssen as a functional weakness of the nervous system, varying from the slightest degrees in simple localities to entire loss of strength in the whole nervous system." Arndt states the characteristics of neurasthenia to be "increased excitability with a tendency to rapid fatigue, especially of the muscular system." (Page 7.)

D. *Bad Effect of Long Hours on Safety*

(1) Incidence of Accidents

Emphasis is laid upon the need of limiting excessive working hours for women by the increased danger from accidents during certain hours of work.

The statistics of all countries which have recorded the hours in which industrial accidents occur, show that the number of accidents tends to rise after a certain number of hours of work, and that the fatigue of the workers subtly influences the accident rate.

FRANCE

Revue Scientifique. 4e Juin, 1904. Les Accidents du Travail et les Compagnies d'Assurances. [*Industrial Accidents and Insurance.*] Prof. A. Imbert, *University of Montpellier. Paris, 1904.*

The law of 1898 upon the accidents of industry is now six years old . . . it is one of the most beneficent of the Republic . . . and should aid in solving social questions. (Page 711.)

The number of accidents, as a matter of fact, does not depend only on the number of workmen or the kind of work, but, it must be reiterated, depends also in large measure on the organization of labor and the qualities of the human machine. More explicitly, many accidents result from the physical or mental fatigue of the workman at the moment, and this assertion can easily be proved by innumerable instances. (Page 715.)

The imminence of an accident is usually made manifest to workmen by some occurrence, which, by the peripheral excitation of sight, sound, or sensation, is made known to the brain. There is often only an inappreciable time in which this message may be conveyed to the brain and the necessary stimulus sent forth to the muscles to execute by rapid

and energetic contractions the movements necessary for defence or retreat.

The exact time necessary for each of these successive acts has never been precisely estimated, but enough is known to demonstrate that a workman who is in a condition of mental or physical fatigue does not respond as quickly to such stimuli, but that each such act takes a longer time than would otherwise be true. Certain elements of the whole phenomenon may be studied separately. Thus one knows that that rapidity of muscular contractility and consequently the quickness of the motion made by a muscle diminishes with the time during which the muscle is made to contract, while the intensity of the contraction also diminishes proportionately.

One result of this fact is that fatigue renders the workman less apt to avoid accident, since he cannot make as intense an effort as usual nor execute movements of his normal rapidity. (Page 715.)

In order to find corroboration of the theory that the number of accidents would increase with fatigue I asked M. Mestre, inspector of labor in the department of Hérault, to record the accidents in his district during 1903 by the hours of the day in which they occurred.

These statistics are to be published soon, and it is enough to say here that they all, without exception, verify what has been said, as shown by this table:

TRANSPORTATION

Total number employed, 6695 workmen. Whole number of accidents in 1903, 660.

ACCIDENTS IN THE MORNING		ACCIDENTS IN THE AFTERNOON	
Hours	*Numbers*	*Hours*	*Numbers*
7 A. M.	25	1 P. M.	18
8 "	30	2 "	40
9 "	20	3 "	45
10 "	57	5 "	105
11 "	63	5 "	118

Two facts are shown very clearly by this table of figures, namely, the considerable share played by fatigue in producing accidents and the equally important influence, in the inverse sense, of the midday hour of rest. (Page 716.)

FRANCE

Revue Scientifique. Paris, 24e Septembre, 1904. Statistiques d'Accidents du Travail. [*Statistics of Industrial Accidents.*] Prof. A. IMBERT, *University of Montpellier, and* M. MESTRE, *Factory Inspector, Hérault. Paris, 1904.*

The law requires notice to be given of every accident that necessitates more than four days' loss of work. These records are kept in the official headquarters for each department, and we have utilized these official figures for our chart.

Hérault, 1903

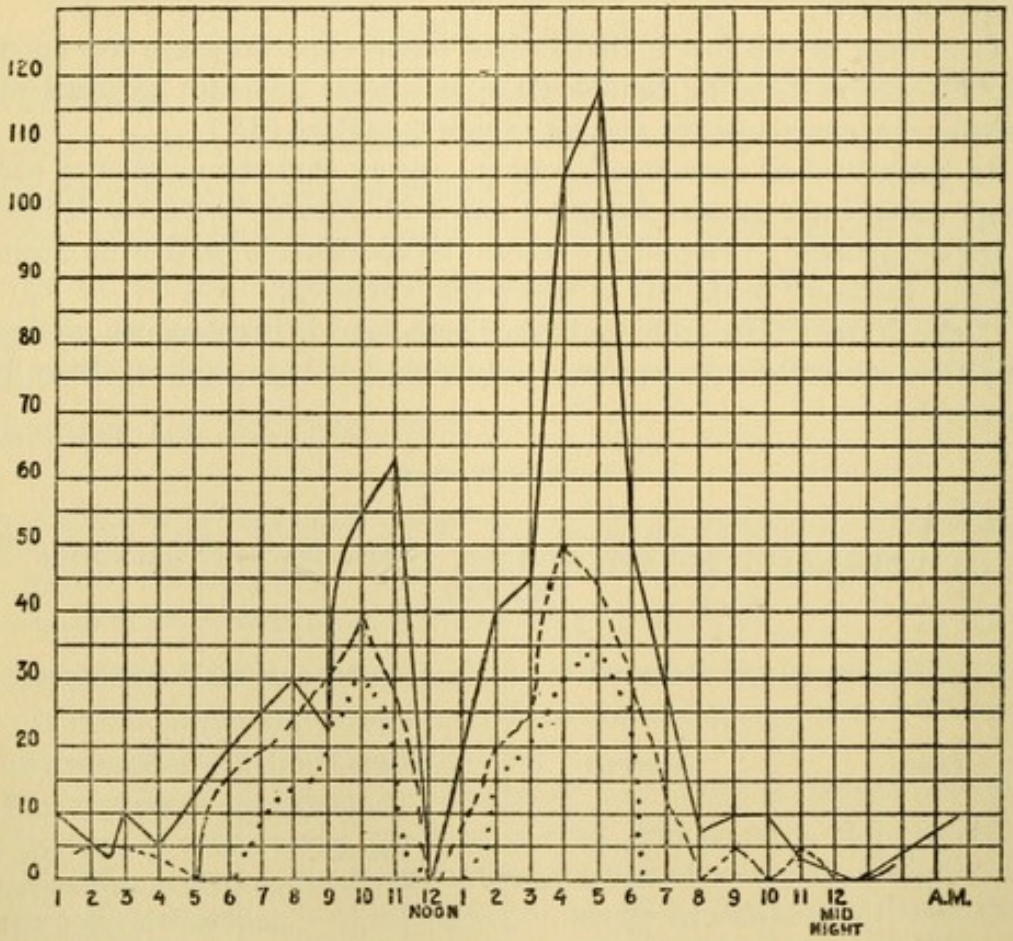


FIG. 63.

The heavy line represents 660 accidents and 6,695 workmen in transportation. These men are licensed.
The broken line shows 326 accidents and 1,453 workmen in chemical works.
The dotted line shows 189 accidents and 4,528 men in woodworking industries.

(Page 386.)

FRANCE

Figure 63 shows in the heavy line, the 660 accidents that happened only in the occupations of Transportation, comprising 6,695 workmen.

General indications of this curve are:

1. The number of accidents increases progressively from hour to hour during the first half-day.

2. The number of accidents in the first part of the second half-day, after the noon rest, is noticeably less than that of the final hour of the first half-day.

3. In the course of the second half-day accidents become progressively more numerous with every hour.

4. The maximum number of accidents per hour is notably greater in the latter part of the second half-day than in the latter part of the first half-day.

Hérault, 1903

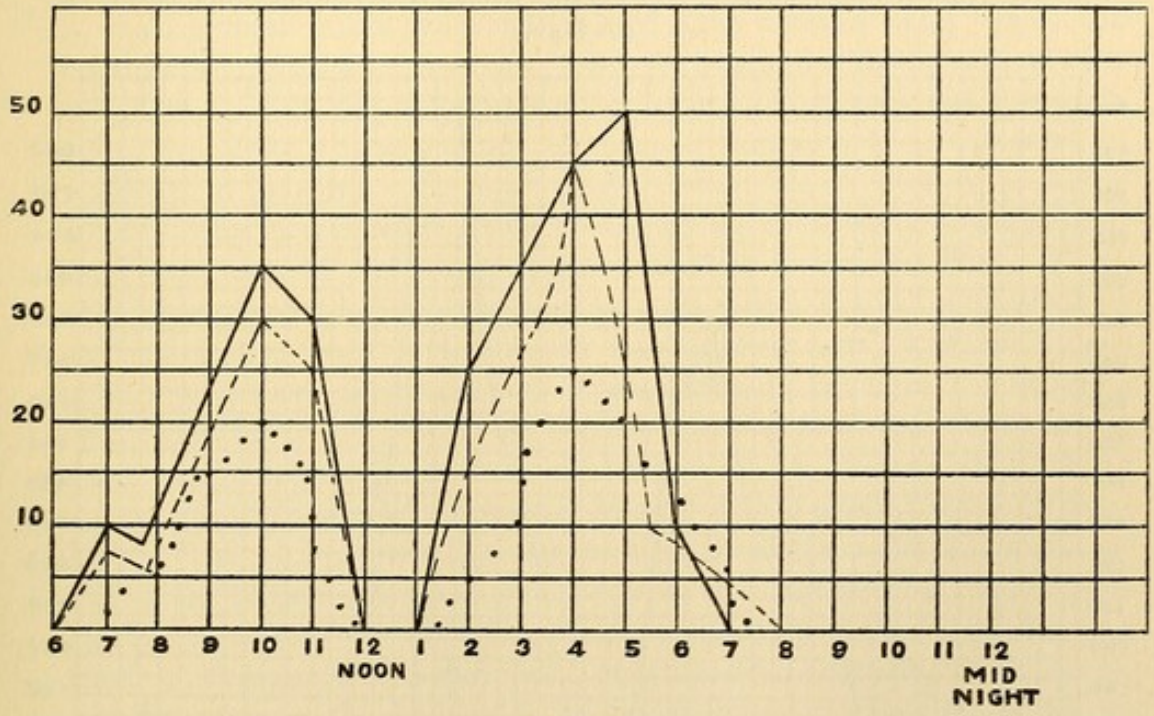


FIG. 64.

Here the heavy line shows building trades and stone work: 280 accidents, 4,686 workmen.
The broken line shows the ordinary metal trades: 149 accidents, 3,237 workmen.
The dotted line shows commerce and banking: 237 accidents and 15,567 men.

(Page 387.)

In order to verify the conclusions suggested by this chart we inquired into the proportion of accidents in other industries.

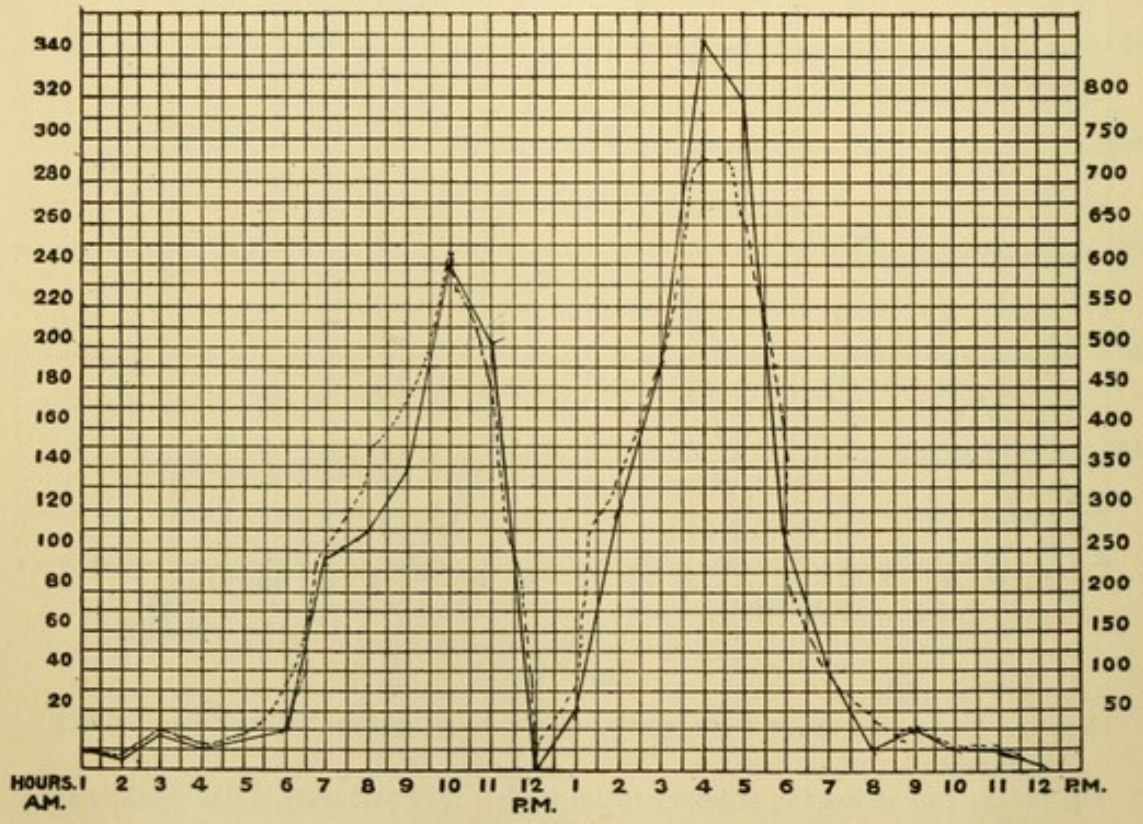
FRANCE

M. Leroy, the division inspector of labor at Toulouse, then voluntarily sent us the result of similar statistics which he had had made by the departmental inspectors under his orders, viz., in Ande, Ariège, etc., etc. Without reproducing here all the curves which show these various statistics it is sufficient to state that all, without exception, presented the general characteristics which are displayed by the charts here shown. (Page 387.)

Since fatigue is the inevitable accompaniment of all expended energy, and as it cannot be suppressed without at the same time suppressing all labor, it is at least important to limit it and not allow it to attain that degree at which its influence in producing accidents is eminently evil. (Page 388.)

Figure 65 shows in heavy line 2,065 accidents among 56,458 workmen of Hérault, and the dotted line shows 5,534 accidents among 140,407

FIG. 65.—CHART SHOWING THE OCCURRENCE OF ACCIDENTS ACCORDING TO HOURS OF DAY.



The heavy line shows one Department of France with 56,458 workers and 2,065 accidents.

The dotted line shows nine (9) Departments of France with 140,407 workmen and 5,534 accidents.

(Page 388.)

workmen of 9 departments in the region of Toulouse, drawn according to hours. (Page 388.) FRANCE

Revue Scientifique, 21e Octobre, 1905. Hygiène Publique. Nouvelles Statistiques d'Accidents du Travail. [*Public Hygiene. New Statistics of Industrial Accidents.*] M. A. IMBERT, *University of Montpellier, and* M. MESTRE, *Factory Inspector in Hérault.*

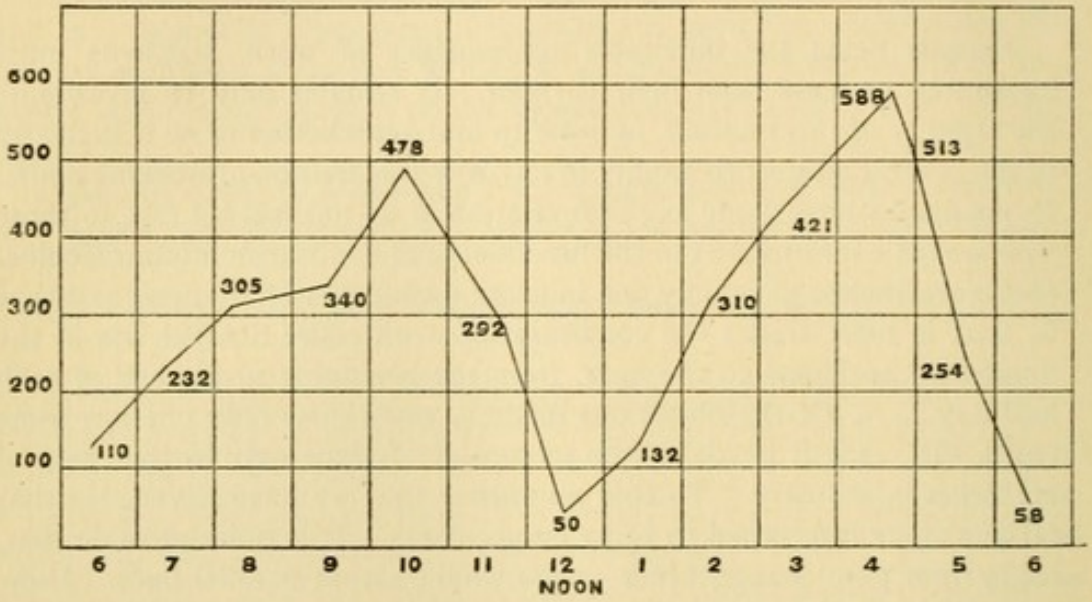
Fatigue being the inevitable consequence of work, accidents must inexorably increase from hour to hour. It remains only to investigate the rapidity of this increase, in order to find out whether or no it is clearly to the general interest to modify in any way the division of working hours. If our figures have come as the revelation of an unexpected fact to those who are little informed as to the functioning of the human motor machine, they nevertheless gave only one indication that was really new, and that is, that in most trades the conditions of work cause a *rapid* rise in the number of accidents to the hour, from the beginning to the end of each half day. . . . Of the objections made to our charts only one has some truth, viz., that it is too simple to consider fatigue only as the cause of accidents in industry. To this we answer that we have never said that fatigue alone intervened to bring on accidents. It is quite possible that, aside from pure chance, other causes would act on parallel lines. However, either such other existing causes would have a gradual influence, and we cannot then see how they would exercise their activity except by engendering a more precocious and intense fatigue; or, they would make themselves felt in a relatively short time, and could then only bring about some irregularity in some limited sections of our charts. (Page 520.) . . . As to the causes of the second order, it was to eliminate their irregularities that we drew the line representing all of the 5,534 accidents befalling the 140,407 workmen who, in 1903, were affected by the accident compensation law of 1898. Irregularities found upon the charts showing single trades would then disappear, as (they disappear) on chart No. 74, which represents the division according to hours of the 3,352 accidents that occurred in 1904 in the department of Hérault, Aveyron, Lozère, Cantal and Tarn, and we simply stated that the general features of the chart were strictly explainable by the action of fatigue. . . . As to the proposal to bring a half hour of rest into each of the two halves of the working day, it seems to us that, in all trades where the workman is not in charge of a steadily running machine, this should not be difficult. As to trades where it would present serious difficulties, there is another remedy that might be proposed, and which should not be rejected until its probable

FRANCE

effects had been well considered; that is, cutting off the last hour of the working day, or even the establishment of the eight-hour day. (Page 521.)

FIG. 74.—NUMBER OF ACCIDENTS BY HOURS OF THE DAY

Year 1904. All Industries. Total Accidents, 3,352



SCALE OF ACCIDENTS.

From 1 to 5 A. M., 118 Accidents. After 6 to Midnight, 151 Accidents.

(Page 521.)

We are led to this view by the physiological study of occupation fatigue, and do not intend to discuss thoroughly this urgent social problem of reducing hours of labor which must be approached from many points of view, but we will simply show one side of it. . . . Observe in the first place that the plan of dropping off the last hour of the day's work, crude and simple though it may be, would have as its minimum effect the prevention of all those accidents that would otherwise occur in the final hour of work. Now, according to one general chart for September, 1904, these accidents form $\frac{1}{7}$ (one-seventh) or $\frac{1}{8}$ (one-eighth) of all (750 in 5,534), and the proportion is substantially the same for the year 1904. This immediate effect, then, would be considerable. It would mean an important reduction in the loss of social energy,—a loss which is partly temporary and partly permanent. (Page 521.)

FRANCE

Ministère du Travail et de la Prévoyance Sociale, Bulletin de l'Inspection du Travail et de l'Hygiène Industrielle. 1906. Numéro 3–4. Paris, 1906. Travaux originaux des Inspecteurs. [*Bulletin of the Labor Department. Leaflets, 3–4. Original Contributions of the Inspectors.*] *Étude sur les Accidents du Travail.* [*A Study of Industrial Accidents.*] M. Le Roy, *Division Factory Inspector, Toulouse. Paris, 1906.*

In a report made in 1903 by M. Mestre, he said: . . . "Accidents were divided into two categories, viz.:

1. Those that might have been foreseen; preventable. 2. Those which could not be foreseen; not preventable.

It seems to me, however, that it is proper to take another factor into account, a factor which is so much more serious in that it dominates in all accidents augmenting their frequency, or sometimes aggravating their effects. This factor is fatigue.

It is indisputable in fact, that the more fatigued a worker is the more liable he is to accident. The accident is then the consequence of the combined results of physical depression, relaxed attention and less rapid movements." (Page 219.)

Struck by the statements and charts of Dr. Imbert . . . I secured data from the various inspectors of my district during two years. . . . My conclusions were identical with those arrived at by M. Mestre. I prepared charts for 1903 and 1904, first for each separate industry and then for all together, and the results to my mind leave no doubt of the merits of the conclusions drawn by Imbert and Mestre from their inquiries. I am familiar with the objection that, as fewer men are at work at certain hours than others it is not surprising there should be more accidents at one time than another. . . . However, between 7 and 11 A. M. and 2 and 5 P. M. all workmen who work by day, either summer or winter, are at work, so that the record of those hours must be of real importance.

In the charts, the hours form the abscisses and the accidents represent the ordinates. . . . We then find that the number of accidents increased progressively from hour to hour in each of the two working periods, forenoon and afternoon, reaching their maxima at 10 A. M. and 4 P. M. We find also that accidents are more frequent in the second half than in the first half of the day, and that they are much less numerous in the morning and after the rest pause than at the end of the preceding periods. (Page 221.)

Leaving out of consideration those groups of but few workmen . . . and those where the possibilities of accidents are slight . . . and those textiles where, thanks to legal requirements of safety devices, accidents formerly so frequent have been reduced from 1.4 per cent in 1903 to 1.1 per cent in 1904 . . . we have left those groups whose members are

FRANCE obliged to exert physical force. . . . In 1904, when the statistics were absolutely complete, we find, in transportation, from 7 to 11 A. M., an increasing progression up to 10 o'clock, that is 71, 75, 117, and 140 accidents; and in the afternoon from 1 to 5 o'clock, the same thing up to 4 o'clock, viz., 50, 79, 143, 196. At 5, the number fell to 162 accidents.

In building and masonry, etc., we find, in short, a maximum of 187 accidents in 1903 and 160 in 1904 attained progressively by 10 A. M., and, on resumption of work, 227 (maximum) in 1903 at 5 P. M. and 194 (maximum) in 1904 at 4 P. M. . . . All these data bring us necessarily to a consideration of fatigue as one of the chief causes of accidents . . . and the data of the metal trades, showing higher figures in the morning only confirm this view because by the division of labor here into three shifts the hours at which the men change bring the same proofs as to the effects of fatigue (one shift works by day and the others change at midnight and noon).

But physical fatigue is not the only thing to consider. We must remember also the cerebral fatigue of the workman who is constrained to long daily hours of work at monotonous tasks. This fatigue induces a nervous depression which is betrayed by inattention, very often resulting in accident. It is precisely this form of fatigue that explains the increasing progression of accidents with the progress of working hours in industries where work is most often limited to watching the machinery. (Page 222.)

The anomaly of the last hour being less heavily charged with accidents is explainable in two ways:

1. In many industries, as is well known, there is a certain slackening of activity and the last hour is the least productive.

2. In others, the workman has a spurt of energy as the closing time approaches.

. . . The plan adopted in Austria, where each working period is divided by a half-hour's rest, has, if we may judge by the statistics that are published, resulted in a sensible diminution of the number of accidents in the hour following the resting time.

France also should try some organization of industry which would tend to eliminate that vast number of accidents due to the physical and cerebral fatigue of the worker. (Page 223.)

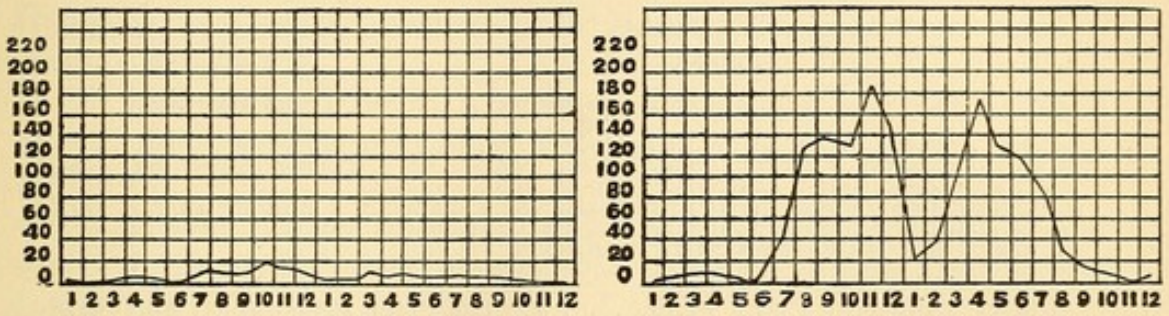
BELGIUM *Royaume de Belgique. Ministère de l'Industrie et du Travail. Rapports Annuels de l'Inspection du Travail, 1907.* [*Annual Reports of the Belgian Factory Inspection, 1907.*] *Brussels, Lebègue, 1908.*

The accompanying charts show the proportion of accidents according to the days of the week and the hours of the day. (Page 204.) (4th District: Ghent.)

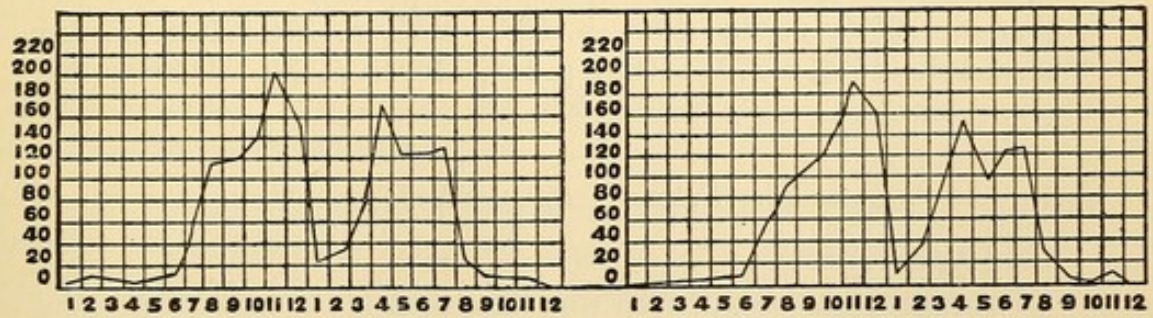
Textile industries cause 39.6 per cent of all the accidents in industrial establishments . . . and the whole number of accidents in industrial establishments forms 72 per cent of all accidents. (Page 206.) BELGIUM

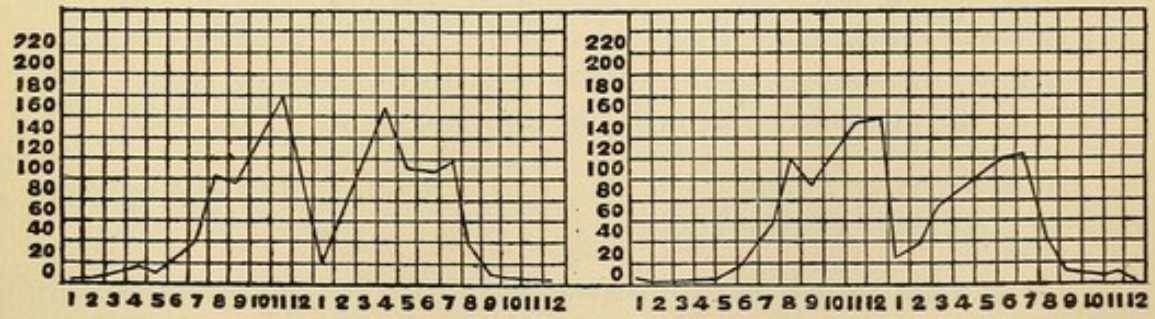
Accidents for the Year, 1907

Showing the Hourly Average by Days of Week

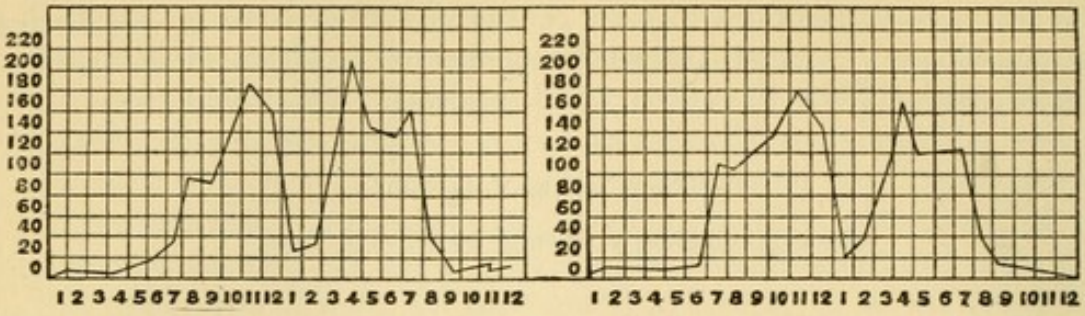


Annual Report of the Belgian Factory Inspectors for 1907. Brussels, 1908. (Pages 204, 205.)





BELGIUM



(Pages 204–205.)

GREAT BRITAIN

British Sessional Papers. Vol. XV. 1831–32. Report from the Select Committee on the "Bill to regulate the Labour of Children in the Mills and Factories of the United Kingdom."

James Blundell, Esq., M.D. . . . Lecturer on Physiology and Midwifery in the School of Guy's Hospital:

10881. May not the numerous and afflicting accidents which occur more particularly at the end of the day, and are observed to increase toward the termination of the week, be fairly attributed to this overfatigue and lassitude? I think they may. (Page 125.)

[See also 2590, p. 99. 6944, p. 293. 6875, p. 294. 7488, p. 325. 4328, p. 165. 5010, p. 270. 10881, p. 545. 10945, p. 550. 11494, p. 596. 11579, p. 604.]

Hansard's Parliamentary Debates. Vol. LXXIII. 1844.

Lord Ashley:

"Those honourable gentlemen who have been in the habit of perusing the melancholy details of mill accidents should know that a large proportion of those accidents—particularly those which may be denominated the minor class, such as loss of fingers and the like—occur in the last hours of the evening, when the people become so tired that they absolutely get reckless of the danger. I state this on the authority of several practical spinners. Hence arise many serious evils to the working classes, none greater than the early prostration of their strength." (Page 1082.)

British Sessional Papers. Vol. X. 1901. Report of the Chief Inspector of Factories and Workshops.

One can only feel surprise that accidents are not more numerous (in laundries), when one realizes that the slightest carelessness or inattention

may result in the fingers or hand being drawn between the hot cylinders, and when one considers how easily such inattention may arise in the case of the over-tired young workers. (Page 383.)

British Sessional Papers. Vol. X. 1904. Report of the Chief Inspector of Factories and Workshops.

The comparative immunity from accidents in the laundries in the West Riding of Yorkshire may be possibly due in some measure to the moderate hours of employment.

The incidence of accidents according to time of day is somewhat surprising, the most dangerous hours apparently being 11 A. M. to 12 noon and 4 to 6 P. M. . . . Probably 11 A. M. to 12 noon is more generally than any other time the last tiring hour of a day five hours' spell; 4–6 P. M. covers the time when most generally the transition is from daylight to artificial light. (Pages 210–211.)

Reference was also made (in the Thirteenth International Congress of Hygiene and Demography), although figures were not adduced, to the alleged increase in the number of accidents which occur late in the working day when the effects of intellectual and physical fatigue have made themselves apparent. (Page 298.)

British Sessional Papers. Vol. X. 1905. Report of the Chief Inspector of Factories and Workshops.

Again I think the effect of fatigue is shown in the last hour before midday and during 12 to 1 o'clock. Fatigue again appears to be a cause of accidents in the later period of the afternoon spell. (Page 250.)

Infant Mortality: A Social Problem. GEORGE NEWMAN, M.D., D.P.H., F.R.S.E., *Lecturer on Public Health at St. Bartholomew's Hospital, London. Medical Officer of Health, Metropolitan Borough, Finsbury. London, Methuen, 1906.*

The results of fatigue become manifest in various ways, not the least being the occurrence of accidents or of physical breakdown. The former, as is now well recognized, occur most frequently in fatigued workers. For example, since 1900 there has been a steady, though not marked, increase in the number of accidents to women over eighteen years of age in laundries. In 1900 such accidents numbered 131; in 1904, 157. Now

GREAT BRITAIN

it has been shown that whilst the first half of the day yields about the same number of accidents as the second half, more accidents, amounting to nearly double the number, occur between the hours of 11 A. M. and 1 P. M. and between 4 P. M. and 7 P. M. than at any other time of the day. (Pages 112–113.)

AUSTRIA

Eighth International Congress of Hygiene and Demography. Budapest, 1894. Vol. VII, Sec. V. Über das Verhältniss der Dauer des Arbeitstages zur Gesundheit des Arbeiters und dessen Einfluss auf die öffentliche Gesundheit. [The Length of the Working Day in its Relation to the Workman's Health and its Influence upon Public Health.] Dr. E. R. J. KREJCSI, *Vice-Secretary of the Chamber of Commerce in Budapest. Budapest, 1896.*

The most valuable special statistics bearing upon the subject of fatigue are those of the trade-accidents kept by the accident insurance offices. The ones that chiefly merit notice are those of the German Imperial Insurance Department published in 1890, of the accidents for 1887 distributed over the hours of the day when they occurred.

From these data it may be seen how greatly accidents increase as the fatigue of the worker increases. (Page 327.)

(*Amtliche Nachrichten des Reichs-Versicherungsamtes, VI. Jahrg., Berlin, 1890. P. 280 et seq.*)

DAYWORK

Morning	*Whole No. of Accidents*	*Percentage*	*Afternoon*	*Whole No. of Accidents*	*Percentage*
6– 7 A. M.	435	2.83	12–1 P. M.	587	3.74
7– 8 "	794	5.16	1–2 "	745	4.84
8– 9 "	815	5.29	2–3 "	1037	6.73
9–10 "	1069	6.94	3–4 "	1243	8.07
10–11 "	1598	10.38	4–5 "	1178	7.65
11–12 noon	1590	10.32	5–6 "	1306	8.48

Similar figures are shown by the General Workman's Sickness and Relief Insurance in Vienna, and some recent tables have been communicated to me by Dr. Leo Verkauf before their publication.

They are as follows:

AUSTRIA

DAYWORK

Morning	*Whole No. of Accidents*	*Percentage*	*Afternoon*	*Whole No. of Accidents*	*Percentage*
6– 7 A. M.	187	3.01	12–1 P. M.	82	1.32
7– 8 "	437	7.03	1–2 "	331	5.32
8– 9 "	517	8.31	2–3 "	538	8.65
9–10 "	716	11.51	3–4 "	700	11.25
10–11 pause	505	8.12	4–5 pause	508	8.17
11–12 noon	338	5.43	5–6 "	418	6.72

(Page 328.)

GERMANY

Fourteenth International Congress of Hygiene and Demography. Berlin, Sept. 1907. Vol. II, Sec. IV. Die Ermüdung durch Berufsarbeit. [*Fatigue resulting from Occupation.*] Dr. ROTH. *Berlin, Hirschwald, 1908.*

That the fluctuations of the mental tone in course of working hours influence not only the worker's capacity but render him more liable to accident by producing a mental apathy or indifference as a result of weariness is also a fact too seldom understood or acknowledged.

It is readily explained, for the fatigued workman cannot give that close attention to safety appliances and machine guards that a normally resistant worker can give. In regard to the frequency of accidents, proof of the statement made above is furnished by the statistics of the Imperial Insurance Department for 1887 and 1897. Here the relation between the length of working time and progressive uncertainty of control over muscles, as well as the relaxation of mental tone, is made clear in the statistics of 1897, which noted the hours when accidents occurred. The three final morning hours show twice as many accidents as the first ones, and the final afternoon hours, from 3 to 6, were also more disastrous than the first part of the afternoon. Taking the authentic statement that, on an average, an accident occurs in every three hours throughout the year, the following tables show the variations:

A. M. hours from 6 to 9—1.10 accidents
" " " 9 " 12—2.36 "
P. M. " " 12 " 3—1.02 "
" " " 3 " 6—2.11 " (Page 618.)

Professor Imbert has also stated that his observations show that accidents occur in parallel lines with the extent of working time and reach the highest proportion at the end of overtime. (Page 619.)

GERMANY

Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. IV. Discussions on Section IV.

Dr. Roth (Potsdam):

We know by the imperial statistics that most accidents happen in the final hours of work, and I have no doubt at all that, if it were possible to make similar computations in the matter of illness, we should find that most cases of sickness, especially those of poisonous origin, have their starting point in the final working hours. That which is often ascribed to the carelessness of the worker is in reality in numberless cases the result of oncoming fatigue. (Page 290.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science, Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen, and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

The exhausted workman no longer has full control over his muscles. His results are less exact. Danger by accident increases. If it is reckoned that, on an average, one accident takes place every 3 hours throughout the year, then, according to the German Accident Statistics of 1887 and 1897, the numbers of accidents between the hours 6 to 9 A. M. form 1.10%; from 9 to noon, 2.36%; from noon to 3 P. M., 1.02%; and from 3 to 6 P. M., 2.11%.

Professor Imbert has also shown that in the occupations noted by him the numbers of accidents reached their highest point near the end of working hours. (Page 1214.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. 1895. [*Official Information from Reports of the* (*German*) *Factory Inspectors.*] *Berlin, 1896.*

The ten-hour day, with the exceptions necessary for certain trades, is a measure which can be introduced without great difficulty, and which would prevent many dangers threatening the health of workers. Many accidents are no doubt due to the relaxed vigilance and lessening of bodily strength following excessive hours of work. (Page 369.)

GERMANY

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. XXIII. 1898. [*Official Information from Reports of the (German) Factory Inspectors, 1898.*] *Berlin, 1899.*

The inspector for Württemberg remarks that some accidents are doubtless incurred by the extreme demands made upon the endurance of the men: it is readily conceivable that overtired workers easily commit mistakes resulting in accidents. (Page 182.)

The inspector for Württemberg II, amongst a number of explanations of accidents, mentions overstrain of the workman as one cause. (Page 182.)

Jahresbericht der Grossherzoglich Badischen Fabrikinspektion für das Jahr 1900. [*Reports of the Factory Inspectors of Baden, 1900.*] *Carlsruhe, Thiergarten, 1901.*

It would seem superfluous to speak of the increase in the numbers of accidents due to overfatigue which is brought on by excessive working hours, for the thing is self-evident. (Page 30.)

Jahresbericht der Grossherzoglich Badischen Fabrikinspektion für das Jahr 1903. [*Reports of the Factory Inspectors of Baden, 1903.*] *Carlsruhe, Thiergarten, 1904.*

Positive deductions as to accidents can only be made if the statistics for a number of years show a certain uniformity. At present it looks as if Monday (because Sunday is not always used for real rest), and Saturday, on account of the physical overtension caused by the week's work, were especially liable to accidents.

The accidents that occur between 6 and 8 P. M. are, as a rule, not in the beginning of night shifts but at the end of day shifts. The unfavorable influence of the final hours of work is, therefore, greater than is shown in the tables which make the day's work appear to close at 6 P. M. (Page 66.)

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1904. Bd. I. Preussen. [*Reports of the (German) Factory and Mine Inspectors for 1904. Vol. I., Prussia.*] *Berlin, Decker, 1905.*

A workman's arm was crushed in an accident. . . . It was the belief of the inspector that this accident was directly traceable to overfatigue, brought on by the excessive length of the hours during which this man had been kept at his post. . . . (Page I[123].)

GERMANY

Jahresbericht der Grossherzoglich Badischen Fabrikinspektion für das Jahr 1905. [*Reports of the Factory Inspectors of Baden, 1905.*] *Carlsruhe, Thiergarten, 1906.*

The readily explainable preponderance of accidents on Mondays and Saturdays is evident in this, as in former reports. . . . The evening hours seem to be especially favorable for the occurrence of accidents. (Page 90.)

Amtliche Nachrichten des Reichs-Versicherungsamts, 1910. I. Beiheft. I. Teil. Gewerbe-Unfallstatistik für das Jahr 1907. [*Reports of the Imperial Insurance Department. 1910. Appendix I. Part I. Statistics of Industrial Accidents for the year 1907.*]

NUMBER AND PER CENT OF INJURED PERSONS WHO HAD BEEN AT WORK EACH SPECIFIED NUMBER OF HOURS ON THE DAY OF THE ACCIDENT, FOR METAL-WORKING INDUSTRIES AND FOR ALL INDUSTRIES IN GERMANY, 1907

Number of Hours Injured Persons Had Been at Work	METAL-WORKING INDUSTRIES		ALL INDUSTRIES	
	Number Reported	*Per cent*	*Number Reported*	*Per cent*
Less than 1	88	5.79	3,939	4.94
1 and under 2	125	8.23	6,885	8.63
2 and under 3	133	8.76	7,351	9.21
3 and under 4	209	13.76	9,004	11.28
4 and under 5	199	13.10	9,739	12.20
5 and under 6	135	8.89	8,106	10.16
6 and under 7	116	7.64	6,462	8.10
7 and under 8	161	10.60	6,908	8.66
8 and under 9	141	9.28	6,817	8.54
9 and under 10	109	7.18	6,041	7.57
10 and over	103	6.77	8,539	10.71
Total	1,519	100.00	79,791	100.00

(Page 329.)

SWITZERLAND

Sixth International Congress of Hygiene and Demography. Vienna, 1887. Part XIV. Fabrikhygiene und Gesetzgebung. [*Factory Hygiene and Legislation.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector. Vienna, 1887.*

. . . Excessive work and fatigue leads to dulness, nerve tension relaxes. Observation grows dull and accidents result. . . . (Page 36.)

Il Ramazzini, Giornali Italiano, di Medicina Sociale. Anno I, Fasc. ITALY
10–11. [*Italian Journal of Social Medicine, October to November, 1907.*] *Le stagioni, i giorni, le ore degli infortuni del lavoro.* [*Seasons, Days, and Hours when Industrial Accidents Occur.*] Professor G. PIERACCINI *and* Dr. R. MAFFEI, *Head Physicians in the Royal Main Hospital of S. M. Nuova in Florence.*

We made an investigation of the *workmen employed in the machine shops of the railways of Italy and the accidents incident to their work in the five years, from 1901 to 1905.*

Florence, accidents 2509; Verona, 1671; Bologna, 214; Foggia, 229; Naples, 173; Rimini, 170; Lucca, 100; Pontassieve, 71; Rome, 62; Ancona, 40; Milan, 38; Venice, 43; Pistoja, 32; Lecco, 30; Sulmona, 25; Castellamare, 22; Brescia, 15; Forte, 14; Bari, 12; other cities, such as Foligno, Ferni, Cremona, Udine, Vicenza, Padova, etc., a number less than 10.

We divided the accidents into two groups, one of which comprises only the accidents in the machine shops of Florence, while the other includes all the scattered shops in the above-mentioned cities.

In our deductions we find the greatest number of accidents in the Florentine group, because it has fewer heterogeneous elements. But since this group is numerically too small (2509) to allow of accurate deductions, we add to this first group the other larger one (3058), of accidents in the other machine shops of the Italian railways.

The combined numbers of the two groups are sufficiently homogeneous: first, because they include the same dangerous work or groups of related work; secondly, because the workers are all of the same sex (male); thirdly, because no worker is under 16 years, only a few from 16 to 20, while very few are more than 60; fourthly, because they live and work under conditions similar, or nearly so, to their usual life and customs as regards education and culture, temperature, and social surroundings. (Pages 548–549.)

Industrial accidents are more numerous in the morning hours than in the afternoon, and have a marked tendency to increase in direct proportion to the lengthening of the working day. Omitting the first and last hours of work for reasons already mentioned (*i. e.* because fewer workmen are present), so as to be exact in our conclusions, it is evident that there is an increase as follows:

206½ accidents in the 2nd hour
258 " " " 3rd "
324½ " " " 4th "
323 " " " 5th "

(Page 580.)

ITALY

The protraction of the hours of labor raises the number of accidents with each successive hour, in both the first and in the second half of the day. It remains now to trace the causal element, or elements, of the phenomenon.

There is no doubt that in brain or muscle work, as in any energetic action of our organism, there is a consumption of dynamogenic material, while the products of normal organic metabolism, which increase during work, act on the animal economy as poisons.

This condition of things, which only food and rest can correct and remove, and which occurs regularly in the daily work of the toiler, will, as time progresses, after a few hours of work, show its effect on the worker.

These facts are scientifically demonstrated by a complete series of experiments with the ergograph, among which are those of Kronecker, Mosso, Maggiore, Treves, Joteiko, Casarini, etc.

. . . We must admit a destruction of oxydizable material in our organism, a corresponding condition of auto-intoxication, or a febrile, painful condition proportioned to the duration and intensity of a mental or physical task. . . . And since the work of a machinist is both brain and muscle work, as it requires muscular strength, close attention, and diligent application, and also sometimes mental effort, we may reasonably admit that a protraction of the hours of labor raises the figure of accidents; because, with the protraction of the work, the worker becomes first fatigued, and then exhausted. (Pages 580–582.)

UNITED STATES

Report of the New York Bureau of Labor Statistics. 1900.

The statistics of accidents show that the organism imperceptibly reaches in the fifth hour of work such a degree of exhaustion that the power of observation is considerably diminished; accidents occur two or three times as frequently during this fifth hour as in the first hours of work. (Pages 65–66.)

Report on Condition of Woman and Child Wage-Earners in the United States. Vol. XI. Employment of Women in the Metal Trades. Senate Document No. 645, 61st Congress, 2nd Session, 1911.

This table combines the results obtained from the records of 19 establishments engaged in metal manufacture, 126 cotton mills for a period of one year, and one cotton mill for a period of eight years,* the unpublished records of the Indiana Department of Factory Inspection for three years, and the published tabulation of the Wisconsin Bureau of Labor.†

* Cotton Textile Industry, Vol. I of the report, p. 395.

† Fourteenth Biennial Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1909–10, Part II, p. 78.

DISTRIBUTION OF INDUSTRIAL ACCIDENTS THROUGH THE HOURS OF THE DAY

Hours	Cotton Mills				General Manufacture				Metal-working Establishments		Grand Total	
	126 Mills 1 Year		*1 Mill 8 Years*		*Indiana 3 Years*		*Wisconsin*		*Total*			
	No. of accidents	*Per cent*	*No. of accidents*	*Per cent*	*No. of accidents*	*Per cent*	*No. of accidents*	*Per cent*	*No. of accidents*	*Per cent*	*No. of accidents*	*Per cent*
6 to 7 A. M.	73	6.19	63	8.22	..	..	..	..	..	..	136	0.91
7.01 to 8 A. M.	95	8.05	68	8.88	546	11.31	76	4.02	486	7.81	1,271	8.53
8.01 to 9 A. M.	126	10.68	82	10.71	492	10.19	126	6.67	677	10.87	1,503	10.09
9.01 to 10 A. M.	**161**	**13.64**	90	11.75	**603**	**12.49**	227	12.01	**860**	**13.81**	**1,941**	**13.04**
10.01 to 11 A. M.	128	10.85	**114**	**14.88**	469	9.71	**245**	**12.96**	763	12.25	1,719	11.54
11.01 to 12 M. . .	78	6.61	43	5.61	338	7.00	208	11.00	491	7.89	1,158	7.78
12.01 to 1 P. M.	58	4.92	9	1.18	183	3.79	49	2.59	241	3.87	540	3.63
1.01 to 2 P. M.	78	6.61	63	8.22	441	9.13	126	6.67	602	9.67	1,310	8.80
2.01 to 3 P. M.	98	8.30	67	8.75	481	9.97	213	11.27	676	10.86	1,535	10.31
3.01 to 4 P. M.	**126**	**10.68**	**77**	**10.05**	**598**	**12.38**	**240**	**12.70**	**716**	**11.50**	**1,757**	**11.80**
4.01 to 5 P. M.	90	7.63	57	7.44	480	9.95	229	12.12	511	8.21	1,367	9.18
5.01 to 6 P. M.	59	5.00	33	4.31	197	4.08	151	7.99	203	3.26	643	4.32
6.01 to 7 P. M.	7	.59	..	..	..	..	..	..	..	..	7	.05
7.01 to 8 P. M.	3	.25	..	..	..	..	..	..	..	..	3	.02
Total.	1,180	100.00	766	100.00	4,828	100.00	1,890	100.00	6,226	100.00	14,890	100.00

UNITED STATES

The establishments from which records were obtained employed 11,178 males and 3,781 females, a total of 14,959. Since the records were obtained for an average period of 3.47 years, this represents workers to the number of 51,908 laboring for one year. The number working in the cotton mills for one year was 64,571, and the single mill for eight years represents 10,816 working for one year. In all 127,295 worker years are represented by the portion of the table based upon records gathered at first hand. (Page 95.)

In this table the period from 7 A. M. to 12 noon is one of almost perfectly uniform employment. The entire force is, except for cases of injury or illness or other causes of absenteeism, at work. These absences will, of course, in so large a group be distributed over the hours regularly and so not disturb the number of persons exposed.

The period from 1 to 5 in the afternoon is of nearly the same character. The last hour is clearly influenced by a lessening number of people employed. Very many establishments close at some point between 5 and 6, either constantly or at some period of the year. This undoubtedly accounts in large measure for the lessened number of accidents during that hour, as compared with the last hour of the morning. (Pages 96–97.)

. . . Apparently the accident rate is a complex product, dependent on a variety of factors, concerning which we have as yet little information. One factor which probably has a very marked influence is the rate of production. It is a truism that the faster a machine operates, other things being equal, the greater the danger of accident from it. (Page 98.)

. . . Any increase of speed of operation, unless accompanied by some counteracting safeguard, may be expected to show a higher accident rate. That such increase of speed during part or all of the work period is the general practise is common opinion. . . .

It is evident that in the interrelation of influences acting upon the situation now one and now another may be dominant. The most constant factor will be fatigue. It will be present in varying proportion in every case. It may act with the tendency to increase speed to produce a greater number of accidents. It may in the end become so pronounced that speed is reduced and the accident rate lowered.

It is safe probably to offer as a provisional hypothesis that the immediate cause of a variation in the accident rate through the hours of the day is the varying rate of activity. Fatigue then comes in as an important secondary factor, serving sometimes to increase the accident rate, sometimes to decrease it.

There will be some tendency to minimize the factor of fatigue in the above process, because it is not a matter of acute sensation. We can

recognize, and measure with some accuracy, the gradual increase of the fatigued condition before sensation begins to advise of its presence. It is a steadily progressive process. It gradually upsets those nice adjustments of the living organism upon which depend efficient labor and the safety of the worker. The margin of safety in modern industry is small. It is measured too frequently by fractions of an inch. Reduce the alertness and the exactness with which the body responds to the necessities of its labor, and by just so much have you increased the liability that the hand will be misplaced that fraction which means mutilation. (Pages 100–101.) UNITED STATES

(2) Fatigue of Attention

After fatigue has set in, the faculty of attention is in inverse ratio to the duration and intensity of work undertaken. Attention is always accompanied by a sensation of effort, and fatigue of attention is due to the continuance of the efforts and the difficulty of sustaining them.

Physiological reaction time is the name given to the interval between the occurrence of some external phenomenon and the signal of its having been perceived by any given individual. This interval is greatly influenced by fatigue. When the brain is fatigued, attention flags and reaction time is retarded. Hence, after overexertion fatigued workmen are subject to increased danger when reaction time is slowest and attention at its minimum.

Revue Internationale de Sociologie. Novembre, 1895. Le Travail Humain et ses Lois. [*The Laws of Human Work.*] Francesco S. Nitti, *University of Naples. Paris, Giard et Brière, 1895.* ITALY

Certain writers have observed that accidents are more frequent in the later than in the first hours of work. Ordinarily this significant fact is attributed entirely to psychic causes—to the lack of interest and assiduity of the workman—whilst it actually arises from a purely physiological fact, namely, that attention is always in an inverse ratio to the duration and intensity of work. It may be taken as a fixed law that *all work has a limit beyond which, if effort continues, attention decreases and tends to disappear completely.* (Page 1030.)

ITALY

This is a fact that every one can prove.

A captain tells me that at the beginning of a march the soldiers are prompt and attentive, but, at the end of a certain number of hours, attention decreases little by little; it is then difficult to maintain order: the men stumble against obstacles, walk at hazard, fall into ditches. If they are forced to still greater exertion they advance unevenly, without seeing anything, indifferent even to danger. Attention is gradually dissipated until quite lost.

The workman is at first cautious and attentive: he avoids danger because his attention is alert: as sensibility decreases with the onset of fatigue his attention diminishes; he does not see danger. Accidents of labor, unhappily called "accidental," are more numerous with men subjected to exhausting labors, precisely for the same reason that they are more frequent in the later part of the working hours. "The number of accidents," says the Imperial German Insurance Office, "increase with extraordinary rapidity in proportion as the fatigue and weariness of the workmen insensibly increase." (Page 1031.)

It is then a fixed fact that fatigue blunts sensibility little by little, and destroys attention. (Page 1032.)

"With fatigued subjects," says Féré, "the eyelids relax, the convergence of the eyes becomes difficult, the position of the eyes lack steadiness, the gaze is vague and appears to be fixed on vacant space. Convergence being one of the conditions necessary for concentration of the attention, the defect here coincides with incapacity for mental work." (Page 1032.)

The fact that fatigue destroys attention was brought out a century ago by A. Crichton.

Now, the faculty of attention, as Darwin has so admirably shown, is the most important of all faculties for the development of human intelligence. ("Descent of Man," Vol. I, page 44.) (Page 1033.)

Excess of muscular labor, by suppressing attention, prevents the development of intelligence. (Page 1033.)

Fatigue. A. Mosso, *Professor of Physiology, University of Turin. 1896. Translated by* Margaret Drummond, M.A., *and* W. B. Drummond, M.B., *Extra Physician, Royal Hospital for Sick Children, Edinburgh. New York, 1904.*

In 1850, Hermann V. Helmholtz made out exactly the rapidity with which the mandates of the brain are sent along the nerves to the muscles, and measured the velocity with which impressions made on the surface

of the body reach the brain. Everyone has noticed that scarcely do we feel ourselves pricked before we instinctively withdraw our hand. ITALY

Helmholtz measured the time which elapses (1) between a prick and the perception of the pain; (2) between the perception of the pain and the muscular contraction in response. He found that in man the nerve current passes along the motor nerves with a velocity of 30 metres per second. The rapidity with which stimuli are propagated along the sensory nerves, which conduct impressions from the periphery of the body to the nervous centres is very similar. Some writers have found that the rate of propagation along the nerves may be as slow as 20 metres per second. (Pages 74–75.)

Physiologists, especially the pupils of Wundt, have extended to all the senses their investigations of the phenomena of attention. One of the most singular facts—one of which we have all had practical demonstration when fencing or playing at ball or at any game of skill—is that attention increases the promptitude of reaction; when we are off our guard we require a longer time to get into the proper position and hit back.

. . . The difference is not in the rapidity of the movement, but in that of the psychic processes. The time of physiological reaction, or simply physiological time, is the name given to the interval between the occurrence of an electric spark, for instance, and our giving some sign of having perceived it, say, by touching an electric button on which our hand rests. This short space of time varies in different individuals, and represents the delay which takes place before we take account of one of the most simple forms of perception. Great individual differences are found in this as well as in the more complex forms of perception. . . . Fatigue has a great influence on the duration of this reaction time. When such measurements are repeated without an interval for rest, the time before the response is given gradually increases.

Most people take about 134 thousandths of a second before responding with the hand to a touch on the foot; but fatigue of the attention may prolong the interval to 200 or 250 thousandths of a second.

Obersteiner showed that noises and all causes which tend to distract the attention lengthen the time of physiological reaction. One example will suffice to show how much better our brain functions in silence. Obersteiner had an organ placed in the room where, by means of Hipp's chronometer, he was measuring reaction time. When there was silence, the subject of the experiment took 100 thousandths of a second before with his right hand he gave a sign of having felt a touch on his left; but when the organ was played, the time was prolonged to 140 or even 144 thousandths of a second. This retardation took place in spite of the greater

ITALY

intensity of the attention, and whenever the music ceased, the time of physiological reaction became as before. (Pages 203–205.)

In weak and nervous people, especially in women, a very prolonged strain on the attention may give rise to serious ailments. (Page 188.)

If the brain is fatigued, it is almost impossible to be attentive. (Page 198.)

The best example of the incapacity for attention produced by muscular fatigue is given by Alpine ascents. Only with great difficulty could Saussure do a little intellectual work on Mt. Blanc. "When I wished to fix my attention for a few consecutive moments, I had to stop and take breath for two or three moments."

In my own case I have observed that great muscular fatigue takes away all power of attention and weakens the memory. I have made several ascents. I have been once on the summit of Monte Viso and twice on that of Monte Rosa, yet I do not remember anything of what I saw from those summits. My recollection of the incidents of the ascents becomes more and more dim in proportion to the height attained. It seems that the physical conditions of thought and memory become less favorable as the blood is poisoned by the products of fatigue, and the energy of the nervous system consumed. . . . Several Alpinists whom I consulted agreed with me that the last part of an ascent was least distinctly remembered. (Page 200.)

Thirteenth International Congress of Hygiene and Demography. Vol. V, Sec. IV. Dans quelle mesure peut-on, par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel ou tel mode d'organisation du travail? [To what extent may fatigue resulting from occupation be estimated by physiological methods, and what argument can medical and physiological science present that will influence favorably certain methods of industrial organization?] Dr. ZACCARIA TREVES, *University of Turin. Brussels*, 1903.

The examination of psychic functions in individuals profoundly fatigued by walking shows that preceding fatigue makes the subject more susceptible to subsequent fatigue, and that physical ailments or insufficient sleep have the same effect.

After fatigue a delay in promptness of reaction and a greater number of faults of memory and attention are noticeable, whilst moderate work has a favorable influence upon these functions. (Page 27.)

The Psychology of Attention (authorized translation). TH. RIBOT, *Professor of Comparative and Experimental Psychology in The Collège de France. Chicago, Open Court, 1894.* FRANCE

Under the general head of exhaustion we include a very numerous group of states in which attention cannot pass beyond a very weak stage. . . .

Examples are found in . . . extreme physical or mental fatigue. . . . In exhaustion it is impossible or extremely difficult to fix the attention. (Page 97.)

La Fatigue et l'Entraînement Physique. [*Fatigue and Physical Training.*] Dr. PHIL. TISSIÉ. *Paris, Alcan, 1897.*

Attention exhausts a weak brain and puts it in a state of the least resistance, exactly as an illness would do. (Page 125.)

Binet and Courtier established by observation of the capillary pulse, noted by a delicate instrument, that the mental effort required for fixed attention excited a vaso-constrictor reflex with acceleration of the heart, and of respiration, often vaso-motor irregularity or fluttering at this phase of excitation; then came a stage of depression, with slowed pulse and respiration, and a general weakening of dicrotism of the capillary pulsation, which is, they state, a symptom of fatigue. (Page 125.)

The power of attention is variable with individuals: it is proportioned to the physical development and age; it is rudimentary with degenerates . . . and weak persons; it is little developed in children. (Page 125.)

Every impression is a memory in formation or which may be evoked when once formed; now, childhood is spent in accumulating memories for all the rest of life, and, as there are few impressions which do not cause muscular functioning, it follows that the more numerous the impressions, so are the motions more numerous, and, *vice versa*, the more numerous the movements are, so are the impressions and the stores of memory more numerous. This is one of the reasons for the physical activity of childhood, which seeks to adapt itself to its environment by the intermediary of its sensory organs. (Page 127.)

Attention exhausts the psycho-dynamic forces necessary for motion, and, conversely, motion attenuates or suppresses attention. (Pages 127–128.)

The power of attention is limited and intermittent because each fixation of attention is accompanied by a sensation of effort. (Pages 130–131.)

FRANCE

Étude sur l'Influence de la Durée du Travail Quotidien sur la Santé Générale de l'Adulte. [*Study of the Effect of the Length of Working Hours upon the General Health of Adults.*] ILIA SACHNINE, *1900.*

Attention is always accompanied by a sensation of effort, and fatigue resulting from attention is in direct proportion to the continuance of the effort and the difficulty of sustaining it. If one attempts to fix his attention unwaveringly upon one object, he is soon conscious that the object is less keenly realized, then becomes clearer; in a word, attentiveness has a kind of rhythm; it oscillates. (Page 135.)

Every one knows by experience that if attention or mental work be prolonged beyond measure there results a sort of mental cloudiness which tends to become more and more severe and may be accompanied by vertigo. The mental activity diminishes; under fatigue, attention and memory are weakened, the association of ideas becomes difficult and distraction augments. (Page 138.)

Travail et Plaisir. [*Work and Enjoyment.*] CHARLES FÉRÉ, *Doctor of Medicine. Paris, Alcan, 1904.*

Fatigue, which is shown in lessened energy of voluntary motions and also in their slackening and loss of precision, brings also a diminution of muscular tonicity. There is a fatigue of tone (Tonus). The cramps which often coincide with other signs of motor weakness may be considered as due to a sort of ataxy of tone. This means, in other words, that the physical conditions of attention are profoundly altered; involuntary attention is diminished as well as voluntary attention. (Pages 446–447.)

Defect of attention hinders receptivity. At the same time memory undergoes a rapid disintegration. Depression of attention and of memory is evinced in practical life by mistakes, errors, troubles of association, etc. (Page 447.)

BELGIUM

Thirteenth International Congress of Hygiene and Demography. Brussels, 1903. Vol. V, Sec. IV. Dans quelle mesure peut-on par des méthodes physiologiques, étudier la fatigue, ses modalités et ses degrés dans les diverses professions? Quels sont les arguments que les sciences physiologiques et médicales peuvent ou pourraient faire valoir en faveur de tel ou tel mode d'organisation du travail? [*To what extent may fatigue resulting from occupation be estimated by physiological methods, and what arguments can medical and physiological science present in favor*

of special methods of industrial organization?] Dr. JEAN DE MOOR, *University of Brussels. Brussels, 1903.* BELGIUM

An excess of physical labor extends its depressing influence to all nervous functions. It diminishes the precision of movements and the exactness of their rhythm, and promotes trembling. It diminishes cutaneous sensibility and blunts all the psychic activities. (Page 9.)

Labor always involves to a certain degree the intervention of the higher mental activities; more and more, in our era, the share of mental work grows in every department. It is thus certain that in many occupations men exhaust not only the muscles employed but also the functions of attention and association which are incessantly brought into action. (Page 9.)

Über die Ursachen der Neurasthenie und Hysterie bei Arbeitern. [*The Causes of Neurasthenia and Hysteria among Working People.*] PAUL SCHÖNHALS. *A Study of 200 Cases in the Workingman's Sanitarium at Shönow Zeblendorf. Berlin, 1906.* GERMANY

In the development of nervous disorders, overstrain of the faculty of attention, which is concentrated on the work, is of the most decisive influence. (Page 27.)

Medizinische Klinik. Bd. 3², Nr. 30, 1907. Die Ermüdung des Nervensystems und der Muskeln. [*Nervous and Muscular Fatigue.*] Dr. JENÖ KOLLARITS, *Professor of Neurology, Buda-Pesth. Berlin, 1907.* AUSTRIA

. . . Fatigue, like a shadow, attends every manifestation of life, . . . stimulation modifies tissue change and promotes disassimilation. Thereupon should follow a process of active assimilation. (Page 893.)

Symptoms of fatigue are caused by the progress of disassimilation as it takes place in the living and working tissues. If the organism, as a whole, is incapable, even with the help of accelerated heart action and deep rapid respirations of replacing the loss to tissues through consumption of their material, then we speak of exhaustion.

Fatigue of the nervous system embraces mental fatigue, or weariness from thought,—fatigue of motion, and fatigue of feeling or sensation. Every one knows that continuous thought is fatiguing. No one can read indefinitely—sooner or later the mind refuses to follow the words. A complete restoration from such fatigue is only to be attained by a complete release from work.

AUSTRIA

It is important to know how long one cell or cell group of the brain may remain active in mental work . . . (experiments described of calling faces of acquaintances before mental vision, etc.). It is probable that disturbance of attention is nothing else than the speedy wearying of the brain cells that are called directly into action; to be sure the heightened irritability of the nervous system under the stimulus of attention also comes into play. (Page 894.)

UNITED STATES

The Mental Symptoms of Fatigue. Reprinted from the Transactions of the New York State Medical Association. EDWARD COWLES, M.D., *Medical Superintendent of the McLean Hospital, Somerville, Mass. New York, Fless and Ridge, 1893.*

Every exercise of the will in attention is accompanied by the expenditure of energy, and by the "sense of effort" that occurs, particularly when attention works against some resisting motive, interest, or feeling. This directing and inhibitory control is at its best in the equilibrium of health of mind and body, and therefore it is a most important means of estimating mental health and vigor; mental disorder is commonly attended with disturbances of the normal process of attention. (Page 13.)

Sixty-fifth Annual Meeting of the American Institute of Instruction. The Relation of Fatigue to Social and Educational Progress. HENRY S. BAKER, Ph.D. *Boston, 1895.*

The grand law of fatigue, as related to the mind, is that the highest faculties are the first to weaken from general fatigue, and become dull, inactive, or useless. (Page 38.)

Continued attention to one subject cannot be given by a tired person for, being a higher faculty, it tires among the first. (Page 38.)

The will is one of the first things to feel the effect of general fatigue. A tired man is lazy, physically and mentally. His higher brain cells have "struck," as it were for a holiday, and more brain food and time to eat it, so to speak. (Page 39.)

E. *Bad Effect of Fatigue upon Morals*

The dangers attendant upon excessive working hours are shown also by the moral degeneration which results from over-fatigue. Laxity of moral fiber follows physical

debility. When the working day is so long that no time is left for a minimum of leisure and recreation, relief from the strain of work is often sought in alcoholic stimulants. In extreme cases the moral breakdown leads to mental degeneracy and criminal acts.

(1) General Loss of Moral Restraints

British Sessional Papers. Vol. XXII. 1842. Reports of Inspectors of Factories. GREAT BRITAIN

There can be little doubt that working 10 hours a day would be more favourable to health and the enjoyment of life than 12 hours a day can be; but without entering into the question of health, no one will hesitate, I think, to admit that, in a moral point of view, so entire an absorption of the time of the working classes . . . must be extremely prejudicial, and is an evil greatly to be deplored. Some there are, undoubtedly, who, by more than ordinary natural energy, overcome this disadvantage; but with the great mass it has the effect of rendering them ignorant, prejudiced, addicted to coarse sensual indulgences, and susceptible of being led into mischief and violence by any appeal to their passions or prejudices. With so few opportunities of mental culture, and of moral and religious training, it is surprising that there should be so many virtuous and respectable people among them. For the sake, therefore, of public morals, of bringing up an orderly population, and of giving the great body of the people a reasonable enjoyment of life, it is much to be desired that in all trades some portion of every working day should be reserved for rest and leisure. (Page 30.)

British Sessional Papers. Vol. VI. 1901. Report from the Select Committee of the House of Lords on Early Closing of Shops.

Witness, Sir W. MacCormac, President of the Royal College of Surgeons:

2466. . . . I have a strong opinion that moral and physical well-being depend largely one upon the other, and that if from any cause the physical condition of men and women is lowered the moral nature must to some extent suffer too. . . . I quite agree with the opinions of my predecessors that such long hours are very grievous, and are calculated to do the community in which they largely prevail serious harm. (Page 120.)

GREAT BRITAIN

The Case for the Factory Acts. Edited by Mrs. Sidney Webb. *London, Richards, 1901.*

If working long and irregular hours, accepting a bare subsistence wage, and enduring insanitary conditions tended to increase women's physical strength and industrial skill—if these conditions of unregulated industry even left unimpaired the woman's natural stock of strength and skill—we might regard factory legislation as irrelevant. But as a matter of fact a whole century of evidence proves exactly the contrary. To leave women's labour unregulated by law means inevitably to leave it exposed to terribly deteriorating influences. The woman's lack of skill and lack of strength is made worse by lack of regulation. And there is still a further deterioration. Any one who has read the evidence given in the various inquiries into the Sweating System will have been struck by the invariable coincidence of a low standard of regularity, sobriety, and morality, with the conditions to which women, under free competition, are exposed. (Pages 209–210.)

Diseases of Occupation from the Legislative, Social, and Medical Points of View. Thomas Oliver, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery and Lucifer Match Committees of the British Home Office. New York, Dutton, 1908.*

The cheerless days, too, spent in a textile factory amid the din of machinery, and the monotonous character of the work, are not such as of themselves to quicken the intellect and promote the higher interests of life. Is it not rather that they tend, through the strain they cause, to encourage a craving for that form of recreation which seeks an outlet in excitement and pleasure, and, on the other hand, to dishearten men and women, who, as factory operatives, feel that they cannot rise to a higher occupation than that of minding machinery? The despotism of some branches of modern labour is overpowering. Factory legislation has done something to minimize this. . . . To be of helpful service factory legislation must be progressive and keep pace with the industrial problems special to each succeeding age. (Page xii.)

ITALY

Revue Internationale de Sociologie. Nov., 1895. Le Travail Humain et ses Lois. [*The Laws of Human Work.*] Francesco S. Nitti, *Professor, University of Naples. Paris, Giard et Brière, 1895.*

A fact of no less importance affirmed by physicians everywhere and which explains why people subjected to long hours of work are often very

excitable without displaying real resistance in industrial struggles, is that fatigue causes in individuals and races subjected to it, an irritable weakness, an excessive excitation, and almost always a feeble will. (Page 1038.) ITALY

Fatigue. A. Mosso, *Professor of Physiology, University of Turin, 1896. Translated by* Margaret Drummond, M.A., *and* W. B. Drummond, M.B., *Extra Physician Royal Hospital for Sick Children, Edinburgh. New York, Putnam, 1904.*

Extreme fatigue, whether intellectual or muscular, produces a change in our temper, causing us to become more irritable; it seems to consume our noblest qualities—those which distinguish the brain of civilized from that of savage man. When we are fatigued we can no longer govern ourselves, and our passions attain to such violence that we can no longer master them by reason.

Education, which is wont to curb our reflex movements, slackens the reins, and we seem to sink several degrees in the social hierarchy. We lose the ability to bear intellectual work, the curiosity, and the power of attention, which are the most important distinguishing characteristics of the superior races of man. (Page 238.)

Proceedings of the First International Convention on Industrial Diseases. Milan, 1906. Frenastenia e delinquenza in rapporto a taluni ordinamenti del lavoro. [*Imbecility and Criminality in Relation to certain Forms of Labor.*] Prof. Crisafulli.

Every overfatigued worker is subject to a kind of poisoning derived not alone from the insalubrity of his place of work and surrounding conditions, but also from exhaustion.

The symptoms of this abnormal condition are always more apparent in the last hours of the working day. Muscular weariness produces cerebral weariness. In a word, it is exhaustion which is often followed by nervous overexcitability, by hypersensitiveness, melancholy, sullenness, etc., all of which urge the individual to impulsive and conscienceless acts. From this to crime is but a step. (Page 149.)

Muscular work influences the nervous system, for good or ill. The brain is profoundly affected by muscular overfatigue. The excessive weariness and lassitude of the overworked man can no longer be considered the immediate result of his work, by rather the index of anomalies in metabolism from which auto-poisoning inevitably results. Prof. Mosso found that the brains of carrier pigeons, after a flight of 500 kilos,

ITALY

were pale and anæmic; likewise the brains of quails, which, flying from the African coast, fell exhausted upon our shores. (Page 150.)

It is true that among malefactors there are many who, wearied and tormented by overwork and exhaustion suffer persistent changes of the organic metabolism to the detriment of the inhibitory centres, numbing the conscience, enfeebling moral and discriminatory powers, with irresponsible resultant actions often positively instinctive.

It is an established fact that overfatigued workingmen, through the actual poisoning of fatigue, become unsettled in their mental equilibrium, remaining almost paretics in mental associations and discriminations, in the inhibitory powers and in the sentiments. (Page 157.)

FRANCE

Travail et Plaisir. [*Work and Enjoyment.*] CHARLES FÉRÉ, *Doctor of Medicine. Paris, Alcan, 1904.*

It is said that laziness is the mother of all vices, but fatigue is no less fertile; it increases desires and lessens self-control. (Page 451.)

GERMANY

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. 1896. [*Official Information from Reports of the* (*German*) *Factory Inspectors.*] *Berlin, 1897.*

Inspector for Baden:

Then, too, physical overexhaustion cannot promote morality, for with lowered bodily resistance goes enfeeblement of will power. (Page 251.)

UNITED STATES

Massachusetts House Document. No. 98. 1866.

Overwork is the fruitful source of innumerable evils. Ten and eleven hours daily of hard labor are more than the human system can bear, save in a few exceptional cases. . . . It cripples the body, ruins health, shortens life. It stunts the mind, gives no time for culture, no opportunity for reading, study, or mental improvement. It leaves the system jaded and worn, with no ability to study. . . . It tends to dissipation in various forms. The exhausted system craves stimulants. This opens the door to other indulgences, from which flow not only the degeneracy of individuals, but the degeneracy of the race. (Page 24.)

Massachusetts House Document. No. 44. 1867. Report of Special Commission on the Hours of Labor.

It is certain that men may labor so severely and incessantly as in the long run to impair the vital energies, and thus reduce the powers of pro-

duction; and it may be further true that too great amount of toil may not only injure the physical powers, but depress or impair the mental faculties, so that in this way the productive capacity of a people may be greatly lessened. And, still further, not only the physical and mental but the moral nature of man may be imbruted by severe and unreasonably protracted toil.

The hours devoted to labor should not be so extended as not to leave sufficient time and strength to engage in those pursuits which will qualify the laborer for the discharge of his duties to himself, his family, and his government. (Pages 22–23.)

Evidence Submitted to the Massachusetts Legislature in Favor of the Enactment of a Ten-Hour Law. Lawrence, 1870.

After many years of careful observation, I think I can say, with truth, that the results of the eleven-hour system are evil, and only evil, physically, intellectually, and morally.

Overtasking all the powers of men, women, and children; pressing them in all their labors, and long, weary, exhausting hours of toil to a mere subsistence. . . . Any system of labor which thus tramples upon and treats with contempt man's higher nature, requiring of the father, mother, and children a constant battle to secure a bare living, leaves no time to cultivate the intellectual or moral nature; every energy of mind and body is crushed. Crime treads on the heels of crime as a natural result, driving multitudes to the intoxicating cup with all the attendant miseries. I. DUNCAN. (Pages 13–14.)

Report of Massachusetts Bureau of Statistics of Labor. 1870–1871.

Reduced hours of labor have a great tendency to improve one morally, mentally, and physically—a person will, under continual long hours, either succumb from want of physical power, or become a mere brute, not having time to think, visit, or do anything that would tend to personal improvement. Under such circumstances, it is nothing but work and sleep, if there is a family to support. (Page 591.)

Report of the Maine Bureau of Industrial and Labor Statistics. 1892.

Employers should realize that long hours at a severe tension are a cause of irritation among their employees, and they become ripe for almost any trouble, and trifles are often sufficient to precipitate violent strikes. The real cause of many of these strikes is overwork. (Page 12.)

UNITED STATES

Report of New York State Factory Inspector. 1899.

Long hours of hard manual labor destroy the mental appetite in almost every instance.

The man is unfitted for reading or study—he is physically tired—and his intellect is inactive. The drain upon his vitality has been continuous and heavy, and he must needs sleep in order to recuperate. This continues indefinitely—each succeeding day being but a repetition of the former. (Pages 16–17.)

Report of the Nebraska Bureau of Labor and Industrial Statistics. 1907–1908.

Girls in factories are expected to keep up a certain "pace" while at work, and ten hours of driving work at a hot pace are not to be considered conducive to good health physically or to leave the worker in any humor for applying herself to educational improvement. Dances and shows will be the most attractive things to be indulged in after work, if the chance offer. (Pages 33–34.)

Sixty-fifth Annual Meeting of the American Institute of Instruction. The Relation of Fatigue to Social and Educational Progress. HENRY S. BAKER, Ph.D. *Boston, 1895.*

Among the higher functions of certain brain tracts is that of inhibition. These tracts are called "inhibitory centres," and their function is like that of brakes on a wagon, or like the governor on an engine, or like that of a coachman who holds a tight rein when his spirited team is going down hill or along a crowded street. The effect of fatigue on these centres is seen very quickly in any prolonged effort. . . . In general, self-control is lost, and the lower, the baser, and the more selfish faculties of our nature run riot. . . . In short, the fatigued person is very sure to fly off on a tangent in one or more lines. In other words, his inhibitory centres have ceased to act, he has little self-control. Most crimes of all kinds are committed at night, when men are tired, ugly, and possessed of little judgment, comparatively, and less conscience. . . . The rested boy or man can resist temptation, but the tired one cannot. His will and conscience are both too weak. (Page 41.)

The facts of fatigue settle scientifically and beyond appeal some social and religious questions. Dr. C. F. Hodge, of Clark University, proved that, while eight or ten hours of rest restored the tired nerve cells to a

condition nearly normal, at least thirty or thirty-six hours is needed for an absolutely complete recuperation. That means that a Sabbath, giving so long a rest, is a necessity, if man is to do his best work physically and intellectually or live at his best esthetically, morally and religiously. (Pages 51–52.) UNITED STATES

Women and the Trades. ELIZABETH BEARDSLEY BUTLER. *The Pittsburgh Survey. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1909.*

Dulled senses demand powerful stimuli; exhaustion of the vital forces leads to a desire for crude, for violent excitation. Little time is left for pleasure after a ten-hour day. In such circumstances, culture of hand or brain seems unattainable, and the sharing of our general heritage a remote dream. A consideration of even more immediate importance is that such circumstances impel undisciplined girls toward unsocial action, toward vicious or criminal behavior. Craving for excitement is the last symptom of a starved imagination. At this point, discrimination has become too great an effort; foresight and social judgment have become impossible. Any excitation, destructive or not, is acceptable, if only it be strong; the effect of it is to create a desire for stronger stimulation. Roller-skating rinks, dance halls, questionable cafés, may figure only temporarily in the worker's life, or by increasing the demand for excitement, may lead to sexual license. (Page 356.)

(2) GROWTH OF INTEMPERANCE

British Sessional Papers. Vol. XXI. 1833. Second Report of . . . the Commissioners for inquiring into the Employment of Children in Factories and . . . Reports by the Medical Commissioners. Dr. HAWKINS (*Lancashire district*). GREAT BRITAIN

Intemperance, debauchery, and improvidence are the chief blemishes on the character of the factory workpeople, and those evils may easily be traced to habits formed under the present system, and springing from it almost inevitably. . . . On all sides it is admitted that indigestion, hypochondriasis, and languor affect this class of the population very widely. After twelve hours of monotonous labour and confinement, it is but too natural to seek for stimulants of one kind or another; but when we superadd the morbid states above alluded to, the transition to spirits is rapid and perpetual. (Page 4.)

GREAT BRITAIN

Hansard's Parliamentary Debates. Vol. LXXIII. 1844.

Mr. Roberton, a distinguished surgeon at Manchester, says, in a published essay:

I regard it as a misfortune for an operative to be obliged to labour for so long hours at an exhausting occupation, and often in an impure atmosphere. I consider this circumstance as one of the chief causes of the astounding inebriety of our population.

Many females state that the labour induces an intolerable thirst; they can drink, but not eat. (Page 1095.)

Mr. V. Smith:

. . . Overwork, with disproportionate wages, was often productive of immorality. The reason was obvious; overwork produces exhaustion and a craving for excitement, which led to immorality. . . . High wages paid for work very laborious were apt to make workmen dissipated. Overexertion required corresponding periods of idleness. (Pages 1501–1502.)

British Sessional Papers. Vol. XXIII. 1877. Report of Inspectors of Factories for Half-year ending April 30, 1877.

Overtime induces drinking; it will be found in all the occupations in which overtime is worked there is more or less drinking. In trades like brickmaking, where there is a considerable strain upon the muscles, there is on that account a tendency to think it necessary to replace the waste by exciting drink, and this is, of course, intensified when work is continued longer than the body can properly sustain. (Page 15.)

British Sessional Papers. Vol. XXXIV. 1893. Royal Commission on Labour. Group C.

Mr. George Mitchell, chemical workers of Glasgow, Imrie, and Rutherglenn:

21,250. And you are satisfied that that is an accurate statement that, year in and year out, 60 per cent of the men employed in the chemical works work seven days a week, 12 hours per day? — No. It is not the case that they do it, from the very fact that the physical strain is too great for them.

For instance, as a general rule, they are paid every fortnight, and generally on the Saturday on which the pay occurs, you will find, if you take a visit through the chemical works, that the furnaces are in a great number of cases out, for the simple reason that the men's exhaustion is so great

that they generally get drunk immediately after getting their pay, and consequently are unable to come to their work that afternoon. . . .

21,252. You say in consequence of the physical exhaustion entailed by their labour, that on the pay days the men generally get drunk? — Yes. (Page 3.)

British Sessional Papers. Vol. XII. 1903. Report of the Chief Inspector of Factories and Workshops.

The result is disastrous, even from the point of view of the industry itself, which if properly organized would be capable of offering really desirable employment to skilled workers instead of being, as it too often is, the last resort of the idle and intemperate. . . . I would add that too often the very intemperance is created by the conditions of employment, by the excessive overstrain of endurance. (Page 174.)

British Sessional Papers. Vol. XXXII. 1904. Report of the Inter-Departmental Committee on Physical Deterioration. Vols. I, II, III.

Committee report:

160. . . . The close connection between a craving for drink and bad housing, bad feeding, a polluted and depressing atmosphere, long hours of work in overheated and often ill-ventilated rooms, only relieved by the excitements of town life, is too self-evident to need demonstration. (Page 30.)

164. The tendency of the evidence was to show that drinking habits among the women of the working classes are certainly growing, with consequences extremely prejudicial to the care of the offspring, not to speak of the possibility of children being born permanently disabled. Factory labour is mentioned as a predisposing cause. (Page 31.)

The Case of the Journeymen Bakers. Evils of Night-work and Long Hours of Work. William Augustus Guy, M.B., *Fellow of the Royal College of Physicians, Professor of Forensic Medicine, King's College; Physician to King's College Hospital, etc. London, Renshaw, 1848.*

But we must look at night-work and overwork in another light. We must look at it, not merely as the cause of sickness and premature decay, but as an unwholesome influence, acting day by day directly upon the body and indirectly upon the mind. Bodily exhaustion is evidently unfavourable to the exercise of self-control. It produces a feverishness, a

GREAT BRITAIN

restlessness, an excited state of mind, which is very apt to lead to excessive indulgence in spirituous liquors. The mind cannot settle to anything even to sleep, and craves excitement and exciting amusements; and thus bad habits are formed, which grow upon a man until it becomes very difficult to throw them off. (Page 12.)

Dangerous Trades. THOMAS OLIVER, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the Home Office. London, Murray, 1902.*

It is frequently asserted that laundry women as a class are intemperate and rougher than most industrial workers. That they are peculiarly irregular in their habits it is impossible to deny; and the long hours, the discomfort and exhaustion due to constant standing in wet and heat, discourage the entrance into the trade of a better class of workers is certain. . . . The prevalence of the drink habit among many of them, of which so much is said, is not difficult to account for: the heat of an atmosphere often laden with particles of soda, ammonia, and other chemicals has a remarkably thirst-inducing effect; the work is for the most part exhausting, even apart from the conditions, and the pernicious habit of quenching the thirst, and stimulating an overtired physical condition, with beer. (Pages 671–672.)

GERMANY

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1907. Bd. I. Preussen. [*Reports of the (German) Factory and Mine Inspectors for 1907. Vol. I. Prussia.*] *Berlin, 1908.*

Wherever night shifts or excessively long hours are the rule, alcoholic stimulants are taken constantly as a means for keeping up the energies . . . it is then doubly harmful. (Page 1^{240}.)

A definite decrease in the consumption of alcoholic drinks is to be hoped for as a result of the slowly progressing movement for shorter hours, better economic conditions, etc. . . . because the physical strain will then be lessened, nutrition better, etc. (Page 1^{241}.)

Handbuch der Arbeiterwohlfahrt. Bd. II. [*Handbook of the General Welfare of the Working Classes. Vol. II.*] *Edited by* Dr. OTTO DAMMER. *Arbeiterschutz.* [*Protection of Working People.*] Dr. ASCHER. *Stuttgart, Enke, 1903.*

That the over-exhaustion of brain and nerves not only is frequent among employees in responsible posts, as on railroads, etc., but has also

cost many innocent lives as well, is too well known to need referring to here. Of no less importance is the indirect influence of working time on the worker. A rest so short that it actually only suffices for sleep degrades man to a beast of burden, undermines family life, when such exists, demoralizes the individual, who is allowed only the possibility of satisfying sensual wants, drives the man to drink and the woman to prostitution. (Page 79.)

Verwaltungsbericht der Landes-Versicherungsanstalt Berlin, für das Jahr 1906. [*Report of the State Invalidity and Old Age Insurance Department for Berlin for 1906.*] *Report of the Physician in Chief of the Beelitz Sanitarium. (Tuberculosis not included.) Berlin, Loewenthal, 1907.*

It is self-evident that the organism of the workman, overstrained by claims which often force him beyond the limit of his natural capacity, has urgent need of abundant and suitable nourishment. (Page 62.) . . . That a body so ill-nourished must with time lose its capacity for work, is undeniable, and it is only too readily conceivable that its possessor first intermittently, and then regularly, resorts to stimulants to brace himself, either not knowing or not apprehending the greater injury that it will do him. (Page 63.)

Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. II. Sec. II. Die Ursachen des Alkoholismus. [*Causes of Alcoholism.*] Dr. H. Vogt, *Germany, Berlin, 1908.*

By far the most important factors in alcoholism are the power and effect of external conditions . . . the influence of the surroundings . . . dangers encountered in occupations; then, too, the repeated exertions required by work, often far exceeding, whether momentarily or continuously, the strength of the worker. (Page 376.)

Among external factors encouraging alcoholism different kinds of working conditions present very special temptations, sometimes because of the intensity of strain involved in them, or it may be because they are repulsive to the worker and so call for a special effort. (Page 379.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. Conrad, *Professor of Political Science in Halle;* L. Elster, *Ober Reg. Rath in Berlin;*

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W. LEXIS, *Professor of Political Science in Göttingen; and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

Often the overtaxed workman seeks to relieve this tension, to keep up by the stimulus of drink. The enhanced capacity temporarily gained by such means, especially by alcohol, which plays a fatal part, only sinks later, however, into a more pronounced fatigue. (Page 1216.)

SWITZERLAND

Berichte über die Fabrikinspektion im Jahr 1879. [*Reports of the (Swiss) Factory Inspectors. 1879.*] *Berne, Stämpflische Printing House, 1880.*

Dr. Fridolin Schuler, Inspector of 1st District:

One hears much complaint of the drunkenness . . . immorality of the workmen, but, surprisingly enough, only in those industrial regions where excessive hours of work are regularly the rule. An employer . . . whose men worked from early morning until far into the night did not seem to realize that this was the real reason for what he called their "laziness." For who can fail to perceive that a workman who is kept at crushingly hard work early and late must become tired out—must need artificial stimulants to keep him going? (Page 14.)

It seems that, in general, the entire discussion of the normal workday has been confined too exclusively to the commercial standpoint and that an all-round examination of the subject on the basis of the suggestions here made is greatly to be desired. (Page 14.)

FRANCE

Débats et Documents Parlementaires, Chambre des Députés, 23e Mars, 1881. [*Parliamentary Debates and Documents (French), Chamber of Deputies, Mar. 23, 1881.*] *Suite de la discussion des propositions de loi concernant la durée des heures de travail dans les usines et les manufactures.* [*Discussion of the sections of the law relating to the length of hours of work in workshops and factories.*]

Senator Waddington:

As far back as 1848, General Castellane said, "The workers have no time to sleep. When one cannot sleep, one must keep up his strength by extra food. They cannot do that, so they have recourse to alcoholic drinks to produce a fictitious strength." (Page 616.)

Archives Générales de Médecine. Vol. I. 1906. La Journée de Huit Heures. [*The Eight-hour Day.*] Dr. P. CORNEILLE. *Paris, 1906.* FRANCE

Dr. Verhaeghe, in la Médecine Sociale, regards the long working day as an obvious cause of overstrain and sees in this overstrain the primary cause of alcoholism, tuberculosis, and physical degeneracy in all its forms.

The same opinion is held by Dr. Gley of the Faculty of Medicine.

Like Imbert, he sees in fatigue the chief causes of labor accidents, and, like Verhaeghe, he holds that excess of labor leads to alcoholism. (Page 1199.)

Proceedings of the 1st International Convention on Industrial Diseases. Milan, 1906. Frenastenia e delinquenza in rapporto a taluni ordinamenti del lavoro. [*Imbecility and Criminality in Relation to certain Forms of Labor.*] Prof. CRISAFULLI. ITALY

In the bitter competition of the age, the organism of workmen quickly succumbs to fatigue; they must therefore be looked after with all due care to ward off the many incurable ailments that threaten the life of both manual and brain workers.

. . . In many cases this poisoning produced by fatigue drives the working man to drink, by means of which he hopes to restore his exhausted energy.

The consequences are, then, serious indeed, there being a double poisoning at work, that of fatigue and that of alcohol. (Page 150.)

Evidence Submitted to the Massachusetts Legislature in Favor of the Enactment of a Ten-Hour Law. Lawrence, 1870. UNITED STATES

G. S. Weaver, Pastor of Universalist Church, Lawrence:

I beg leave to state, after ten years' observation in this community, that in my judgment our people are so overworked as to materially hinder their intellectual and spiritual improvement. Their excessive labor quite unfits them for serious thought and for seeking the advantages of Christian improvement. I seriously question whether their exhausted condition does not create a desire for stimulants, which is even a greater evil than overwork among our laboring people. Anything which legislators can do to preserve the physical force of our people and temperate habits will be work in the right direction, and nothing is clearer than that the mothers and children are the class specially needing legislative care.

I could say much from observation on these two points, *Overwork* and *Intemperance.* (Pages 20–21.)

UNITED STATES

Report of Massachusetts Bureau of Statistics of Labor. 1871.

Labor excessively protracted defeats its own end—the maximum of production—by the exhaustion and sickness engendered, and by the drunkenness, dissipation, and idleness of which it is the efficient cause.

The evils resulting from the excessive labor of factory men, women, and children, especially the latter two classes, produce marked results of a detrimental nature. (Page 573.)

Massachusetts Senate Documents, No. 33. 1874.

The Committee on the Labor Question to whom was referred so much of the Governor's address as relates to Labor Reform, having considered so much thereof as pertains to the enactment of a ten-hour law, and having also considered the petition of Wendell Phillips and others for the passage of such a law, report: . . . that working eleven and twelve hours a day in these factories saps the energies and produces a depression of spirits that finds relief only in the indulgence of intoxicants. (Page 1.)

Relations between Labor and Capital. United States Senate Committee on Education and Labor. Vol. 1. 1883. Gov't Printing Office, 1885. Testimony of ROBERT HOWARD, *Mule-spinner in Fall River Cotton Mills.*

I have noticed that the hard, slavish overwork is driving those girls into the saloons, after they leave the mills evenings . . . good, respectable girls, but they come out so tired and so thirsty and so exhausted . . . from working along steadily from hour to hour and breathing the noxious effluvia from the grease and other ingredients used in the mill. (Page 647.)

Wherever you go . . . near the abodes of people who are overworked, you will always find the sign of the rum-shop.

Drinking is most prevalent among working-people where the hours of labor are long. (Page 649.)

Report of the New York Bureau of Labor Statistics. 1900.

Excessive work and long hours are the causes that have powerfully promoted the use of stimulants and intoxicating liquors. The harmful influence of a long working day acts not only directly upon those who work, but also upon future generations and threatens the vigor and full development of the human race. (Page 66.)

UNITED STATES

Fourteenth and Fifteenth Annual Convention of the International Association of Factory Inspectors of America. Indianapolis, 1900. Niagara Falls, 1901. (*Bound in New York Department of Labor Report, 1901.*) *The Shorter Workday in its Effect upon the Personal Character of the Worker.* JOHN HOLBROOK, *Deputy Commissioner of Labor, Michigan.*

There is such a thing as the moralization of time in reference to its effects upon personal character. The worker who formerly toiled long hours from morning till night and six days in the week, left idle on the seventh day, was under great temptation to make a brute of himself on that day. Too tired to do anything, jaded body, starved brain, brutalized soul, there could be no Sunday rest for such; there was nothing left to do but get drunk as the natural result of a tired and brutalized body and soul.

More leisure has given opportunities for thought and the growth of intelligence which eager minds have not been slow to improve; the newspaper, work of science, and a quiet Sunday in which more than a small minority attend worship, have been wonderfully helpful and elevating.

Under the old order of things no man could avail himself of Sunday rest and worship. He was too tired and too weary to enjoy them, even if he had the capacity, which was very doubtful; nor was he fitted for home life and its duties, and consequently missed its moralizing effects. (Pages 564–565.)

Industrial Conference under the Auspices of the National Civic Federation, New York, 1902. The Eight-hour Day. Prof. GEORGE GUNTON, *Institute of Social Economics. The Winthrop Press, New York, 1903.*

So long as the laborer works to the point of being exhausted, so far is the possibility of this educational opportunity destroyed. To work in the factory till exhausted disqualifies a laborer for reading a book, for instance, and for enjoying the social influences of family and friends. It fits him for the saloon, it fits him for the need of stimulants; he comes to the point where he wants the quickest relief, and, unfortunately, that is too frequently the saloon. (Page 173.)

American Academy of Political and Social Science. Vol. XXVII, No. 3. 1906. Philadelphia. The Manhood Tribute to the Modern Machine: Influences Determining the Length of the Trade Life among Machinists.

James O'Connell, President International Association of Machinists:

In searching for something to brace up his nerves the worker has no idea he is taking great risks, or running any danger of becoming a victim

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to the drug habit. Unfortunately, it often happens that he strikes something which for the time seems to renew the health and vigor of the years gone by, but the relief is only temporary. He must repeat and increase the dose, and before he knows it—he perhaps never realizes it—he becomes the slave of some derivative of coal tar, alkaloid or alcohol. (Page 494.)

The Steel Workers. JOHN A. FITCH. *The Pittsburg Survey. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1910.*

The dust of the mills, too, that the men have been breathing for twelve hours, sends another quota to their beer or whiskey to clear out their throats. Then comes the largest contingent of all, the men wearied with the heat and the work, some almost overcome and dragging their feet. These feel the necessity of a stimulant, and they get it day after day, regardless of the waste of physical and nervous energy involved in keeping themselves keyed up to their work by an artificial aid. I do not think I am far wrong when I say that a large majority of steel workers sincerely believe that the regular use of alcoholic drinks is essential to keep them from breaking down. (Page 227.)

The better class of steel workers, who view their fellows with a sympathetic eye, explain the holiday intoxication of a certain element in the industry as a logical result of steady work and the long day. After weeks and months of work, twelve hours a day, and no holidays, a man gets far behind in his accumulation of the pleasure that he feels to be his due. (Page 228.)

F. *Bad Effect of Long Hours on General Welfare*

(1) STATE'S NEED OF PRESERVING HEALTH

The experience of manufacturing countries has illustrated the evil effect of overwork upon the general welfare. Health is the foundation of the state. No nation can progress if its workers are crippled by continuous overexertion. The loss of human energy, due to excessive working hours, is a national loss, and must inevitably result in lowering the nation's prosperity.

Hansard's Parliamentary Debates. Vol. LXXIV. 1844. GREAT BRITAIN

Viscount Howick:

I contend that you altogether misapply the maxim of leaving industry to itself when you use it as an argument against regulations of which the object is not to increase the productive power of the country, or to take the fruits of a man's labour from himself and give it to another, but, on the contrary, to guard the labourer himself and the community from evils against which the mere pursuit of wealth affords us no security. The mere increase of a nation's wealth is not the only—it ought not even to be the first and highest—object of a Government. The welfare, both moral and physical, of the great body of the people I conceive to be the true concern of the Government . . . In the too eager pursuit of wealth, a nation, like an individual, may neglect what is of infinitely higher importance. (Page 642.)

Factory Act Legislation. The Cobden Prize Essay for 1891. Victorine Jeans. *London, T. Fisher Unwin, 1892.*

The bodily and intellectual energy of the individual workman is, after all, the only true basis of any kind of national greatness. . . . Long experience teaches this: that no law which promotes the physical, intellectual, and moral good of the working classes can in the long run prove economically unsound. (Page 91.)

The Case for the Factory Acts. Edited by Mrs. Sidney Webb. *London, Richard, 1901.*

The question arises, however, whether on philanthropic grounds alone individuals of mature years can be denied the right to work as long and as unhealthily as they like. The Acts of 1891 and 1895 show signs of a recognition, if a tardy one, that the real grounds of interference with industry are considerations of public health and safety. The old idea of protecting certain classes of workers because they are not "free agents" is more and more felt to be irrelevant, if not meaningless. There are still those who ask in astonishment, "May not a man, may not a woman, employ their capital or their labour as they choose?" But the State says, with a less and less hesitating sound, "Not under conditions wasteful of the life, or destructive of the efficiency, of those employed, or dangerous to the safety and well-being of the community." To this conclusion it has been driven by inquiry into the conditions of public health. (Page 123.)

GERMANY

Handbuch der Hygiene. Bd. 8[1]. [*Handbook of Hygiene. Vol. 8*[1].] *Edited by* Dr. THEODORE WEYL. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. EMIL ROTH. *Jena, 1894.*

In no field have State and society greater duties to perform than in industrial hygiene and the prevention of accidents, and these duties become more serious as the difficulty and dangers of occupation increase. . . . And yet no one can deny that the present industrial labor of women and children betokens a misdirection of working strength which, by dint of premature and unnatural drains upon and exhaustion of labor capacity, is capable of inflicting moral and physical injury upon the family. Obviously also, the preservation and vigor of the family are the first essentials of all social reforms. . . . The protection of labor is not only a postulate of humanity and of morals, but above all else, of the national health.

The aim and purpose of our work is to benefit the whole race, by bringing the egoistic desires of individuals into harmony with the purposes of a unified society. (Pages 1–3.)

Die Pathologie und Therapie der Neurasthenie. [*Pathology and Therapeutics of Neurasthenia.*] Dr. OTTO BINSWANGER, *Professor of Psychiatry and Director of the Psychiatric Hospital at Jena. Jena, Fischer, 1896.*

General prophylaxis will find its most pressing duty to lie in the protection of those members of society who are still healthy, from immoderate demands upon their strength. As, on account of the competition in all classes of society, it is hardly possible to relax intensity of work for any one individual without destroying his chances for success, a general plan of hygienic regulation of work must be adopted with a view to the preservation of racial vigor, and the working energy demanded shall be reduced enough to allow rest and recreation in ample extent for every one. (Page 358.)

Archiv für Unfallheilkunde, Gewerbehygiene und Gewerbekrankheiten. Bd. I. Über den Gesundheitsschutz der Gewerblichen Arbeiter. [*Protection of the Workingman's Health.*] Dr. SCHAEFER. *Stuttgart, Enke, 1896.*

There is scarcely a single industrial occupation in which one or more of the above influences (results of excessive standing, sitting, etc.) is not

prominent. We include them therefore in the general dangers of occupation to which factory workers especially are exposed. (Page 202.)

The claim for a shorter working day, which has been pressed in all civilized countries within the past few decades, and which may be defined as an absolute social need, can not be urgently enough supported in the interest of the public health. (Page 204.)

Gesammelte Abhandlungen. Bd. III. [*Complete Works. Vol. III.*] *Die Volkswirthschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages.* [*The Economic Significance of a Shorter Working Day.*] ERNST ABBÉ. *Paper read before the Political Society, Jena, 1901. Jena, Fischer, 1906.*

As the expenditure of power due to the machines running idle amounts to a useless consumption of 30–40 millions of marks of coal, wasted in Germany, so, even more important, is the waste of energy in the loss of efficiency of 3 or 4 million men. And the question then arises: What is the sense of this undoubted waste of strength, when it is possible for men to produce the same in the 8 hours that they do in 10? And whose loss is it? Is it only the loss of individual convenience to men who would find it more agreeable to spend only 8 hours at work, or is it a loss that has a general social and economic significance? I hold it is the latter. (Page 236.)

This squandering of human strength means a loss to the intelligence and mental activity of the human race; it means that a valuable capital which Germany possesses in the intelligence of her workers is lying idle, because the conditions are not such as to permit this intelligence to expand to its full value. (Page 237.)

Grenzfragen des Nerven und Seelenlebens. Bd. VI. [*Borderland Problems of Nervous and Psychic Life. Vol. VI.*] *Edited by* LOEWENFELD *and* KURELLA. *Über die geistige Arbeitskraft und ihre Hygiene.* [*On Mental Working Power and its Hygiene.*] Dr. L. LOEWENFELD. *Wiesbaden, Bergmann, 1906.*

The efficiency of the individual is a part of the national efficiency. If one considers how rushing and incessant the commercial rivalry of civilized states is to-day, and realizes how closely the results of this struggle depend upon the intellectual capital which the nations have at their command, one is obliged to admit what a great significance for national welfare there is in the mental working capacity of the individual. But among

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those most concerned there has been, as yet, by no means adequate recognition of this fact. . . . We are still far from being able to say that all is done that can be done, by private initiative and by the state, to preserve and develop the brain power of the nation. (Page 68.)

Handwörterbuch der Staatswissenschaften. Bd. I. [*The Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

But there is one time when politico-economic doubts (as to the industrial results of restriction) must take second place. Wherever the length of working hours is responsible for injury to health or morals, then the state is justified in interfering, even although the results from the economic point of view cannot be clearly determined. It conflicts with the moral sense of modern nations to permit the robbery of human working power and to allow men to be used simply as means of enriching other men. Such parasitic industries present no elements of strength, but only disease and weakness. (Page 1207.)

SWITZERLAND

Berichte der eidg. Fabrikinspektoren über ihre Amstätigkeit in den Jahren 1894 und 1895. [*Reports of the (Swiss) Factory Inspectors. 1894 and 1895.*] *Aarau, Sauerländer, 1896.*

Among the social questions of the day the reduction of hours holds first rank. . . . It cannot be denied that one who abuses his strength by excessive labor, loses his health and frequently becomes a worn-out and useless man before his time, often indeed a charge upon society. The interest of the workman and the interest of society are at one in demanding a just and rational limit of the hours of work. (Page 129.)

ROUMANIA

Proceedings of the Eleventh International Congress of Medicine, Rome, 1895. Vol. I. Die Stellung des Staates zur Modernen Bacteriologischen Forschung [*The Attitude of States to Modern Bacteriological Investigation.*] Dr. V. BABES, *University of Bucharest. Rome, 1895.*

There should be physicians specially trained, and free from the claims of general practice, who could make widely known in responsible circles and especially among statesmen, all the achievements of medical science and the lines of practical application on which their vast importance for the health of nations might be utilized. . . .

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Men so trained must then, before all, agitate strongly for a fundamental reconstruction of society in the interest of an international and social reform based upon the following principles, namely: that individual health cannot be separated from the general health; that the health of one class is decided by that of another class; and that precisely the health of the lower classes possesses the highest socio-economical value of all. (Page 244.)

AUSTRIA

Eighth International Congress of Hygiene and Demography. Budapest, 1894. Vol. VII. Sec. V. Über das Verhaltniss der Dauer des Arbeitstages zur Gesundheit des Arbeiters und dessen Einfluss auf die Öffentliche Gesundheit. [*The Length of the Working Day in its Relation to the Workman's Health and Influence upon Public Health.*] Dr. E. R. J. KREJCSI, *Vice-Secretary of the Chamber of Commerce, Budapest. Budapest, 1896.*

One of the most important, most pressing questions is the regulation of working hours, and this question cannot be considered to be settled even in those states which have already established a "normal" working day. In the face of all the facts, of the dangers threatening the public health through overexertion arising from too long working hours, it becomes the duty of States to give continuous attention to the claims made for a hygienic and therefore an allowable working time, and to lower the duration of working hours progressively, . . . in accordance with the findings of authorized physiological and socio-economic investigations. The scruples which have been loudest heard in opposition are gradually being silenced, and experience will prove that the factory hand will be able to attain a higher efficiency by practice and training. We do not know, to-day, at what point in production, as gauged by the working time, a permanent inferiority of capacity comes on. It is possible that it may appear after a number of hours that would seem to us, with our present ideas, very small indeed. (Page 331.)

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Tenth International Congress of Hygiene and Demography. Paris, 1900. In one volume. Address of M. Waldeck Rousseau, President of the Council, Minister of the Interior, France. Paris, Masson, 1900.

More and more do democracies realize that the laws of hygiene are an integral part of their programme.

They are recognizing that the working classes—to whom the means of obeying the claims of private sanitation are too often lacking—have the right to demand a minimum guarantee from public hygiene; that laws

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are necessary to enforce this; that such laws are a debt of society toward its members. (Page 15.)

Revue d'Économie Politique. T. XVI. 1902. La Protection Légale des Travailleurs, est-elle Necessaire? [*Is Legal Protection for Working People Necessary?*] M. RAOUL JAY, *Professor of Law, University of Paris.*

The strength of the nation is the strength of the individuals that compose it. No one contests the terrible consequences that a nation must expect that subjects its children to labor which checks their physical and mental development. . . . But to safeguard the nation's interest it does not suffice merely to regulate child labor. "To protect the child and not to protect the mother is an absurdity." Said Jules Simon . . . What good is gained if—even supposing the child is protected—the strength of the adult is wrecked in a few years by excessive or unhealthy labor;—if the adult is not given the leisure necessary to develop his human qualities? . . .

To secure the necessary "national minimum" is, for some countries, an imperative duty. I am thinking of the military service, where the strength of all is the guaranty of national independence. (Pages 148–149.)

Revue d'Économie Politique. T. XV. 1901. La Nouvelle Réglementation de la Journée de Travail. [*The New Labor Legislation.*] M. BOURGUIN, *Professor of Political Economy, Lille.*

The whole movement of modern civilization tends in the direction of a progressive reduction of the hours of labor. . . . The future of the race must not be compromised, family life destroyed, the physical energy of the worker shattered, or his intellectual or moral development stunted by excessive toil. (Page 344.)

BELGIUM

Les Projets de Limitation de la Durée du Travail des Adultes en Belgique. [*Proposals regarding Limitation of Hours of Work for Adults in Belgium.*] HECTOR DENIS. *No. X of the Publications of the Belgian Section of the International Association for Labor Legislation. Liège, Bernard, 1908.*

In the debate, M. Dejace attributed a police power to the State by which it might properly intervene not only to restrain, but also to prevent abuses. As serious exploitation compromises not only the existence of the worker but also the very future of the race, this, to his mind, was sufficient

ground, and the only legitimate ground, for preventive intervention by Government. (Page 18.) BELGIUM

M. Denis held that state regulation is not only justified when the actual existence of the worker and of the race is threatened, but further that it is justifiable in securing the necessary conditions for the conservation and development of the laboring classes physically, intellectually, morally, socially, and politically. (Page 19.)

Psychology furnishes a justification of restrictive law, in demonstrating the defectiveness and slow development of the consciousness of fatigue. The social consciousness, then, must supplement that of the individual. (Page 20.)

Report of the Massachusetts Bureau of Statistics of Labor. 1871. UNITED STATES

It is claimed that legislation on this subject is an interference between labor and capital. . . . But legislation has interfered with capital and labor both, in the demand for public safety and the public good. Now public safety and *public good, the wealth* of the Commonwealth, centred, as such wealth is, in the well-being of its common people, *demands that the State should interfere* by special act in favor of . . . working women, and working children, by enacting a ten-hour law, to be enforced by a system of efficient inspection. (Page 567.)

Report of the Massachusetts State Board of Health. 1873. EDWARD JARVIS, M.D.

All additions to the physical, moral, or intellectual power of individuals in any individual are, to that extent, additions to the energy and the productive force—the effectiveness of the State; and on the contrary, all deductions from these forces, whether of mind or body—every sickness, and injury or disability, every impairment of energy—take so much from the mental force, the safe administration of the body politic. . . .

The State thus has an interest not only in the prosperity, but also in the health and strength and effective power of each one of its members. (Page 336.)

National Convention of Factory Inspectors in the United States. Philadelphia, June 8–9, 1887. Columbus, Myers, 1887.

Rufus R. Wade, Chief Factory Inspector of Massachusetts:

The history of what is called our Ten-hour Law was a record of constant, feverish struggle, maintained year after year, passed in one branch

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of the Legislature and defeated in the other, and it was not until several annual sessions had elapsed that the bill so earnestly and bitterly fought over became a law. It is well that such bills are enacted; it is well that the producers of wealth have been recognized. (Page 199.)

. . . In our State the policy has been of conserving manhood. The eye, the hand, the brain of the worker are finer machines than any produced by his labor and skill. So we think it is wiser to improve our people than to increase the productive capacity of our machinery. (Page 13.)

Report of the Michigan Bureau of Labor Statistics. 1898.

A shorter working day for these classes of laborers seems an imperative necessity if we would increase the true value of the State; for we believe that a nation, state or community, has but one value, and that is human life and happiness. Any system which depreciates or robs us of the wealth of the human is an injury to the best interests of the State. (Page 77.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. Part III. 1907–1908. Industrial Hygiene and the Police Power; Being a Reprint of a Paper on the Legitimate Exercise of the Police Power for the Protection of Health, by HENRY BAIRD FAVILL, M.D.

In the industrial world, health is the foundation of productiveness and the bulwark of economy. That society and progress depend utterly upon these factors can hardly be questioned. It is hence only necessary to reach a conclusion as to the fundamental importance of health as related to the product of any individual or to have a comprehensive grasp of the elements of waste and dissipation in social affairs to at once put the question of public health as a thing apart to be dealt with as a social problem irrespective of its particular bearing upon any class of citizens. (Page 480.)

We must study the relation of health to labor.—It needs no argument to maintain that abundant data and well considered demonstration will be necessary to bring to pass this great reform. It is not the purpose of this discussion to go into the detail of the research leading to this end. It is agreed that labor legislation must have its foundation in clear economic advantage. It is perhaps not so well agreed, but the idea is rapidly growing, that of all the factors of an economic advantage, health is the most crucial. Upon this hypothesis, therefore, the conclusion may rest, that the logical primary step is the establishment of broad and effective study of health as related to laboring conditions. (Pages 485–486.)

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American Academy of Political and Social Science. Vol. XXVII. No. 3, 1906. Philadelphia. Physical and Medical Aspects of Labor and Industry. FREDERICK L. HOFFMANN, *Statistician Prudential Insurance Company of America, Newark, N. J.*

The most valuable possessions of a workman are his health, strength, and intelligence. The conservation of health and strength, the prolongation of life and prevention of disease, are important economic factors which more or less determine the success of nations in the struggle for commercial supremacy and race survival. A gain in longevity, an increase in vitality, a decrease in disease liability, are all economic elements of the greatest possible economic importance.

They lie at the root of the true problem, for they determine in the long run the real and enduring progress, prosperity and well-being of the masses. (Page 465.)

The period of industrial activity of wage-earners generally, but chiefly of men employed in mechanical and manufacturing industries, it may be assumed, should properly commence with the age of fifteen and terminate at sixty-five. (Page 465.)

. . . There is an economic value inherent in every year of a workman's life, and . . . every gain in human longevity above the age of fifteen and below the age of sixty-five represents a corresponding gain to the nation at large and a distinct contribution to the accumulated wealth and capital of the nation. (Page 466.)

. . . If on the basis of an average net gain to society of 300 dollars per annum, the 50 active years of a working man's life represent a total of 15,000 dollars, then if death should occur at the age of 25, the economic loss to society would be 13,695 dollars; if at the age of 35, it would be 10,593 dollars; if at the age of 50, 4495 dollars; and, finally, if at the age of 60, the loss would still be 1090 dollars. Of course, the values would vary considerably in different employments, but the broad principle is fairly well illustrated and with approximate accuracy in this calculation. (Page 467.)

If this theory is applied to the problem of preventive medicine and vital statistics, some extremely suggestive conclusions result from a careful study of the facts. Out of every 1000 males living at the age of fifteen . . . by the last English life table 464 will survive to the age of sixty-five, while 556 will have fallen out, or have died, in the meantime, as the result of either accidents or disease. The present consideration takes into account only the 556 out of every 1000 who die between the age of fifteen and sixty-five from causes which, by modern standards

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of medicine and hygiene, are largely of a preventable nature. This theory is readily susceptible of statistical proof, but it needs merely to be pointed out that the mortality from some of the most important of these causes, such as consumption, typhoid fever, and industrial accidents, is more or less decreasing in all civilized countries. (Page 468.)

. . . If the duration of life has, on the average, the considerable economic value referred to at the outset, then it manifestly must be to the advantage of the state and the employers of labor that nothing within reason be left undone to raise to the highest possible standard the level of national physique and of health and industrial efficiency. . . . The interests of the nation, of wage earners as a class, and of society as a whole, transcend the narrow and selfish interests of the short-sighted employers of labor who, disregarding the teachings of medical and other sciences, manage industry and permit the existence of conditions contrary to a sound industrial economy and a rational humanitarianism. There can be no question of doubt but that at the present time the average life and industrial efficiency of a workingman in the United States is not what it should be, and it is manifestly the duty of the State, of employers of labor, of labor associations, and of workingmen themselves to take the facts of the problem into consideration and by intelligent co-operation raise to the maximum the standard of life and health in American industry. (Page 484.)

National Child Labor Committee. New York. Proceedings of the Fifth Annual Conference. Chicago, Ill., 1909. The Federal Children's Bureau. HENRY B. FAVILL, M.D. *Chicago, Ill.*

Absolute control of the health of the individual can never be the function of the State. Control of the conditions under which the lives of the people shall be lived and their energies expended is an inevitable necessity. The State will approach this problem from the standpoint of self-preservation. Defective health is the foundation of crime, pauperism, and degeneracy as well as that widespread inefficiency due to obvious disease.

All sociologic forces have come to recognize this fact. The physical well-being of the people is the deepest interest of the State. (Pages 37–38.)

(2) States' Need of Preserving Health of Women

The health of the race is conditioned upon preserving the health of women, the future mothers of the Republic.

British Sessional Papers. Vol. XIV. 1868–1869. Reports of Inspectors of Factories for Half-year ending 30th April, 1869. GREAT BRITAIN

The question of the cheapening of labor by the extended employment of women and children from home, is one of ever deepening interest in a country like ours. . . . Whatever affects the female character, its influence on society, on her own life as well as on the conditions of life in her offspring, is being gradually encircled with contingencies, the result of which, to those who see them in their various phases, it is not possible to regard without considerable anxiety. . . . The time seems, indeed, to be fast approaching when the cheapness of production with a certain amount of excellence only is to be the trader's great highway to prosperity, and when whatever relates to social life is to succumb to the competition which is running to and fro upon it. (Page 75.)

Problems of Poverty. JOHN A. HOBSON, M.A. *London, Methuen, 1891.*

Surely, from the large standpoint of true national economy, no wiser use could be made of the vast expansion of the wealth-producing power of the nation under the reign of machinery, than to secure for every woman destined to be a wife and a mother, that relief from the physical strain of industrial toil which shall enable her to bring forth healthy offspring, and to employ her time and attention in their nurture. . . . (Page 168.)

Women's Work and Wages. EDWARD CADBURY, M. CÉCILE MATHESON, *and* GEORGE SHANN. *London, T. Fisher Unwin, 1906.*

The employer is responsible for the hours passed inside his place of business, and if the conditions are such that the average worker is checked in development, or is actually deteriorating, the employer is running into debt to the country.

If he uses up human capital instead of the interest in energy, etc., which can be repaired daily by an average constitution, his business is aided either by the worker's relatives or by the rates which must provide for those who are prematurely disabled. Women especially fall off in capacity in consequence of early overstrain, and this has a disastrous effect on their offspring; while many in middle life drag on a miserable existence on the diminished wages they are able to earn. In so much as this is due to work and not to home life, our labor conditions need reform, and employers and the consuming public must be held jointly responsible. (Pages 198–199.)

CANADA

Report of the Royal Commission on a Dispute respecting Hours of Employment between the Bell Telephone Co. of Canada, Ltd., and Operators at Toronto, Ont. The Department of Labor. Ottawa, Canada, 1907.

Conclusions and Recommendations:

We believe that where it is a question between the money-making devices of a large corporation and the health of young girls and women, business cupidity should be compelled to make way. The evidence given before us, and the facts of experience, as cited, go to prove that this is a matter which cannot with safety be entrusted to the parties concerned, but is one which in the interest of the protection of the health and well-being of persons engaged in this form of industrial pursuit calls for legislative interference on the part of the State. (Page 97.)

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Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemburg für dar Jahr 1902. [*Reports of the Factory Inspectors in the Kingdom of Württemburg. 1902.*] *Stuttgart, Lindemann, 1903.*

As in the long run the commercial success of a nation depends upon its possessing a healthy, skilled, and mentally alert population, a reduction of working-women's hours, intelligently systematized, can only be advantageous to industry. (Page 188.)

The ten-hour day for working women can be introduced into all branches of industry without real difficulty, and considering the continually greater demands that are being made on the physical and mental elasticity of workers in general and women in particular, it will be in the interests of the maintenance of a healthy working class. (Page 211.)

Handbuch der Hygiene. Bd. 8[1]. [*Handbook of Hygiene. Vol. 8*[1].] *Edited by* Dr. Th. Weyl. *Hygienische Fürsorge für Arbeiterinnen und deren Kinder.* [*Hygienic Care of Working Women and their Children.*] Dr. Agnes Bluhm, *Berlin. Jena, 1894.*

Two leading reasons exist for the newly developing codes of protective laws relating to woman in industry. She requires special care because:

1. She is physically not as strong as man.
2. She is the bearer of the future race whose health and vigor will be markedly influenced by hers, and the State must therefore feel the keenest interest in securing a vigorous and efficient posterity. (Page 83.)

GERMANY

Die Arbeitszeit der Fabrikarbeiterinnen. Nach Berichten der Gewerbe-Aufsichtsbeamten bearbeitet im Reichsamt der Innern. [*The Working Hours of Women in Factories. From the Reports of the (German) Factory Inspectors. Compiled in the Imperial Home Office.*] *Berlin, Decker, 1905.*

The inspector for Breslau says, "The reduction of the working day to ten hours is such a decided step in advance, and is of such marked and wholesome influence on the mental, physical, and moral status of the entire working population, that its introduction should be emphatically urged."

The inspector for Cologne says, "The reduction of the working day for all women over sixteen years must be regarded as a necessity for both moral and hygienic reasons."

The inspector for Hanover says, "The reasons for the reduction of the working day to ten hours—

(*a*) The physical organization of woman,

(*b*) Her maternal functions,

(*c*) The rearing and education of the children,

(*d*) The maintenance of the home—

are all so important and so far reaching that the need for such education need hardly be discussed."

Another inspector says, "Considering the detrimental physical defect of factory work, its nerve-exhausting character, its ruinous influence on family life, and the care of children, and, indeed, under all the aspects of the physical, moral, and mental development of the working class, the reduction of the legal working day for women must be regarded as an emphatic demand and a moral obligation, whose introduction must be urged after a careful and conscientious weighing of all the reasons for and against it." (Page 106.)

Most of those factory inspectors who advise the legal establishment of the maximum 10-hour working day dwell with emphasis on the urgent necessity of shorter working hours from the standpoint both of health and morals. (Page 106.)

FRANCE

Débats Parlementaires. Sénat. 7e Juillet, 1891. [*Proceedings of the French Senate, July 7, 1891.*] *Rapport sur le travail des enfants, des filles mineures, et des femmes dans les établissements industriels.* [*Report on the Industrial Employment of Children, Young Girls and Women.*]

M. Jules Simon:

It is impossible for me not to tell the Senate what I think of the position

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of women in industry, and that I may gain your favor, gentlemen, I ask permission to tell you that for at least forty years I have applied myself to this question. (Page 573.)

When I ask, when we ask, for a lessening of the daily toil of women, it is not only of the women that we think, it is not principally of the women, it is of the whole human race. It is of the father, it is of the child, it is of society, which we wish to re-establish on its foundation, from which we believe it has perhaps swerved a little. (Page 575.)

ITALY

Proceedings of the First International Convention on Industrial Diseases. Milan, 1906. Frenastenia e delinquenza in rapporto a taluni ordinamenti del lavoro. [*Imbecility and Criminality in Relation to certain Forms of Labor.*] Professor CRISAFULLI.

Uninterrupted social progress cannot be dissociated from social and moral betterment.

This can be obtained only when the physical and mental welfare of the worker shall be protected through rational and efficacious measures; when the children shall be shielded through the elimination of all danger of degeneration; when woman shall be protected, so that during girlhood she shall not enfeeble her natural powers of resistance, and as a mother shall be able to perform her duties. (Page 158.)

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Massachusetts Legislative Documents. House. No. 44. 1867. Report of Special Commission on the Hours of Labor.

Eleven hours' toil each day for six days in each week is more than women and children ought to be required to perform. We are certain that they cannot do this without impairing, sooner or later, their vital powers, and shortening the duration of life. We are confident that it is a most uneconomical waste of life, which it is the interest of the State to prevent. (Page 8.)

Report of the Ohio Inspector of Workshops and Factories. 1890.

. . . It must be remembered that these female factory employees will in all probability at some time become mothers, and to be broken down in health when that important period of their life arrives, would certainly be conducive to evil results, and a condition we should strenuously endeavor to avoid. (Pages 37–38.)

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Report of the Michigan Bureau of Labor Statistics. 1897.

. . . Is it not high time that so far as law can effect the labor of the "Nation's wards"—the women and children—the hours of labor should be limited and regulated; and that so far as governmental power and influence can be exerted, it should be upon the side of those who are the bone and sinew, the foundation and the mainspring of a country's greatness, prosperity, and progress? (Page 213.)

Report of the Nebraska Bureau of Labor and Industrial Statistics. 1907–1908.

Scientists and thinkers have pointed out that health and vitality are the capital of society. It follows, then, that any lessening or weakening of the natural power of womanhood over the race will be distinctly injurious. To lower the standard of bodily strength will bring a disastrous reaction on society later. To deprive her of mental training means simply a retrogression to serfdom—slow, perhaps, but sure. Prevention of these things is the object of about all of the laws passed in recent years by progressive States and Nations. In too many instances the laws are crude and give too wide a latitude for transgressors. (Page 33.)

Report of the Minnesota Bureau of Labor, Industries, and Commerce. 1907–1908.

In Europe, where large standing armies are maintained and the physical condition of the race as a race is more minutely noted, there has long been an appreciation of the importance of maintaining the health of the mother. . . . The long period of standing on their feet, the shortened time for meals, all combine to militate strongly against, not only her own health, but the health of those who shall come after her. (Pages 243–244.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part VII. Women Workers in Milwaukee Tanneries. IRENE OSGOOD, *Special Agent.*

Unless we change the present demoralizing condition we will continue to see women, worn out by the work of their youth, unable to do their part in making happy and successful homes. Their children, if not given better opportunities, go through the same course and keep up the circle of vicious inefficiency. We can look for better conditions only with the increased intelligence and efficiency of the more fully developed girl,

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working in co-operation with an employer who recognizes that she is entitled in the workshop to cleanliness, to good sanitation, light, and air; to protection from dangerous machinery; to the removal of all brutalizing conditions, and of all conditions which place undue strain upon her moral character, even to excluding her from employment in certain industries. She should be entitled to every safeguard to health, such as shortening the work period, the opportunity for a nourishing noon meal; the prevention of undue strain upon her body, and breaks during the working hours for bodily rest. (Pages 1111–1112.)

Report of the Washington Bureau of Labor Statistics and Factory Inspection. 1909–1910.

By reason of the conditions surrounding them it is undoubtedly true that the women wage-earners must look to the state for assistance in securing the benefits of a reduced working day.

Usually the nature of their employment, their fear of losing their positions and the fact that others are waiting to take their places combine to render it impossible for female wage earners to perfect an organization possessing the strength or influence such as is wielded by the unions of skilled mechanics. It becomes of moment, therefore, to inquire whether the state itself should not enlist its aid in behalf of this class of toilers. . . . The fact that many women, under existing conditions, are working continually on the verge of physical and nervous exhaustion cannot be contradicted. Their power of endurance is strained to the utmost at all times, and the element of recreation scarcely enters into their lives, for the reason that the hours not spent at their work must be devoted to an effort to regain their energy for tomorrow's toil.

Yet it is to these same women wage-earners that the state must look in large measure for the mothers of its future citizens, and it would appear, therefore, that the state has a vital interest in this phase of the situation. As a nation and as a state, we are devoting a great deal of thought and endeavor to the subject of conservation of our natural resources, and it is fair to ask if it is not worth while to give some attention to the problem of conserving and protecting the physical strength of our wage-earning womanhood. (Pages 11–12.)

(3) The Double Burden of Working Women

Overlong working hours are particularly injurious to women because their sex doubles the claims made upon

them. After working hours domestic duties must be performed. The unmarried as well as the married woman cannot avoid home work for herself or her family, the performance of which, after the regular day's labor, lengthens her working time by several hours. With shorter working hours the unavoidable domestic duties may be performed without exhausting the workers.

Hansard's Parliamentary Debates. Vol. LXXIV. 1844. GREAT BRITAIN

Sir R. Peel:

Robert Sutcliffe, an operative, said: . . . "with regard to their own families . . . If they did not wish their daughters to grow up completely unfit for every domestic duty which, as wives and mothers, they would be called on in after life to discharge, they must insist on a curtailment of the present excessive and protracted toil they endured in the factories. He had daughters at work in the factory—they were required to get up at five in the morning and they did not get home till eight in the evening, and they were then in such a state of exhaustion, both of body and mind, they were altogether unfit to learn anything of household economy." (Pages 676–677.)

British Sessional Papers. Vol. XXVIII. 1844. Reports of Inspectors of Factories for Half-year ending 31st Dec., 1843.

The substitution of female for male labour, which has increased to so great an extent of late years, is attended with the worst consequences to the social condition of the working classes, by the women being withdrawn from domestic duties; and diminished comforts at home have the most corrupting influence upon the men. All these evils are much aggravated, when the women are worked so excessively that their life must be passed between the workshop and bed. The subject has been repeatedly mentioned to me by some considerate and humane mill owners, who know the evils of such a system, and wish to see it put down. (Page 4.)

British Sessional Papers. Vol. XVIII. 1856. Reports of Inspectors of Factories for Half-year ending 31st Oct., 1855.

The necessity of some restriction of labour, for the mitigation of the evils of the excessive labour of women and young persons, cannot be

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doubted; and the effect of such restriction upon their physical and moral condition is a matter of serious importance and of vital moment. . . . Women were deprived of those hours so requisite to the head of a family for her home, and the performance of domestic duties. (Page 81.)

British Sessional Papers. Vol. XIV. 1868–1869. Reports of Inspectors of Factories.

It has been, for instance, the strongest plea for all kinds of relaxations under the Factories Acts Extension Act, 1867, during the past year that the working classes are beginning to reside 1, 2, or 3 miles from their places of work, and in several instances that they come and go by railway. On that account, if for no other, the hours of work ought not to be extended to 7, 8, or 9 o'clock at night, *i. e.*, to the time of starting the last train outward. Nothing could be much worse in a social point of view than, for women especially, to have to return home from work at 8, 9, or 10 o'clock at night to their families, in all weathers, and out of every degree of temperature, if they may ride 2 or 3 miles, to complete their days' work in neglected domestic duties. (Page 293.)

Problems of Poverty. JOHN A. HOBSON, M.A. *London, Methuen, 1891.*

In estimating the quantity of work which falls to the lot of industrial women-workers, we must not forget to add to the wage-work that domestic work which few of them can wholly avoid, and which is represented by no wages. Looking at the problem in a broad human light, it is difficult to say which is the graver evil, the additional burden of the domestic work, as far as it is done, or the habitual neglect of it, where it is evaded. . . . To the long hours of the factory worker or the shop-woman, we must often add the irksome duties which to a weary wife must make the return home a pain rather than a pleasure. (Page 156.)

Women's Work. A. AMY BULLEY *and* MARGARET WHITLEY. *London, Methuen, 1894.*

. . . If the arguments in favour of a general reduction of the hours of labour are strong anywhere, they are peculiarly strong in the case of women, for in a vast number of cases a woman, when she leaves her daily work, has to begin a second spell of work at home. (Page 163.)

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Jahres-Berichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1899. [*Reports of the Factory Inspectors in the Kingdom of Württemberg, 1899.*] *Berlin, Reichsdruckerei, 1900.*

The majority of women are employed about 10 hours a day. But taking this as the usual working day and adding to it the time which a married woman must give to her family cares, there results a total working day of 13 or 14 hours for her, an amount of labor that is usually not required of a single woman. (Page 19.)

Overfatigue of the nervous system is a result of the work of married women in factories: only very strong constitutions are able to bear such exertion without harm. (Page 20.)

Jahres-Berichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1902. [*Reports of the Factory Inspectors in the Kingdom of Württemberg. 1902.*] *Stuttgart, Lindemann, 1903.*

In behalf of the ten-hour day we advance the following reasons:

First and foremost, women's health. As already shown, in the report for 1899 on "Employment of married women in Factories," serious injury arises from strenuous factory work carried on year in and year out in combination with work in the home.

Such over-exertion saps the strength of women prematurely and gradually undermines their health. The children of such mothers are, according to the overwhelming testimony of trained nurses, doctors, clergymen, and others who were consulted by the factory inspectors, usually pallid and delicate.

When, in turn, these children enter the factories right after leaving school, a healthy, sturdy, and persistent race is not to be looked for. (Pages 186–187.)

Jahresbericht der Grossherzoglich Badischen Fabrikinspektion für das Jahr 1902.] [*Reports of the Factory Inspectors of Baden, 1902.*] *Karlsruhe, Thiergarten, 1903.*

Special Report on length of hours of women.

In the report for 1899 it was exhaustively shown how greatly a reduction of hours was needed for the health, not only of married women, but of all women, and it was pointed out that housework and homekeeping require time and strength which women, after eleven hours in the factory were quite unable to give. Many times did working women tell the in-

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spectors how exhausting the long workday was, and how greatly they desired a shorter day. In opposition to them, employers often declared that the women would make no good use of longer leisure, but would only idle it away.

Such ideas have certainly not proved to be correct, nor have they been shared by all employers. For instance, the owner of a large factory, forced by competition to an 11-hour day, declared that the legal establishment of 10 hours would be a blessing for the women. (Page 73.)

Die Arbeitszeit der Fabrikarbeiterinnen. Nach Berichten der Gewerbe-Aufsichtsbeamten bearbeitet im Reichsamt des Innern. [*The Working Hours of Women in Factories. From the Reports of the (German) Factory Inspectors, Compiled in the Imperial Home Office.*] *Berlin, Decker, 1905.*

From Cassel:

It is important to remember what a shortening of working hours means to the working woman who has to go a long distance to and from her work. Often an hour is spent thus, making it not 10 hours, but 12 hours that the worker is compelled to be away from home. (Page 109.)

It was frequently pointed out that the interests of working women require a shorter day because of the necessary household duties which they often have to perform after working hours. The inspector from Württemburg said: "It often happens that married and unmarried women must work for hours at home before and after going out to the mill or shop, whereas the stronger man is entirely exempt from this additional labor." (Page 110.)

The inspector for Upper Bavaria dwells upon the advantage accruing to the health of working-girls as follows:

"In the matter of health the shortening of the working hours is of unusual value, because for them free time is not resting time, as it is for a man. For the working-girl on her return from the factory there is a variety of work waiting. She has her room to keep clean and in order, her laundry work to do, clothes to repair and clean, and, besides this, she should be learning to keep house if her future household is not to be disorderly and a failure." (Page 111.)

Many inspectors urge the need of shortening the hours of labor on grounds of morality. From Offenbach it is reported: "The period before marriage is the time for learning the future profession, but during this period the factory worker is exposed to strain and fatigue, which hinder her bodily development and deprive her of educational oppor-

tunity. Desirable, therefore, would be a reduction of the working hours which should give to married women more time for their housework and family life, and to the younger unmarried women the opportunity to learn the art of home-making, because upon this the health, welfare, and prosperity of her whole family will depend." (Page 113.)

Schriften der Gesellschaft für Soziale Reform, Heft 7–8. [*Publications of the Social Reform Society. Nos. 7 and 8.*] *Die Herabsetzung der Arbeitszeit für Frauen und die Erhöhung des Schutzalters für Jugendliche Arbeiter in Fabriken.* [*The Reduction of Women's Working Hours and the Raising of the Legal Working Age for Young Factory Employees.*] Dr. AUGUST PIEPER *and* HÉLÈNE SIMON. *Jena, Fischer, 1903.*

The protection of health takes precedence over everything else. The health of women is more quickly undermined in wage-earning occupations than that of men, partly because they are less strong and resistant and partly because they are burdened with domestic as well as industrial labor—more especially when, as married women, they have to care for a family. (Page 4.)

Whether the working woman as such is less resistant to injurious conditions than the working man is immaterial. What is important to remember is that her sex doubles the claims made upon her, and it is this that undermines her vital resistance. To the physiological burdens and the overwork due to a combination of housework and industrial toil, imperfect nutrition, and deficient recreation are often to be added—she has, in short, distinctly, an average standard of living that is inferior to that of men. (Page 91.)

The reports of 1899 (Germany) upon factory work for married women gave the inspectors occasion to advocate—as they did in almost every part of the country—a progressive reduction of working hours to 10 and 9 hours, and, especially for girls under 18, to 8 hours. Their investigations amply exposed the vicious circle of destructive influences that the working-woman traverses. As a young girl, her health is early sacrificed; as a grown woman, she is driven between home duties and wage-earning. She succumbs without having been able to guide the life of her family to a prosperous development. (Page 109.)

Handbuch der Medizinischen Statistik. [*Handbook of Medical Statistics.*] Dr. FRIEDRICH PRINZING, *Ulm. Jena, Fischer, 1906.*

The injurious effects of factory work on married women are noticeable in many ways. Factory work is chiefly detrimental to married women

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because of the unreasonable demands made upon their strength by the combination of factory with housework. On social grounds the prohibition of factory work for married women is not practicable, but much may be done to protect the health of such women by legal restriction and regulation of working hours, ample rest legally secured, and special provisions for pregnancy and the period of lactation. (Page 129.)

FRANCE

Débats Parlementaires. Sénat. 9e Juillet, 1891. [*Proceedings of the French Senate, July 9, 1891.*] *Rapport sur le travail des enfants, des filles mineures, et des femmes dans les établissements industriels.* [*Report on the Industrial Employment of Children, Young Girls, and Women.*]

M. Waddington:

The woman wage-earner, gentlemen, does not always live at the mill-gates; she is therefore obliged to make a half or three-quarters' hour journey before she arrives; consequently she will leave home at half-past five in the morning, only to return at half-past eight or nine o'clock in the evening. Is that living? Under such circumstances can a woman truly care for her children and her home? (Page 584.)

La Protection Légale des Travailleurs. [*Legal Protection of Working People.*] *Discussions of the French Section of the International Association for Labor Legislation, 3rd Series, 1905–1906. Paris, Alcan, 1907.*

After the woman has worked the same number of hours in mill or shop that men have done, she goes home and has to do more work there. (Page 182.)

UNITED STATES

Report of the Colorado Bureau of Labor Statistics. 1887–1888.

I think ten hours a day too long for female workers. Many of them have to cook, clean, wash, and sometimes care for some sick person in their family, and also do many other things too numerous to mention, after a hard day's work. They cannot afford to have such work done for them; their pay is far too small. (Page 336.)

Report of the Maine Bureau of Industrial and Labor Statistics. 1888.

I think that if Saturday afternoons were given to the working women for recreation, the amount of good done would more than compensate for the loss of labor or money. Considering the various demands upon the

working woman's time outside of work hours,—in caring for her room and clothes and numerous other duties,—it seems that this provision should be made for her. (A worker.) (Page 101.)

Report of the Ohio Bureau of Statistics of Labor. 1889.

Working women even more than working men suffer because of long hours of labor. Generally speaking, they work many more hours every day than men, because after the day in the workshops is ended many of them must be occupied with household cares, while men may rest. Ten hours a day to at least one-third of the working women means oftener fifteen. (Page 47.)

Report of the Illinois Factory Inspectors. 1893.

In many cases the shortening of the day has been in the morning, so that women and children who have had a long walk or ride before reaching the factory at 7 o'clock, now sleep an hour later and reach their work at 8. The mother of the family, who rises still earlier to cook the breakfast and put up the lunch, also profits by this added hour of rest. (Page 19.)

Report of the Michigan Bureau of Labor Statistics. 1899.

Where is the man who dare say regulation by law is not necessary . . . in case of public works of females? It is idle to say they are able to take care of themselves; they cannot, and while legal restrictions must not be made to hinder women from earning an honest living under suitable conditions, there is one principle which must be applied as a test of suitability in all situations—the proved tendency of their occupation under certain conditions to destroy health and unfit them for their duties as wives and mothers. And what will happen to a home when the mother is compelled to work in a factory ten hours, toiling all day, coming back after dark to her children, weary, jaded, fretful, almost desperate? Tidiness, cleanliness, and happiness are impossible. (Page 61.)

Report of the New York Bureau of Labor Statistics. 1900.

The wife's life is darkened even more by the long-hour day, especially if she also be a working woman. Even if the day be one of only ten hours, she must arise as early as five o'clock to prepare breakfast for her husband and herself, so that they may be at their work places at seven. Beginning at that early hour her day will be a very long one. (Page 70.)

UNITED STATES

Report of the Illinois Bureau of Labor Statistics. Part II. 1906.

Time leaving home for work and reaching home from work, ride or walk, car fare.

Record obtained from those (working women) reporting as to the hours when leaving home for work and the hours reaching home after the day's work. 2535 reported as to the time leaving home for work. Of this number 20.8 per cent had to leave home in the morning before 6.30 o'clock; 54.6 per cent from 6.30 to 7.00 and 24.6 per cent at 7.00 A. M. or later.

The number reporting the time arriving home from work was 2486. Of this number 9.1 per cent reached home in the evening before 5.00 to 5.30; 20 per cent from 5.30 to 6.00; 49.2 per cent from 6.00 to 6.30, and 21.7 per cent 6.30 and later.

Car fare is an expense incident to the working girl, especially in larger cities, where factories and other places are liable to be located remote from residence districts. The record here shown is for 2484 women or girls. 60.7 per cent walk to and from their work, 35.4 per cent use the cars, and 3.9 per cent both ride and walk. (Page 195.)

(4) Effect of Women's Overwork on Future Generations

When the health of women has been injured by long hours, not only is the working efficiency of the community impaired, but the deterioration is handed down to succeeding generations. The overwork of future mothers thus directly menaces the welfare of the state.

GREAT BRITAIN

British Sessional Papers. Vol. XXI. 1833. Second Report of the . . . Commissioners for inquiring into the employment of Children in Factories, . . . and Reports by the Medical Commissioners.

Sir David Barry's report (Scotland):

Having on one occasion given a certificate to the effect that I believed that persons occupied in factories were not more subject to disease than those engaged in other occupations, and having, on further experience had reason to doubt the correctness of the views I then held, . . . on a similar certificate being presented to me last year, I declined to sign it. . . . I believe it will be found to be the case that nearly all the wives of weavers and many of those of labourers, formerly worked in factories;

and even giving the circumstances of low wages, and consequent domestic privations, their due weight, I think we have reason to fear that the descendants of those people are physically deteriorating. . . . A. C. Kilgour, M.D. (Page 30.)

British Sessional Papers. Vol. XII. 1886. Report from Select Committee on Shop Hours Regulation Bill.

Witness, W. Abbotts, M.D.:

2000. Does their employment injuriously affect them as child-bearing women in after years? According to all scientific facts it would do so; it leads to pelvic diseases, and would affect them in after years when they become mothers. . . .

2007. And you, as a medical man of a considerable number of years' experience would not look to girls who have been worked so many hours in one position, standing, as the bearers of healthy, strong children?—I should not.

2008. Then it naturally follows, does it not, that this is a very serious matter in the interests of the nation as a whole, apart from the immediate injury to the person concerned?—Yes, as regards the physical condition of the future race. (Page 102.)

British Sessional Papers. Vol. XVII. 1892. Select Committee on Shop Hours Bill.

Witness, Mr. Sutherst, Barrister and author of "Disease and Death Behind the Counter":

1361. You have stated . . . that the women are handicapped by their physical inequalities?—Decidedly; they are expected to become mothers, and the very long standing and overwork prevents them from rearing subsequently a healthy progeny. (Page 60.)

British Sessional Papers. Vol. XXXIX. 1893. Report of Royal Commission on Labour.

Mr. Henry Mayers Hyndman:

8409. . . . Under present conditions, especially in the case of women, . . . the hours of work are injurious to them; it is directly injurious to them in every shape and way, and helps to enfeeble the coming generation owing to the weakness of mothers after those long periods of standing and toiling. (Page 595.)

GREAT BRITAIN

British Sessional Papers. Vol. XXXII. 1904. Report of the Inter-Departmental Committee on Physical Deterioration. Vols. I, II, III.

Committee report:

251. A very general agreement was expressed that the factory employment of mothers had a bad effect on the offspring, both direct and indirect.

253. The three ladies quoted by Miss Anderson (Principal Lady Inspector of Factories) were unanimous as to the stress and strain involved in the "employment of women from girlhood, all through married life, and through child-bearing." (Vol. I, page 47.)

Ibid. Memorandum on Employment of Mothers in Factories and Workshops. By Miss A. M. ANDERSON, *H. M. Principal Lady Inspector of Factories.*

30. As to the general effect of these conditions on the health of the women and their children, Miss Squire for Lancashire, and Miss Paterson for Dundee report similarly:

"That it is the employment of women from childhood, all through married life, and through child-bearing, that impresses itself upon the mind . . . that it is useless for medical men and others not familiar with the conditions of mill life there to pronounce any opinion on the effect of factory work upon the mother and infant; they have no conception of the stress and strain and of the general conditions of life and work in these mills. (Vol. I, page 124.)

Miss Paterson expressly points to cases showing that it is the stress and strain of the work, and the necessity of maintaining a high standard, coupled with decreasing physical capacity of the child-bearing woman under such conditions that generally determine the moment when the manager in a jute mill sends her home. . . . Sometimes a neighbor will take her place in the mill of the woman who has been sent home on account of her physical inability to maintain her output, in return for her taking charge of that neighbour's children for a small sum. (Vol. I, page 124.)

. . . Great harm is done and suffering occasioned to the women by their remaining at work too long before confinement, as well as by their returning too soon after it. . . . Two of the doctors with whom Miss Squire conferred in Preston attributed the large number of premature births to continued work in the mill during pregnancy and all considered that an exceptional number of cases of uterine trouble existed and was attributable to too early return to work. (Vol. I, page 124.)

Dr. W. Leslie Mackensie, M.A., M.D., M.R.C.P.E., Medical Inspector to the Local Government Board for Scotland:

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6749. If the mother suffers from insufficient food or from exhaustion or over-work, or disease, the result is that disease is shown in the child?—That is my opinion. . . .

6752. And precautions should be taken that she should not suffer from overwork during the period of child-bearing?—Yes; before and after child-bearing. (Vol. II, page 266.)

6897. Now, in your memorandum, I note this passage. You say, "If inherited characters are to mature, therefore, the mother must remain (a) capable of maintaining her own physical equilibrium, (b) capable of giving her excess of nourishment to the embryo. If she fails in (a) or (b) the embryo either dies or suffers in rate of growth, or in ultimate size." Well, then, I suppose, from that we should draw the conclusion that in your opinion the child of a slum mother would be born defective in growth? —It may be so.

6899. And the same with the factory worker?—Yes, I think so. (Vol. II, page 272.)

The Factory System. Illustrated in a series of letters to the Right Hon. Lord Ashley, M.P. WILLIAM DODD. *London, John Murray, 1842.*

Of the evil tendency of factory life on women and children, Mr. Greg speaks thus:

"The fourth cause of ill-health, which prevails among the manufacturing population may be traced to the injurious influence which the weakened and vitiated constitution of women has upon their children."

"They are often employed in factories some years after their marriage, and during their pregnancy, and up to the very period of their confinement, which all who have attended to the physiology of this subject know must send their offspring into the world with a debilitated and unhealthy frame, which the circumstances of their infancy are ill-calculated to renovate. Hence, when these children begin to work themselves, they are prepared at once to succumb to the evil influences by which they are surrounded." (Pages 139–40.)

Infant Mortality: A Social Problem. GEO. NEWMAN, M.D., D.P.H., F.R.S.E., *Lecturer on Public Health at St. Bartholomew's Hospital, London; Medical Officer of Health, Metropolitan Borough, Finsbury. London, Methuen, 1906.*

Physical fatigue, particularly if accompanied by a strain and stress, are likely to exert a decided effect in the production of premature birth, par-

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ticularly if these conditions are accompanied by long hours of work and poor or insufficient nourishment. (Page 80.)

The direct injuries to women and girls employed in factories and workshops are: (c) Injury through fatigue and strain, long hours and insufficient periods of rest for food, . . . and (e) Too short a period of rest at the time of childbirth. Over and over again, in the official reports of factory inspectors or medical officers of health, does one meet with evidences of these injuries. Where the conditions resulting in these evils, coupled with the absence of the mother from home, are present, the infant mortality is high; where they are not present, it is usually low. (Pages 131–132.)

In consequence of the fact that while there has been a steady and continuous decline in the general mortality of Preston during the past thirty years, the infant mortality has shown an increase, a sub-committee was appointed to inquire into the causes (1902), and submitted certain conclusions:

(1) First among these causes is the employment of female labor in mills. An occupation requiring a woman to stand during the greater part of the day when continued up to within a few days or even hours of the time of parturition, must act to the detriment of the offspring, and there is less chance of the latter coming into the world fully grown, well formed, and in good health. Many deaths taking place during the first month, which are returned as due to premature birth, immaturity, congenital debility, convulsions, and the like, may safely be ascribed to this cause. (Page 134.)

In a general way it may be said that it is the employment of women from girlhood all through married life and through the period of childbearing, the continual stress and strain of the work and hours, and general conditions prevailing in women's labor, that is exerting its baneful influence on the individual and on the home. (Page 136.)

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Verhandlungen des Reichstags, 103. Sitzung, 18. April, 1891. [*Proceedings of the German Reichstag, 103rd Session, April 18, 1891.*]

Representative Ulrich:

All the reasons that can be offered in support of a shortened work day in general, hold with double force in favor of shortening the working time of women. For the danger of degeneration of the race is actually greater on the mother's than on the father's side. . . . On the one hand excessive work breaks down the woman personally, on the other hand, through her break-down, it destroys the home. For this reason chiefly the dark side

of female labor is extraordinarily more significant than is usually realized. (Page 2410.) GERMANY

Die Arbeitszeit der Fabrikarbeiterinnen. Nach Berichten der Gewerbe-Aufsichtsbeamten bearbeitet im Reichsamt des Innern. [*The Working Hours of Women in Factories. From the Reports of the* (German) *Factory Inspectors. Compiled in the Imperial Home Office.*] *Berlin, Decker, 1905.*

The reports from Merseburg, Erfurt, Breslau, Hanover, Württemberg, and Offenbach dwell upon the dependence of future generations—their total efficiency and value—upon the protection of working women and girls. (Page 111.)

The report for Württemberg says, in regard to the injurious effect of factory work: "The children of such mothers—according to the unanimous testimony of nurses, physicians, and others who were interrogated on this important subject—are mostly pale and weakly; when these in turn, as usually happens, must enter upon factory work immediately upon leaving school, to contribute to the support of the family, it is impossible for a sound, sturdy, enduring race to develop." (Page 111.)

Handbuch der Hygiene. Bd. 8[1]. [*Handbook of Hygiene. Vol. 8*[1].] *Edited by* Dr. THEODORE WEYL. *Hygienische Fürsorge für Arbeiterinnen und deren Kinder.* [*Hygienic Care of Working Women and their children.*] Dr. AGNES BLUHM. *Jena, 1894.*

Women bear the following generation whose health is essentially influenced by that of the mothers, and the State has a vital interest in securing for itself future generations capable of living and maintaining it. (Page 83.)

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par Prof. ÉTIENNE BAUER. [*The Nightwork of Women in Industry. Reports on its importance and legal regulation.*] *Interdiction du travail de nuit des femmes en Allemagne.* [*Prohibition of nightwork for women in Germany.*] Dr. MAX HIRSCH. *Jena, Fischer, 1903.*

The influence of improper factory labor . . . on future generations is exerted both before and after child birth. Great importance is attached to the general effect of labor on the sexual organs, even on the general health of the female worker, and that at a very early period. A woman

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with an enfeebled and emaciated body, . . . is, according to experience, less capable, or even absolutely incapable of producing healthy and robust offspring. The ailments of both a special and a general sort, due to unsuitable work, weigh heavily and in advance of birth, in many cases, on the descendants. Aside from the fact that female factory workers are frequently deprived of children, as a result of complete sterility or frequent abortions or still births, the surviving infants suffer much of the time from feebleness and sicknesses of all kinds, so that they bear with them from the cradle the causes of premature death, to which must be added the effective evils and dangers of a durable character which are manifested during the period of lactation and up to the last period of infant life. (Page 26.)

A very considerable number of reports indicate as a cause of the excessive mortality of suckling infants, besides insufficient nourishment, the insufficient care given to them, since the mother is prevented by work at the factory from devoting herself sufficiently to her children when they are in good health, and even when they are sick. . . . It is indeed sad for innumerable women to be injured in health, in vitality, and robbed of the full pleasure of living, through the conditions of industrial labor; but the crime of society takes on huge proportions when, for the love of additional gain, very often extremely small, the flower of the new generation is crushed and blighted.

But if such are the effects of normal work by women during the day, they are very much worse in the case of the prolongation of the hours of work, above all when the work continues late in the evening and into the night. Not only that the fatigue and exhaustion of the mother increases in a progressive ratio with each additional hour, but also that she is kept from exercising her motherhood precisely at the time when her care is most indispensable to her little ones. (Pages 27–28.)

FRANCE

Revue d'Hygiène et de Police Sanitaire. La Protection de la Femme dans l'Industrie. [*The Protection of Woman in Industry.*] Dr. HENRI NAPIAS. *Paris, Masson et Cie. T. XVIII. 20 Mars, 1896.*

Everyone knows that there is still much to do, and that, if our legislation has already bettered conditions, new ameliorations are desirable, but they will come, I think, only through the pressure of public opinion, . . . which will become exacting . . . when doctors have made clear the utility of a protection which looks not only to the woman, but, secondarily, the child to be born by her; when it knows better that to protect the mother is an absolute necessity for the future of the race. (Page 193.)

Proceedings of the 1st International Convention on Industrial Diseases. Milan, 1906. Frenastenia e delinquenza in rapporto a taluni ordinamenti del lavoro. [*Imbecility and Criminality in relation to certain forms of labor.*] Prof. CRISAFULLI. ITALY

A great number of born deficients are the offspring of mothers worn out by work from girlhood: work not alone precocious but also overfatiguing and unhealthful; and these mothers were tortured by toil even during the period of their pregnancy. The ailments of the pregnant woman which react painfully upon the fœtus, the hardships of childbirth, the sicknesses of infancy, etc., can easily be traced, among certain classes of workers; in the majority of cases they are recognized as direct and essential causes of imbecility; arrested or deficient mental development, at least in great measure, can also be traced to such causes. (Page 146.)

. . . On the other hand, over-fatigue often generates hereditary weakness, both physical and moral, by reason of which many unfortunates never attain their full development, and, in course of time they commit essentially instinctive acts that, if not absolutely criminal, are certainly irrational. (Page 149.)

Evidence Submitted to the Massachusetts Legislature in Favor of the Enactment of a Ten-Hour Law. Lawrence, 1870. UNITED STATES

I have no hesitation in saying that I am fully satisfied that the long hours of confinement in the atmosphere of the mills is very injurious to health, and of such an enervating nature, as to operate very unfavorably upon the offspring—for of course if the parents are feeble, the offspring must inevitably be of a feeble and sickly nature. (Page 8.) John B. Whitaker, M.D.

Report of the Massachusetts Bureau of Statistics of Labor. 1870.

It debilitates them, and makes them unfit for the reproduction of their kind. Young women, as a general rule, do not make good housekeepers when brought up in a cotton mill, not having opportunity enough to initiate themselves into such duties on account of the long hour system. (Pages 312–313.) Employee.

Report of the Maryland Bureau of Industrial Statistics. 1896.

Once inside the walls of the factory a weary day's work of ten hours' duration is begun, with an intermission for lunch at noon. . . .

UNITED STATES

When the day's work is at last over, the wearied crowd trooping from their place of employment hasten in all directions to their homes, which in many instances are in the extreme suburbs of the city. Once home, they swallow a hasty supper and soon retire to a needed and deserved rest, with no pleasant anticipations for the morrow.

What lives are these for future wives and mothers? Future generations will answer. (Page 52.)

Report of the Michigan Bureau of Labor. 1908.

It is a matter of common knowledge that the consequences to the citizenship of the state, both at the time and in the future, are more grave if women work in the wrong trades, or too many hours or under improper conditions. It injures the mothers of our citizens, so that infants are born to die young, or grow into men weak and sickly—which is bad for the state as well as themselves. . . . We shall begin to see that . . . for the injury to the women, the mothers, the homes, and the rising generation, there must be special laws for the conditions under which women work. (Page 337.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part VII. Women Workers in Milwaukee Tanneries. By IRENE OSGOOD, *Special Agent.*

The effect upon the home and upon society of the woman who has been forced to run the gauntlet of industrial or occupational diseases, has never been measured. Her lack of knowledge of domestic affairs consequent upon her former enforced freedom from household cares, and her ignorance concerning the welfare of children, must necessarily make for domestic unhappiness, and for another race of children poorly prepared to meet the hardships of working class life. (Page 1061.)

Journal of Political Economy. Vol. XIV. 1906. Legislative Control of Women's Work. S. P. BRECKINRIDGE.

The assumption of control over the conditions under which industrial women are employed is one of the most significant features of recent legislative policy. In many of the advanced industrial communities the State not only undertakes to prescribe a minimum of decency, safety, and healthfulness, below which its wage-earners may not be asked to go, but takes cognizance in several ways of sex differences and sex relationships.

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. . . In the third place, the State sometimes takes cognizance of the peculiarly close relationship which exists between the health of its women citizens and the physical vigor of future generations. . . . It has been declared a matter of public concern that no group of its women workers should be allowed to unfit themselves by excessive hours of work, by standing, or other physical strain, for the burden of motherhood which each of them should be able to assume. (Page 107.)

The object of such control is the protection of the physical well-being of the community by setting a limit to the exploitation of the improvident, unworkmanlike, unorganized women who are yet the mothers, actual or prospective, of the coming generation. (Pages 108, 109.)

(5) Infant Mortality

Experience and medical observation show that overwork before as well as after marriage has a disastrous effect upon childbirth. The death rate is high among children of women who have overworked during girlhood as well as among children of working mothers.

Overwork during pregnancy and too soon after childbirth, together with the inevitable neglect of infants by mothers who are kept away from home by overlong working hours, are further contributing causes to a high infant mortality.

Besides their high death rate at birth and during the first years of infancy, the children of exhausted workers are below the normal in size and weight.

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British Sessional Papers. Vol. XIX. 1873. Reports of the Inspectors of Factories for the Half-year ending 31st October, 1872.

Mr. R. H. Leach, certifying surgeon for upwards of thirty years, says:

Shorten their hours of labor, for I believe that scores of infants are annually lost under the present system. As things now stand, a mother leaves her infant (say of two months old) at 6 A. M., often asleep in bed, at 8 she nurses it, then until 12.30 the child is bottle fed, or stuffed with indigestible food. On her return at noon, overheated and exhausted, her milk is unfit for the child's nourishment, and this state of things is again

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repeated until 6 P. M.; the consequence is, that the child suffers from spasmodic diarrhœa, often complicated with convulsions and ending in death. (Page 56.)

British Sessional Papers. Vol. LV. 1873. Report to the Local Government Board on Proposed Changes in Hours and Ages of Employment in Textile Factories. By J. H. BRIDGES, M.D., *and* T. HOLMES.

Experience afforded by residence in the worsted manufacturing town of Bradford, and extensive practise among its population during periods of from one to thirty-five years:

Q. Has the labor any tendency to increase the rate of infant mortality?

A. Yes. The evils occurring in women . . . indirectly affect the more perfect growth of the child in utero, and dispose it when born more easily to become diseased.

Signed on behalf of the Bradford Medico Chirurgical Society, at a meeting held February 4, 1873.

Sub-Committee.

President, J. H. BELL, M.D.
P. E. MIALL, M.R.C.S.
Secretary, DAVID GOYDER, M.D.

(Pages 39, 40.)

British Sessional Papers. Vol. XXXII. 1904. Report of the Inter-Departmental Committee on Physical Deterioration. Vols. I, II, III. 1904.

English Mortality among Infants under One Year of Age. Prepared under Dr. Tatham's direction, from the Official Returns in the General Register Office.

. . . In the years 1873–77 the rates in the urban countries were higher than those in the rural by 26 per cent among male and by 29 per cent among female children, while in the years 1898–1902 the differences had increased to 30 per cent and 34 per cent respectively. . . .

Taking together diarrhœal diseases and diseases of the stomach and liver, the recent five years show an increase of more than 70 per cent in the urban and of nearly 70 per cent in the rural countries.

. . . The increased mortality from diarrhœal diseases is probably attributable in great part to the prevalence of artificial infant feeding, and this view appears to be consistent with the fact that the increase has been greater in the urban than in the rural countries. (Vol. I, page 130.)

Anthropometric Report of the Committee of the British Association of 1883. GREAT BRITAIN

It would appear, therefore, that the physical (and most probably the mental) proportions of a race, and their uniformity within certain limits are largely dependent upon the size of the female pelvis, which acts as a gauge as it were of the race, and eliminates the largest infants, especially those with large heads (and presumably more brains) by preventing their survival at birth. . . .

. . . *Note.* It is probably in this direction that we must look for an explanation of the degenerative influences of . . . sedentary occupations, as they . . . favour the production of . . . imperfectly developed bodies of women. (Vol. II, page 98.)

Transactions of the National Association for the Promotion of Social Science. Vol. 26. 1882. Infant Mortality. THOMAS M. DOLAN, F.R.C.S. *London, Longmans, 1883.*

We can produce statistics which prove that the death rate of infants, the offspring of women who are engaged as operatives, is so high as to require some special explanation to account for it; and still more we can furnish evidence which seems to connect this high death rate with the employment of women in factories. . . . (Page 358.) I . . . asked several practitioners . . . who attended a large number of operatives, "Could you fix the annual number of infantile deaths during the last five years attributable in your opinion to the employment of the mothers in factories before or too soon after labour?" Five replied fixing the mortality at 15 to 20 per annum, two were of opinion that 20 per cent of infantile deaths should be assigned to this cause. . . . Since 1872 I have . . . attended over 2800 cases of midwifery among that class. My increased experience convinces me of the correctness of my views. (Page 361.)

In further confirmation of them it is singular how unanimous all medical officers of health are in assigning the employment of women in factories as a cause of infant mortality.

. . . Dr. Harris Butterfield, Medical Officer of Health for Bradford . . . comments on the excessive mortality of infants in our large towns. This mortality he attributes in great measure to the too early weaning of infants by mothers employed in factories. . . .

Dr. Dudley, Medical Officer of Health, Staleybridge . . . calls the attention of the authorities to the excessive infant mortality to the district. This he attributes to the same causes. . . . (Page 361.)

M. Jean Dolphus, one of the largest manufacturers in Alsatia, found

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that the women employed in his factory lost 40 per cent of their children in the first year, the average mortality at that age being there 18. (Page 363.)

Infant Mortality. A Social Problem. GEORGE NEWMAN, M.D., D.P.H., F.R.S.E., *Lecturer on Public Health at St. Bartholomew's Hospital, London; Medical Officer of Health, Metropolitan Borough, Finsbury. London, Methuen, 1906.*

A nation grows out of its children, and if its children die in infancy it means that the sources of a nation's population are being sapped, and further that the conditions that kill such a large proportion of infants injure many of those which survive. Last year, 1905, there was a loss to the nation of 120,000 dead infants, in England and Wales alone, a figure which is almost exactly one quarter of all the deaths in England and Wales in that year. (Page 2.)

And this enormous sacrifice of human life is being repeated year by year and is not growing less. (Page 7.)

Nor is England alone. . . . The birth rate is declining in civilized nations with few exceptions; and the same may be said of the death rate. But the infant mortality rate, as a rule, is stationary or even increasing.

There are two features, however, which appear to be common to the high infant mortality districts, namely, a high density of population and a considerable degree of manufacturing industry. (Page 26.)

SWITZERLAND

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Nightwork of Women in Industry. Its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Jena, Fischer, 1903.*

Moreover and above all we observe in all countries where woman is protected a lessening of female and also of infant mortality. In England the convincing argument drawn from this fact has often been cited. There among 100 new-born the proportion of infants dying in the first year of their existence was 15 per cent from 1873 to 1875 in England and Wales, and 12.8 per cent in Scotland; by contrast, the percentages were respectively only 14.6 and 12.2 from 1884 to 1893. From 1873 to 1875 the percentage rose to 16.75 in seven great centres of industry. In Switzerland there was noted a similar reduction in infant mortality, which averaged from 1871 to 1880, 19.3 per cent, and from 1881 to 1890, only 16.5 per cent. . . . (Pages xxxvii, xxxviii.)

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Annalen des Deutschen Reichs, Bd. 21, 1888. [*Annals of the German Empire, Vol. 21, 1888.*] *Der Internationale Schutz der Arbeiter.* [*International Labor Legislation.*] Dr. GEORGE ADLER, *University of Freiburg. Munich and Leipsic, Hirth, 1888.*

The worst physiological effects of factory work for women were shown by the increased number of still-births. In the district of Mülhausen, between 1875–79, not less than 58 still-born infants to 1000 births were reported, whilst in country regions the proportion was only 30–40 per 1000.

The death rate of infants in their first year also increased startlingly as a result of industrial toil for women. Thus for Mülhausen and its district, between 1873–82, infant mortality was, on an average, 240 to 1000 infants born living. Naturally also, this region furnished a smaller quota of military recruits than the numbers of its population should have warranted. (Page 470.)

Verhandlungen des Reichstags, 103. Sitzung, 18. April, 1891. [*Proceedings of the German Reichstag, 103rd Session, April 18, 1891.*]

Representative Bebel:

The effect of the excessive industrial labor of women upon the death rate of infants is shown by some statistics of Saxony, which comprise the period from 1880 to 1885, and show the death rate of children in their first year in the industrial towns and districts. The mortality of infants under a year old in the cities of the whole empire averaged 28.5 per cent, while in those cities of pre-eminently manufacturing importance, it rose from 36 to 45 per cent, and in those where women were employed in the highest numbers, as in the vicinity of Chemnitz, it rose from 40 to over 50 per cent. (Page 2420.)

Zeitschrift der Soziale Wissenschaft, Bd. VIII, Nr. 10, 1905. Die Fruchtbarkeit selbst arbeitender und den arbeitenden Ständen angehöriger Frauen. [*The Fertility of Women of the Working Classes and of those Engaged in Industry.*]

This subject has been investigated by Prof. Ugo Broggi, who, in an article in the *Zeitschrift für Versicherungswissenschaft* (July 1, 1905) states that of 172,365 Italian women between the ages of 15 and 54 years who were employed in industrial occupations the average child-bearing co-efficient was only 45 per thousand, or about one-third of the general

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fertility of Italian women (120 per 1000). The investigation, in detail, included 7029 working women in chemical industries and collieries. The average fertility was 46 per cent. 1595 women in food factories showed an average fertility of 39 per cent; 134,770 women in the textile trades, 39 per cent; and 28,971 in varied industries such as paper, wood, clothing, tobacco factories, etc., 73 per cent. Thus, throughout, a lower fertility than the normal. One exception only was noted, in the women employed by the state in the state tobacco manufactories, who, with a fertility of 104 per cent came nearest in their child-bearing capacity to the average of the entire female population. (Pages 663–664.)

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Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. II. Sec. IV. Ermüdung durch Berufsarbeit. [*Overwork as a Result of Occupation.*] Dr. IMBERT, *University of Montpellier. Berlin, Hirschwald, 1908.*

Pinard and his pupils have shown that the period of gestation is of shorter duration in working classes than it is in well-to-do classes.

Again, the average weight of infants at birth is inferior accordingly as the mother has labored up to the time of delivery or when her work has been very hard. (Page 641.)

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Report of the New York Bureau of Statistics of Labor. 1890.

In his report to the federal government of Switzerland, dated Berne, 1889, Dr. Decurtius, states that in the few years since a law was passed in his country forbidding the employment of women for six weeks after their confinement, the mortality of children, including the still-born, decreased from twenty-nine per cent to five per cent. The same decrease was observed in Mülhausen, the great manufacturing city of Alsace, where, owing to the efforts of some philanthropic employers, a general voluntary observance of similar rules prevails, and adequate provision is made for the care of the mother during her absence from the factory. But Dr. Decurtius makes, furthermore, the important statement that, while the mortality of such children is not sensibly greater than that of the children of artisans and farm laborers, so long as the mothers are thus kept from factory work and taken care of, it immediately increases as soon as they return to work. (Pages 81, 82.)

According to Dr. Otto Pringsheim, while the average mortality of children in the Netherlands is 18.88 per cent, it is twenty-one, thirty and thirty-three per cent in the manufacturing cities of Maestricht, Eindhoven and Gonda, respectively. This higher rate in the cities named he attrib-

utes, emphatically, to the hard labor of female workers and the dissolution of family life by the factory system. (Page 82.) UNITED STATES

Bulletin of the United States Bureau of Labor. No. 80. January, 1909. Woman and Child Wage-Earners in Great Britain. VICTOR S. CLARK, Ph.D.

The Dundee investigations suggest, though sufficient statistics were not obtained to confirm the point, that the employment of women in factories before childbirth may cause their children to be of light weight; and the deaths due to a number of causes attributable to the general condition of prematurity are probably larger than the average among the infants of this class of workers.

The relation of the factory employment of women to infant mortality seems well established, though there must be other important factors in the problem. In Bradford the mortality of children under 1 year is 160 per 1000 among working mothers, as compared with 40.8 per 1000 among those of mothers who are not working. (Page 77.)

The higher death rate of infants whose mothers are employed in industrial work may be ascribed broadly to two general causes, (1) prenatal conditions and (2) neglect after birth. Where mothers work unfavorable prenatal conditions are nearly constant from year to year, but neglect after birth causes deaths to fluctuate accordingly as the season is more or less favorable for the survival of infants receiving improper care. In Dundee the deaths within a week of birth are very large, and those due to "immaturity" are more frequent than in cities where fewer mothers work. "It is impossible to apportion the cases of immaturity to definite causes, but it may be broadly stated that premature birth and other causes of death classified with it under the head of immaturity are due to congenital weakness in the infant, and this congenital weakness it is usual to attribute to prenatal causes." One of the leading English experts reports: "The effects of poverty and hard work while the child is being formed in the womb do undoubtedly have the effect of producing weakly children, who either grow up weakly or die."

The first phase of material neglect, after the child is born, forced upon the mother by the necessity of working in a factory, is the cessation of breast feeding, And the relative mortality of infants not fed at the breast appears to be higher in case of women engaged in industrial work, even in their homes, than in case of other mothers. (Pages 78, 79.)

Yet even the most enthusiastic social reformers do not call for amendments to the law to prevent women—or even to prevent mothers—from

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working in factories. This employment is recognized as an economic necessity for the working people at present. It is a condition that it would be far better for a country never to reach—even at the expense of less wealth and so-called industrial progress—but once incurred it can not be remedied abruptly. However, amendments forbidding the employment of mothers immediately before and for two or three months after childbirth, combined if necessary with temporary pensions to working mothers, to carry them over this critical period, are advocated by men who would not be called extremists. Meanwhile the municipal authorities, through their lady health visitors and private associations, are doing something to meet the worst evils arising from these causes. (Page 81.)

(6) Race Degeneration

Deterioration of any large portion of the population inevitably lowers the entire community, physically, mentally, and morally. In communities where excessive working hours have long prevailed, one generation after another has suffered from overwork, inherited weakness, and the loss of all family decencies, until actual race degeneration has resulted. Progressive decline in stature, strength, and efficiency becomes markedly evident. This is conspicuously shown by the large percentage of persons necessarily excluded from military service for physical unfitness.

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Hansard's Parliamentary Debates. Vol. 73. 1844.

Lord Ashley:

By the system we permit, the laws of nature are absolutely outraged, but not with impunity. The slow but certain penalty is exacted in the physical degradation of the human race, including, as it does, the ruin of the body, and the still more fatal corruption of the moral part. (Page 1086.)

Mr. M. Geachy:

On one Member of the Government, at last a Ten Hours' Bill has an hereditary claim. Five-and-twenty years ago the first Sir Robert Peel said before a Committee of the House of Commons in speaking of a Ten Hours' Bill:

"Such an unlimited and indiscriminate employment of the poor con-

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sisting of a great proportion of the inhabitants of the trading districts, will be attended with effects to the rising generation, so ruinous and alarming, that I cannot contemplate them without dismay, and thus the great effort of British ingenuity, whereby the machinery of our manufactures has been brought to such perfection, instead of being a blessing to the nation, will be converted into the bitterest curse." (Page 1217.)

Mr. C. Buller:

In Wiltshire the average duration of life was 33 years, in Manchester it was only 17. . . . Now, it could not be doubted that the evils of this physical condition were calculated to grow worse in every succeeding generation. A people whose life was reduced to one half of the usual average of the labouring class by no accident, no sudden disaster, no chance epidemic, but by the constant action of circumstances unfavorable to health and longevity, were not likely to propagate a vigorous and healthy race. He thought that no legislature could view with indifference a state of things that thus shortened human life, and tended to deteriorate the species. (Page 1435.)

Hansard's Parliamentary Debates. Vol. 74. 1844.

Sir R. Peel:

Mr. John Moor, surgeon, stated, unless something was done to improve the condition of the factory workers, the rising generations in the manufacturing districts would be debilitated more than the present, and so generation would go on until the human species would be everything but extinguished. As a medical man of 40 years' standing in the town of Bolton, he had no hesitation in making this declaration. The ravages which, in his capacity of surgeon, he had witnessed from scrofula and other diseases, consequent upon confinement to the mills, had been so disastrous that he did not hesitate to say that if the system of confinement in mills for so long a period each day was continued much longer, there would be but few engaged in factory labour who would escape deformity. In many cases which came under his own knowledge, inflammation of the feet and legs ensued, which had to be followed by amputation. From these and many other considerations, he was decidedly of opinion that 10 hours' labour in factories was even more than could be endured without injury to the human constitution. (Page 679.)

One other of his (Lord Ashley's) statements . . . had been called in question. He had made it on the authority of a medical man in Lancashire, that long protracted labour had a most injurious effect, especially in cases of pregnancy, that varicose veins had formed and bursting, ended in death. (Page 679.)

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British Sessional Papers. Vol. XV. 1870. Reports of Inspectors of Factories.

This condition of the factory population has . . . been brought under my notice by one of my certifying surgeons. . . . Dr. Ferguson writes thus:

"Within my short experience . . . I see a marked degeneration in the height and general development of children presented for examination, especially in those of 18 years and upwards, and have had to reject during the last 2 years more than 200, because those coming to pass had not more than the average strength and appearance of 11 years. I attribute this degeneration mainly to the intemperate and improvident habits which prevail extensively amongst the parents. Boys of 15 and 16 years old come before me almost every week, not having more than the average height and development of 13 years, their lips pale and the muscles flabby. I fear drunkenness is on the increase among factory hands, especially among the women." . . . (Pages 156, 157.)

British Sessional Papers. Vol. XVI. 1875. Reports of Inspectors of Factories. For half-year ending 30th April, 1875.

It was during this period that the factory hand became changed from the healthy labourer to the weakly, anæmic, and frequently decrepit operative. Doubtless, from the cost of the introduction of steam, and the desire to run the machinery as long as possible, the factory hands did degenerate from the sturdy labourer and operative in the valleys and on the hill sides of Lancashire and Yorkshire to the wasted and down-trodden operative of the purely manufacturing town, working daily and all day long, and possibly part of the night also, in a close, hot, ill-ventilated factory, returning from work to a dwelling more unhealthy than the factory, until the factory population appeared to have become a distinct race, that was known at a glance, so defined had the effects of overwork and unhealthy dwellings become upon the physical appearance and condition of the people. (Page 23.)

British Sessional Papers. Vol. XVI. 1876. Reports of Inspectors of Factories. For half-year ending 31st Oct., 1875.

Testimony of certifying surgeon:

No doubt height is not so much affected as physique, although contrasted with an agricultural population, height is perceptibly less in the factory population. The physical strength and appearance suffer much in factories from confined heated atmospheres, loaded with fine cotton fibres, fine flinty sand, and cutaneous exhalations. The number of gas-

lights, each light destroying oxygen equal to one man, and transitions from the mills and their temperatures to their dwellings. Diet and drinks adapted to a heated employment and stimulants to sooth an excited nervous tension. In short the skin secretes the quantity of an Indian climate. Vision is always on the move. Perception and volition, from the nature of their work, always in action. The weight of liquid thrown off from the skin is compensated by drinks of tea, coffee, and water. The very tension caused by their work is best allayed after hours of labour by resources always at hand. But unfortunately, drink stimulants and mental excitement are resorted to, and want, improvidence, the poorest houses, and bad food tell against healthy offspring. (Page 103.)

Transactions of the National Association for the Promotion of Social Science. 1857. Vol. I. The Early Closing Movement. JOHN LILWALL. *London, John Parker, 1858.*

Mr. Stevens, of St. Luke's Lunatic Asylum, observes: It may be stated with great confidence that a prolific cause for the rapid and extensive increase of insanity in this country is to be found in the unceasing toil and anxiety to which the working classes are subjected. This cause developing the disease in the existing generation, or what is quite as frequently the case, transmitting to the offspring idiocy, insanity, or some imperfectly developed sensorium or nervous system. The agitated, overworked, and harassed parent is not in a condition to transmit a healthy brain to his child. (Pages 554–555.)

A Shorter Working Day. R. A. HADFIELD *of Hadfield's Steel Foundry Co., Sheffield, and* H. DE B. GIBBINS, M.A. *London, Methuen, 1892.*

Those who have studied the history of the Factory Acts are simply aghast at the fearful conditions of labor therein disclosed and at the same time amazed at the endurance of which the workers of that day were capable. The penalty has been paid by their descendants, as those who live in the factory districts can testify. (Page 88.)

The Case for the Factory Acts. Edited by Mrs. SIDNEY WEBB. *London, Richard, 1901.*

It may be enough for the individual employer if his workpeople remain alive during the period for which he hires them. But for the continued efficiency of the nation's industry, it is indispensable that its

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citizens should not merely continue to exist for a few months or years, but should be well brought up as children, and maintained for their full normal life unimpaired in health, strength, and character. The human beings of a community form as truly a portion of its working capital as its land, its machinery, or its cattle. If the employers in a particular trade are able to take such advantage of the necessities of their workpeople as to hire them for wages actually insufficient to provide enough food, clothing, and shelter to maintain them and their children in health; if they are able to work them for hours so long as to deprive them of adequate rest and recreation; or if they subject them to conditions so dangerous or insanitary as positively to shorten their lives, that trade is clearly using up and destroying a part of the nation's working capital. (Pages 20–21.)

. . . Industries yielding only a bare minimum of momentary subsistence are therefore not really self-supporting. In deteriorating the physique, intelligence, and character of their operatives, they are drawing on the capital stock of the nation. And even if the using up is not actually so rapid as to prevent the "sweated" workers from producing a new generation to replace them, the trade is none the less parasitic. In persistently deteriorating the stock it employs, it is subtly draining away the vital energy of the community. It is taking from these workers, week by week, more than its wages can restore to them. A whole community might conceivably thus become parasitic on itself, or, rather, upon its future. (Page 22.)

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Débats et Documents Parlementaires, Chambre des Députés, 23e Mars, 1881. [*Parliamentary Debates and Documents. (French) Chamber of Deputies, Mar. 23, 1881.*] *Suite de la discussion des propositions de loi concernant la durée des heures de travail dans les usines et les manufactures.* [*Discussion of the sections of the law relating to the length of hours of work in workshops and factories.*]

Senator Waddington (quoting M. Vanzuppe, a cotton-spinner, who said):

What is the inevitable result of the silence of the law as to a generally efficacious restrictive regulation of the hours of labor, settled in accordance with human strength?

It is: higher mortality; decreased birthrate; physical and moral degeneration of the industrial masses;

It is: in the last analysis, the loss of many whose intelligence and whose robust arms might have well served the state.

An industrial population tends to destroy itself, and the immigrant

must be looked to to fill the vacant places created by our industrial system. FRANCE

The foundation of free citizenship is education, but by a bitter irony the workers are deprived of the facilities for obtaining it. Exhausted by excessive labor, can they read, or study? (Page 618.)

Tenth International Congress of Hygiene and Demography. Paris, 1900. In one vol. Législation et Réglementation du Travail au point de Vue de l'Hygiène. [*Labor Legislation and Restriction from the Standpoint of Hygiene.*] M. ÉDOUARD VAILLANT, *M. R. C. S. Engl. Paris, Masson et Cie, 1900.*

The insufficiency of labor legislation is plain before our eyes: at 40 or 45 years the laborer, used up by overwork, is unfit for the shop. He went to work too soon; his growth was checked; his organism was enfeebled, and he is replaced in his work by his puny children, destined to a fate like his own.

Misery and degeneration of a modern type appear with modern machines of industry and with the employment of women and children. The different industrial countries, feeling their strength sapped at its sources, have sought counsel from hygiene. This is the origin of the earliest protective laws for children, then those for the adolescent and the woman.

In less than a half century the evil has made frightful progress.

Lack of health, depression, and degeneracy have followed upon physiological poverty resulting from overwork and under nutrition.

Since the end of the last century the testimony of historians, travellers . . . and medico-hygienists has been uniform on this question. With the introduction of machinery and of the factory, displacing handwork, methods of work have been transformed. Daylight no longer limits the working day. Artificial light allows the longest possible use of motor devices, and these are attended by an army of women and children. (Page 503.)

Verhandlungen des Deutschen Reichstags. 103. Sitzung, 18. April. 1891. [*Proceedings of the German Reichstag. 103rd Session. April 18th, 1891.*] GERMANY

Representative Bebel:

The vast change in social and family life which is portended by the increasing pressure of women into industry has been strongly emphasized

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. . . there can be no doubt that the physique of the woman is not adapted to the same degree of muscular exertion and development as the man's. That the sound and healthy development of the race depends in large measure upon the strength and health of the mother is acknowledged, and no one can deny that the health of women to-day is seriously endangered by factory work. The one fact alone, that the military recruiting offices all over Germany have found that from decade to decade the number of physically fit recruits in factory and manufacturing districts is diminishing to an appalling extent, so that it is necessary to draw more and more heavily upon the country regions—shows clear and plainly what kind of process is at work upon the development of the national physique, and the more extensive our industry becomes, and the more it invades the country regions, the more and more certainly will it exhaust those sources of strength which are now the only sources to look to for military defence.

For these reasons it is absolutely essential that the laws should promptly provide ample means for overcoming this tendency to deterioration of race in every way. (Pages 2419–2420.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichts-beamten. 1897. [*Official Information from Reports of the* (*German*) *Factory Inspectors.*] *Berlin, Bruer, 1898.*

It is repeatedly shown in the reports that in certain branches of industry in specific regions the working classes deteriorate in health from one generation to another, as they become hereditarily more predisposed to fall victims to the special injuries induced by their calling. Certain work is regarded as an inherited occupation, even though its unwholesome effect is known and though the bad health of whole families engaged therein becomes ever more clearly evident. (Page 208.)

Of first importance is it to shorten the hours of work. (Inspector in Potsdam.) (Page 210.)

Die Sociale Reform als Gebot des Wirthschaftlichen Fortschrittes. [*Social Reform as a Condition of Socio-Political Progress.*] Dr. HEINRICH HERKNER. *Leipzig, Duncker, 1891.*

The results of excessive work, insufficient wages and deficient nutrition appear with a distinctness that cannot be ignored in the reports of the recruiting statistics. A military examining physician of the empire (German) reported from a factory region: "In the factory villages, where every one works from youth up in the factories, almost all recruits were

unfit for service, and I believe that, if this goes on, it will be useless to send recruiting commissions to these communities." (Page 4.) (Quoted from Archiv für öffentliche Gesundheitspflege in Elsass-Lothringen, VII, 107.) GERMANY

Hours and Wages in Relation to Production. Lujo Brentano. Translated by Mrs. WILLIAM ARNOLD. *London, Sonnenschein, 1894.*

It was said—that machinery had made labour easy which had been arduous; that it even rendered possible the employment of little children where formerly grown-up people had been indispensable; and that as the work was no longer arduous, a prolongation of working days could do no harm. The actual consequence of this easier but longer labour was a complete deterioration of the working classes, physically, mentally, and morally—especially of the women and children whose labour replaced that of male adults. "And so it came to pass," to use the words of the first Sir Robert Peel, "that that great achievement of British ingenuity, by means of which factory machinery attained to such perfection, became, instead of a blessing to the nation, its bitterest curse." (Pages 21–22.)

Jahrbuch für Gesetzgebung, Verwaltung, und Volkswirthschaft im Deutschen Reich. Vol. 25[1. 2]. 1901. Die Wehrfähigkeit der ländlichen und städtischen Bevölkerung. [*The Arms-Bearing Capacity of Country and City Populations.*] Dr. GEORGE BINDEWALD.

It is certain, according to medical testimony, that factory work for women, and work behind the counter in shop and store, takes vengeance upon the young working woman when she becomes a mother; and not only upon her, but even more upon her offspring.

This is just as certain as that healthy, vigorous mothers who have not been subjected to the strain of a struggle for existence, bequeath health to their posterity. (Page 188.)

It is unquestionable that industry cannot be entirely deprived of women's work, but, for the sake of a sturdy race, it appears to be a stringent necessity to restrict such labor to its minimum. (Page 191.)

The work of women in industry should be limited: this may be done chiefly by reducing the length of the working hours, and also by lengthening the periods of rest at the time of childbirth. (Page 192.)

Handwörterbuch der Staatswissenschaften. Bd. I. Jena, Fischer, 1909. [*Compendium of Political Science, Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in*

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Berlin; W. LEXIS, *Professor of Political Science in Göttingen, and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin.*

The state approaches the question of working time from another standpoint than does the church. The state is above all the organ of perception of national interests. The bedrock of national strength is an able, loyal, intelligent people. It is therefore important for the state to see that this foundation is not shattered by the prolongation of working hours. First of all, the fatal influence of excessive hours of work came to light in the inferior military fitness of the factory population. After that it was only in obedience to the most elementary law of self-preservation that states regulated the hours of work of the least resistant classes, the children, young people, and women. According as the proportion of the industrial classes to the whole community is larger, so much more urgently necessary does it become to lessen the serious dangers to health which inhere in industrial as opposed to agricultural occupations, by a wise limitation of the hours of work.

The state needs not only soldiers, but citizens capable and ready to share in public life. Wage-earning must leave some time free for such duties. (Page 1206.)

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Massachusetts House Documents. No. 153. 1850. Minority report re limitation of hours of work.

They fully believe and think that nearly all intelligent persons, who have thought upon the subject, will admit that the present hours of labor in the manufactories of this State, are too many, for the moral welfare and physical health of the operatives, and that this system of labor is a great evil, which, not only immediately affects the laborers themselves, but is diffused into society, and will entail serious effects upon posterity. (Page 6.)

Evidence Submitted to the Massachusetts Legislature in Favor of the Enactment of a Ten-Hour Law. Lawrence, 1870.

I have observed with regret the premature decay of the youth of our city, who are confined, long hours, in an unhealthy atmosphere in our mills, and believe that disease is being nourished in our organisms for an ultimate weakened and miserable race. I believe the cause of humanity demands redress in the matter of time,—the young and female portion of the community, at least, are to be confined in our mills, if we desire a healthy and happy community. Isaac Smith, Jr., M.D. (Page 18.)

Report of the Massachusetts Bureau of Statistics of Labor, 1871. UNITED STATES

14. Progressive physical deterioration produced by family labor in factories. It is well known that like begets like, and if the parents are feeble in constitution, the children must also inevitably be feeble. Hence, among that class of people, you find many puny, sickly, partly developed children; every generation growing more and more so.

15. Connection between continuous factory labor and premature old age. It is a fact, patent to every one, that premature old age is fully developed, in consequence of long hours of labor and close confinement. Very few live to be old that work in a factory. (Page 507.)

Massachusetts Senate Documents. No. 33. 1874.

The Committee on the Labor Question to whom was referred so much of the Governor's address as relates to Labor Reform, having considered so much thereof as pertains to the enactment of a ten-hour law, and having also considered the petition of Wendell Phillips and others for the passage of such a law, Report: That the advocates of a reduction of the present hours of labor in textile manufactories claim, and produce evidence to show, that ten hours is as long as females or children should be required, or allowed, to work in the close confinement of the mills, if the Commonwealth has any interest in insuring a healthy and intelligent posterity. (Page 1.)

Report of the United States Industrial Commission, Final Report. Vol. XIX, 1902.

Factory life brings incidentally new and depressing effects, which those whose experience has been wholly agricultural do not appreciate. But the experience of States which have pushed their way from agricultural to manufacturing industries, and have found that their delay in protecting their factory employees has weakened the physical and moral strength of the new generation of working people, would seem to be an experience which the citizens of new manufacturing States should hope to avoid. (Page 788.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1903–1904.

In certain fields of industry, like the manufacture of cotton goods or hosiery and knit goods, we may find the establishments paying the lowest

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wages, working their employees the longest hours, and under the worst sanitary conditions, temporarily driving out of the field of competition those establishments paying the best wages, working their employees a reasonable length of time surrounded by the best sanitary conditions; but if the process is allowed to continue, the nation tolerating it will certainly revert to a state of discontent, poverty, and crime, which no agency or force can overcome so well as wise factory legislation strictly and judiciously enforced. (Page 137.)

Besides this many eminent students of social conditions maintain that in countries where industries have been allowed to run for centuries without any form of regulation, pauperism and crime are more prevalent than in those countries where regulation exists. Also, in countries where regulations have been imposed and withdrawn, misery and want have risen and fallen in almost direct proportion to the imposition and withdrawal of such regulation, and poor relief has ebbed and flowed in almost the same proportion. (Pages 140–141.)

Popular Science Monthly. Vol. XXIV. 1884. New York, Appleton, 1884. Female Education from a Medical Point of View. Lecture delivered at the Philosophical Institution of Edinburgh. J. S. Clouston, M.D.

There is another vital fact in the constitution of human nature that needs to be taken into account. . . . It is this, that one generation may, by living at high pressure, or under specially unfavorable conditions, exhaust and use up more than its share of energy. That is, one may draw a bill on posterity and transmit to the next generation not enough to pay for it. I believe many of us are having the benefit of the calm, unexciting, lazy lives of our forefathers of the last generation. They stored up energy for us; now we are using it. The question is, can we begin at adolescence, work at high pressure, keep this up during our lives (which in that case will be on an average rather short), and yet transmit to our posterity enough vital energy for their needs? (Page 218.)

II. BENEFITS OF SHORT HOURS

A. *Good Effect on Morals: Growth of Temperance*

The good effect of shorter working hours on the use of leisure is conspicuously shown in the growth of temperance

where working hours have been reduced. With better health and a higher moral tone due to the shorter working day, temperance in the use of stimulants results automatically.

United States Congress, House Report No. 1793 (4405). Hours of Laborers on Public Works of the U. S. Report from the Committee on Labor, 57th Congress, 1st Session, 1901–1902. UNITED STATES

It is contended by the advocates of the shorter day that the additional leisure given to labor in every instance of the shortening of the work day, as it has been shortened step by step from sixteen hours to fourteen, twelve, eleven, ten, nine, and in many instances eight, has resulted in a decrease of intemperance among laborers, the acquirement of better taste and new and better desires, resulting in better homes, greater domestic felicity, and higher degree of intelligence with an increase of laudable pride as to the clothing of themselves and those dependent upon them. In a word, has increased their interests in home and better social relations, raising their moral status, and has made them much better consumers of the products of labor, and hence resulted in increased production.

The proposition that without variation the elimination of intemperance, poverty, pauperism, ignorance, crime and their accompanying evils move parallel with and proportionate to the increase of the social opportunities of the laboring class stands without impeachment of its historical accuracy. (Page 8.)

National Civic Federation Review. Vol. I, No. 7. Sept., 1904. Will Labor Make Concessions for a Shorter Work-Day? Answers to Question: Do you believe that a shorter work-day lessens production or increases the labor cost of production?

Thomas M. Nolan, Editor of the Union Label Magazine, Boston:

. . . Another important point is that the general morale of the craft has advanced as the hours have decreased. Temperance, morality, and a general uplifting tendency has been observed to a greater extent among the rank and file of the printing crafts. (Page 7.)

The National Civic Federation Review. Vol. II, No. 8. Jan.-Feb., 1906. The first annual meeting of the New England Civic Federation, Boston, Jan. 11, 1906.

James Duncan, of Quincy, General Secretary of the Granite Cutters' International Union:

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You may take any locality in this or any other country where the hours of labor have changed from ten to nine, or nine to eight, and I say that temperance has increased in accordance with that reduction. I had the honor to speak in a meeting in Georgia a short time ago, where the mayor of the town was the presiding officer, and he told me when he first became a municipal officer a great part of the revenue of the town came from fines for drunkenness and disorderly conduct of the working people of the vicinity. The granite industry, with which I am proud to be connected, became busy in that locality, and we began the agitation for the shorter work day. The mayor told me that after we had introduced the eight-hour day—and we were successful, and the other trades working nine hours were afterwards reduced to eight—disorderly conduct and intemperance became so little known in the community that the town had to look for taxation in other directions than the saloons in order to meet its necessary expenses. (Page 9.)

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Hansard's Parliamentary Debates. Vol. LXXIV. 1844.

Lord Ashley:

Your own inspectors have told you that without such a limitation of the hours of toil there can be no hopes of the social or moral improvement of the working classes. (Page 912.)

British Sessional Papers. Vol. XXV. 1845. Reports of Inspectors of Factories.

All the Sub-Inspectors in my district concur with me in bearing testimony to the important fact that the reduction in the hours of labour, both of women and children, has commended itself to many who had previously entertained doubts as to its expediency and practicability.

It is impossible to estimate too highly the moral and social advantages which result from these two amendments of the law; and none but those who have witnessed the proceedings to which the former license to employ women long hours and all night gave rise . . . can fully appreciate the simple provisions that now protect both classes. (Page 40.)

British Sessional Papers. Vol. XXVI. 1847–8. Reports of Inspectors of Factories.

It has, on many occasions, been stated to me by masters, that they consider 12 hours' work more than is consistent with the welfare and a

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desirable social condition of their people; that a reduction of 1 hour a day would have effected a great improvement; and that although it would have occasioned a reduction of income both to the employers and the employed, it would not have been to such an amount as to be felt to be too great a sacrifice for the object by either party. . . . I have recently had a letter from the proprietor of one of the largest cotton mills in my district . . . in which he says, "I think that there are evident general indications that the shortening of the hours of labour in factories will prove to be a great moral benefit to our laboring classes." (Pages 3–4.)

The Case of the Journeymen Bakers. Evils of Night-work and Long Hours of Work. WILLIAM AUGUSTUS GUY, M.B., *Fellow of the Royal College of Physicians, Professor of Forensic Medicine, King's College; Physician to King's College Hospital, etc. London, Renshaw, 1848.*

Health on the other hand, like cleanliness, is an ally of virtue and sobriety. It is favourable to self-control, and to quiet and rational enjoyments. It has the same effect on the mind as it has on the palate; it enables it to relish plain and homely fare, and to dispense with unwholesome stimulants. By abolishing nightwork, and shortening your hours of labour, you would be placed in possession, not merely of new faculties of enjoyment, but of time to use them. (Pages 12–13.)

Eight Hours for Work. JOHN RAE. *London, Macmillan, 1894.*

(West Cumberland blast furnaces, experiment tried.) There seems to be every reason to expect better results next year, because the men were showing decisive signs of both physical and moral improvement. Their temperance societies had increased in membership 50 per cent during the year, and the provident and trade societies had spent 20 or 25 per cent less on sick allowances, both results being attributed to the relief from the undue fatigue from which all had suffered before. (Page 92.)

FRANCE

Archives Générales de Médecine. I. 1906. La Journée de Huit Heures. [*The Eight Hour Day.*] Dr. P. CORNEILLE. *Paris, 1906.*

Data obtainable in West Cumberland, England, as to the results of the 8 hour day show that temperance has gained 50 per cent and that mutual aid societies spent from 20 to 25 per cent less in sick pay.

The gasworks in London say:

FRANCE

Drunkenness used to be the rule. . . . The workingmen are sober since we have the 8 hour day.

The same reports come from Königsberg, in Germany, and from Mayence. (Page 1199.)

B. *Good Effect on General Welfare*

(1) General Benefit to Society

History, which has illustrated the deterioration due to long hours, bears witness no less clearly to the regeneration due to the shorter working day. To the individual and society alike, shorter hours have been a benefit wherever introduced. Wherever sufficient time has elapsed since the establishment of the shorter working day, the succeeding generation has shown extraordinary improvement in physique and morals.

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British Sessional Papers. Vol. XXXIV. 1860. Reports of Inspectors of Factories. For Half-year ending 31st October, 1859.

I think I can show that the Factory Acts have put an end to the premature decrepitude of the former long-hour workers, that they have enlarged their social and intellectual privileges, that by making them masters of their own time they have given them a moral energy which is directing them to the eventual possession of political power, and that they have lifted them up high in the scale of rational beings, compared with that which they had attained in 1833, moreover I think I can further prove that all this has been accomplished without any prejudice whatever to our commercial prosperity, as it was asserted there would be; that wages have not been diminished. (Page 47.)

There were in 1833 at least 200,000 females employed within the factories of the limited kingdom. "They were," says Mr. Smith, the eminent surgeon of Leeds, writing on this subject in August last, "a poor, emaciated and down-hearted looking race, with angular shoulders and stooping heads, and altogether destitute of the rounded form of healthy women." There are now 400,000, and they are "fair and florid, stout and muscular, cheerful and happy, and all the outlines are admirable." Such is the concurrent testimony of nine of the certifying surgeons who certify

for mills which employ 70,000 persons in the various branches of textile labor, of whom 40,000 are women and children. (Pages 48–49.)

British Sessional Papers. Vol. XIV. 1868–1869. Reports of Inspectors of Factories. For Half-year ending 31st Oct., 1868.

The physical condition of the operative classes has, from the shortening of the hours of labour, and from other causes, been greatly ameliorated. (Page 30.)

Undoubtedly the Textile Factory Acts embodied in the Act of 1867, notwithstanding their previous success in the textile districts, have been put upon their trial; nor can we be surprised that a question should have arisen in many minds whether Acts originally for textile works only would be found adequate for every trade, so as to bring all under one form of discipline . . . it was scarcely possible but that fictile and metallurgic trades should possess constitutional elements widely different from those of textile trades; the habits of the people being also different, their indulgences different, their expenditure different, themselves not yet accustomed to compulsion of any kind, and open only to the slowest and most careful approaches.

That it has met and conquered most of these and many such obstacles so remarkably . . . is a sufficient proof of the soundness of this kind of legislation. . . . Take, for example, the thousand and one trades carried on in such a place as Birmingham, where the domestic habits of the workers in respect of their employments, their general arrangements and associations, their laissez aller, had all been uncontrolled by any legal discipline down to the 1st of January, 1868, . . . where so many married women were and are yet employed away from their homes and families, and where the custom of leaving all social comforts to chance or opportunity had become perpetual rather than accidental, and the difficulty of entering on a contest with such habits, or of attempting to persuade all the persons whose feelings and interests were to be affected by that change that it would be far better for their physical and moral health than heretofore, and that their longevity, as well as their social comforts, depended on a regard to sanitary laws which had never hitherto been respected by them, may be imagined. What prejudices to overcome! . . . And yet, I have little doubt but time will show . . . masters as well as workers wondering how they ever formerly submitted to long hours, now that they can rejoice in earlier ones, which have given them the glorious fresh air in the summer evenings, and the additional glory of intellect advanced in the scientific institutions of the winter. (Pages 83–84.)

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British Sessional Papers. Vol. XV. 1870. Reports of Inspectors of Factories. For Half-year ending 30th April, 1870.

There is a generous feeling springing up on the part of many employers that the act (i. e. 1867) is a proper one; that its enactments are salutary; that though it binds them to certain provisions, they are provisions that are useful both in a social and business point of view; that long hours never produce the best work . . . there is a general improvement in our work people, and their habits of life are changed. There are fewer hours in the factory, and they have more time at home; besides which, when in the factory they are obliged to be clean, quiet, and industrious, and these habits tend beneficially on their home life. They are more intelligent, and it is remarkable that while they work fewer hours they earn more money. We have found that longer hours mean listlessness and loss of power. (Pages 44–45.)

British Sessional Papers. Vol. XXIX–XXX. 1876. Factories and Workshops Acts Commission. Vol. XXIX. Report.

Mr. Roberts . . . shows that in the last 40 years there has been a general improvement in the physical development of factory children, so that at each period of employment they measure 1 inch more round the chest than children of the same age did 40 years since. . . . We hope that . . . the shortened hours which now prevail in almost every industry will show in the course of another generation results as progressive and satisfactory as those which have already followed upon the regulation of women and employment of children in factories and workshops. (Page lxxii.)

British Sessional Papers. Vol. XX. 1878. Reports of the Inspectors of Factories and Workshops.

Ten years ago, when I made the first effort to introduce the Factory Acts in London, I was frequently met with the statement on the part of employers that the tendency of the Act would be to encourage prostitution, because by giving the women an enforced leisure they would be exposed to additional temptation. I was loath to believe any such theory, and I am glad to say that, so far as my experience during the last ten years goes, the fears thus expressed have never been realized. There has been quite a revolution during that period in the conditions on which seamstress work is carried on in the metropolis. The employment of them in work-

shops and factories has increased enormously, but I can find no employer willing to commit himself to the opinion that in their respective classes there has been any deterioration in the character and the conduct of the workpeople. All the evidence, indeed, which I have obtained goes to establish the contrary. (Page 15.)

British Sessional Papers. Vol. XVIII. 1882. Report of Chief Inspector of Factories.

All our experience goes to show that employers prefer moderate hours under reasonable restrictions to unlimited labor. Very few employers of any class are to be found in occupations under the operation of the Factory Act prepared to say they would willingly return to the old system . . . those who prophesied the dismissal of young persons from their occupation and the substitution of male adult labor acknowledge that they were mistaken, and are loud in their acknowledgment of the advantages to themselves, as well as their employees, of moderate hours of work. (Page 41.)

British Sessional Papers. Vol. XII. 1886. Report from Select Committee on Shop Hours' Regulation Bill.

Witness, W. Cooke-Taylor, Inspector of Factories:

3897. What is the result of your observations of the working generally now of the Factories as to the health of the young persons and women?—I think there is very little doubt the effect of the Acts has been to improve the health of young persons and women, and to make their lives very much happier.

3898. And without any corresponding disadvantage to those who employ them?—I think that all statistics on the subject and all experience show that the corresponding disadvantage has not occurred to all; it was supposed that it would occur, but experience has proved that it has not. (Page 183.)

British Sessional Papers. Vol. XXI. 1894. Report of the Chief Inspector of Factories and Workshops.

In factory legislation there has been steady progress, and whilst Royal Commissions and Trade Congresses have commended what has been accomplished and the mode of administration of the Factory Acts, they have always pointed to further reforms. Bills have been passed which

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could not have been introduced had not manufacturers, who were formerly opponents of such legislation, been convinced of its benefits by the results. (Page 5.)

The Case for the Factory Acts. Edited by Mrs. Sidney Webb. *London, Richard, 1901.*

The two great industries which, at the beginning of the nineteenth century, were conspicuous for the worst horrors of sweating were the textile manufactures and coal-mining. Between 1830 and 1850 the parliamentary inquiries into these trades disclosed sickening details of starvation wages, incredibly long hours, and conditions of work degrading to decency and health. The remedy applied was the substitution, for individual bargaining between employer and operative, of a compulsory minimum set forth in common rules prescribing standard conditions of employment. (Page 36.)

. . . What was the result? Fortunately, there is no dispute. Every one who knows these great industries agrees in declaring that the horrors which used to prevail under individual bargaining have been brought to an end. The terms "cotton-operative" and "coal-miner," instead of denoting typically degraded workers, as they did in 1830, are now used to designate the very aristocracy of our labor. And when, to-day, those who are interested in the industrial progress of women need an example of a free and self-reliant class of female wage-earners, earning full subsistence, enjoying adequate leisure, and capable of effective organization, they are compelled to turn to the great body of Lancashire cotton-weavers, now for half a century "restricted" in every feature of their contract. (Page 37.)

History of Factory Legislation. B. L. Hutchins and Amy Harrison. *Westminster, King, 1903.*

In 1861 the president of the Economic Section of the British Association could say in his address that the results of that bill (ten-hour bill) were "something of which all parties might well be proud. There is in truth a general assent that if there has been one change which more than another has strengthened and consolidated the social fabric in this part of the island, has cleared away a mass of depravity and discontent, has placed the manufacturing enterprise of the country on a safe basis, and has conferred upon us resources against the effects of foreign competitions which can scarcely be overvalued, it is precisely the changes which have

been brought about by the sagacious and persevering and successful efforts to establish in manufacturing occupations a sound system of legal interference with the hours of labor." (Page 122.) GREAT BRITAIN

Handbuch der Hygiene. Bd. 8[I]. [*Handbook of Hygiene. Vol. 8[I].*] *Edited by* Dr. THEODORE WEYL. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. EMIL ROTH. *Jena, 1894.* GERMANY

As the experience of every country daily confirms the fact that the reduction of working hours neither lessens nor deteriorates the working efficiency, nor lowers wages necessarily, there has been in all the civilized countries of Europe during the last ten years a steady tendency to shorten working hours,—a tendency which cannot be too emphatically encouraged in behalf of racial health. (Pages 26–27.)

Royaume de Belgique, Conseil Supérieur du Travail, 9e Session, 1907. [*Higher Council of Labor, Belgium, 9th Session, 1907.*] *Réglementation de la Durée du Travail des Adultes.* [*Regulation of Hours of Work for Adults.*] *Brussels, 1907.* BELGIUM

M. G. Helleputte:

To assure the workman his weekly rest: to prevent his being . . . subjected to excessive daily hours of work which injure his health and prematurely lessen his working capacity,—often his only wealth; to secure a robust, vigorous, and prosperous population,—this is an attractive ideal. From the physical or moral or intellectual view-point alike the reduction of the hours of labor can have none but excellent results. (Page 3.)

Report of the Massachusetts Bureau of Statistics of Labor. 1870. UNITED STATES

The influence of the ten-hour law in England was to raise the educational condition of the laborers, as was at once shown in their increased attendance on public lectures, public meetings, mechanics' institutes, in the establishment of agricultural and horticultural shows, where were exhibited products raised on grounds hired and worked during the time thus gained. . . . No greater boon was ever given to a people than this ten-hour law, and could a laborer of 20 years before it have come back to England, he would be amazed at the improved condition of the working people. (Pages 113–114.)

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Report of the Massachusetts Bureau of Statistics of Labor. 1872.

The testimony of those who have adopted the shorter time is almost unanimous in its favor. Many reported an improved condition of the employees. No instance is given of decreased wages, though many report an increase, not only in wages, but in production. All of the arguments against reduction made by those working eleven hours and over are answered by those who have adopted the shorter time, and worked under that system for years. The advocates of eleven hours have utterly failed to sustain themselves in their continued adhesion to a system that England outgrew twenty-two years ago,—a system unworthy of our State and nation, and one that would not last a month if the victims of it were men instead of women and children, as most of them are. (Page 240.)

Report of the Massachusetts Bureau of Statistics of Labor. On Results of Ten-hour Labor Law in England. 1873.

Lord Ashley said: "Upon the good moral and social influence of the change, the testimony is most favorable from the clergymen and school teachers throughout Yorkshire and Lancaster. How have the women used their time? Hundreds of them are attending evening school,—learning to read and write and to knit and sew, things that they could not have learned under the twelve-hour system.

"A burial society testifies to the diminution of burial although the cholera was upon the town, and that the diminution was among children under five years of age, and he assumes as a reason that mothers can get home earlier and give that attention to children which no hired nurse can ensure.

"The Catholic priests at Stockport and Bolton testify that the number of factory workers attending schools has more than doubled, and that there was not the slightest doubt that the moral, social, and physical condition of the people had improved." (Page 492.)

Report of the Nebraska Bureau of Labor Statistics. 1887–1888.

The reduction of the number of hours required for a week's work has proved to be quite as beneficial to the men and women employed in this establishment as was expected. This change . . . "is worth all the time, expense, and labor involved in the controversy." (Page 122.)

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Report of the Connecticut Bureau of Labor Statistics. 1888.

. . . Their main argument (for 10 hours) is . . . that the interests of society justify and require the adoption of such regulations as will promote the moral, physical, and intellectual development of the laboring people, and that the hours of labor of mothers, daughters, sisters, and of children generally have a vital bearing on this subject of such deep interest to our entire people, and ought to be legally restricted. (Pages 26–27.)

Report of the Massachusetts Chief of the District Police. 1889.

The good results of shortening the hours of labor were soon apparent, in the substantial disappearance of discontent among those affected thereby; in the maintenance of the standard of factory productions, both as to quantity and quality; and in placing Massachusetts in the lead, where, by her history and her aspiration, she rightfully belonged.

. . . If experience has shown anything in this matter, it has been the wisdom and statesmanship of the body of laws in our Public Statutes and additions thereto, which are known as industrial legislation. It is sixteen years since the ten-hour law was enacted; and it is entirely safe to say that, if it were stricken from the statutes to-day, not an influential voice would be raised within our borders in favor of the restoration of the order of things which that law changed. The increase of public interest in matters of this kind is a very significant fact. (Page 7.)

Report of the New Jersey Bureau of Labor Statistics. 1890.

The agitation for shorter hours of labor, for improvement in the sanitary condition of factories and workshops, the restriction of child and women's labor are evidence of a tendency to improve their surroundings and to mitigate some of the evils which have grown up under our changing methods of production. (Page 364.)

The utility of State interference is well shown in the operation of the laws to restrict the employment of children and to regulate the work hours of women and young persons in factories and workshops, now in operation in nearly every State and industrial country in the world, and very generally regarded as among the wisest and most humane acts of modern legislation. (Page 366.)

Report of the Illinois Factory Inspectors. 1895.

In France, Germany, and every other continental country, and in the more progressive States of this country, legislative regulation of the hours of labor has been found an effective measure for the protection of the

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health of the women and children employed in factories and workshops. (Page 5.)

In England the principle of the regulation of the hours of work of women and children has been established for more than a generation; and the regeneration of the working class in that country, from the degradation in which it was sunk in 1844, is attributed to the Factory Acts, and especially to this essential feature of them. (Page 5.)

Report of the New York Bureau of Labor Statistics. 1900.

But the good accomplished by each successive factory law was so clearly apparent, that even capitalistic Parliament could not refuse to continue the policy of labor protection. The evidence that this policy wrought a revolutionary change in the amount of crime, pauperism, and misery is superabundant; but it is too familiar to warrant repetition now. (Page 49.)

The best evidence of the overwhelming success of the short-hour law from all points of view is afforded by the complete conversion of its opponents. Thus it came to pass that in 1860, when a bill was introduced to extend the ten-hour law to other branches of the textile industry, J. A. Roebuck, who had originally opposed with bitterness this kind of legislation, made the following recantation:

"I am about to speak on this question under somewhat peculiar circumstances. Very early in my parliamentary career Lord Ashley, now the Earl of Shaftesbury, introduced a bill of this description. I, being an ardent political economist, as I am now, opposed the measure, . . . and was very much influenced in my opposition by what the gentlemen of Lancashire said. They declared that it was the last half-hour of the work performed by their operatives which made all their profits, and that if we took away that last half-hour we should ruin the manufacturers of England. I listened to that statement and trembled for the manufacturers of England [a laugh]; but Lord Ashley persevered. Parliament passed the bill which he brought in. From that time down to the present the factories of this country have been under State control, and I appeal to this House whether the manufacturers of England have suffered by this legislation." (Page 50.)

Sir James Graham, another persistent antagonist of the short-hour laws, followed Mr. Roebuck with a similar recantation:

"I am sorry once more to be involved in a short-time discussion. I have, however, a confession to make to the House. . . . Experience has shown to my satisfaction that many of the predictions formerly made

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against the factory bill have not been verified by the result, as, on the whole, that great measure of relief for women and children has contributed to the well-being and comfort of the working classes, while it has not injured their masters. The enactment of the present bill ought to approach as nearly as possible the Factory Act. . . . By the vote I shall give to-night, I will endeavor to make some amends for the course I pursued in earlier life in opposing the factory bill." (Page 51.)

All travellers unite in testifying to the wonderful energy displayed in their work by the wage-earners of Australia. Such energy is a product not so much of the stimulating climate as the high standard of comfort made possible by the short working-day. Considerable evidence might be adduced in support of the following enthusiastic opinion of John Rae ("Eight Hours for Work," page 312.)

"The more we examine the subject the more irresistibly is the impression borne in from all sides that there is growing up in Australia, and very largely in consequence of the eight-hour day, a working class who for general morale, intelligence, and industrial efficiency is probably already superior to that of any other branch of our Anglo-Saxon race, and for happiness, cheerfulness, and all-around comfort of life has never had its equal in the world before." (Page 59.)

Report of the United States Industrial Commission. Vol. XIX. 1902.

Lessening of hours leaves more opportunity and more vigor for the betterment of character, the improvement of the home. . . . For these reasons the short work-day for working people brings an advantage to the entire community. (Page 773.)

Report of the Wisconsin Bureau of Labor Statistics. 1903–1904.

No private individual has any more moral right to exhaust the working energy and working capital of a nation without giving "value received" than he has to take the life of an employee outright. The only difference is that one is a slower criminal process than the other. It is not enough that workmen should obtain barely enough for their labor to enable them to live, but they should receive a competency. They should receive as much energy from their employers in food, clothing, homes, and furnishings amid healthful surroundings as they give to their employers in the articles they produce.

The stronger, healthier, and more intelligent a laborer is, the more wealth he represents. The laborers of a nation represent its working

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capital just as the hands of the farmer, his horse, or his ox represent his working capital. And the stronger and healthier either may be, the more capital it represents. The more efficient this capital becomes, the more wealth will be produced. Machinery operators represent the working capital of the manufacturer, and he owes it to the nation which protects him in his business to do everything in his power to increase this working capital and keep it in the highest possible state of efficiency. (Page 130.)

The regulation of factories either by law or by special agreement worked marvellous changes in England. In the course of half a century the "sweated" laborers of this great country whose course of life seemed almost run became energetic, self-reliant, intelligent, and efficient workers, owning their own homes, amid wholesome surroundings, and working a reasonable number of hours for a day's work.

Not only is factory legislation sound in principle, but wherever put to the test it has been found sound in practice as well. (Page 138.)

Fourteenth and Fifteenth Annual Conventions of the International Association of Factory Inspectors of America. Indianapolis, 1900. Niagara Falls, 1901. (*Bound in New York Department of Labor Report, 1901.*) *Problems of Factory Inspection. The Social Interest of Statistics of Factory Inspection.* A. F. WEBER, *Chief Statistician, New York State Department of Labor.*

Scarcely any upward movement of the century overshadows in its importance to the moral and material welfare of human society, the progressive shortening of man's working time. If one country be compared with another, it will be found that with hardly an exception the rule holds that the shorter the hours of labor, the higher the civilization. (Page 519.)

Bulletin of the United States Bureau of Labor. No. 80. January, 1909. Woman and Child Wage-Earners in Great Britain. VICTOR S. CLARK, Ph.D.

Because the modern factory system began in Great Britain and, together with material blessings, brought social evils, the first factory laws were enacted in that country. Since then constant conflict has continued between the destructive forces of untrammelled industry, sacrificing its servants to its dominant end, production, and the protective intervention of society, staying those forces in the interest of humanity. This conflict has resulted in a highly developed system of factory legisla-

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tion, based on over a century of experience. But many evils still afflict workers for which remedies remain to be discovered. (Page 1.)

In Great Britain there is now no such opposition to factory legislation as still evidences itself in some parts of America. No employer or representative of employers was heard to criticise the act as a whole, and there was but mild objection to any of its details. Undoubtedly among smaller works and in the sweatshop districts one might encounter struggling proprietors competing with large manufacturers under the disadvantage of insufficient capital and amid uneconomic conditions, who see in the demands for modern sanitation and regulated employment extortions that foreshadow their own ruin. But these people are few and growing fewer, and do not make public opinion outside their class. The great main current of thought and sympathy among the mass of the nation, including both employers and workers, not only favours present regulations but is not averse to extending them. (Page 11.)

Apart from wages and hours of work, both of which fundamental conditions of workers' welfare have improved while the factory acts have been in force, and partly on account of them, some less direct and more general effects can be traced to these statutes. (Pages 71–72.)

Employers and Employees. Full Text of the Addresses before the National Convention of Employers and Employees. Minneapolis, Minn. September 22–25, 1902. The Economic Effects of the Eight-Hours' Day. FRANK L. MCVEY, *Professor of Political Economy in the University of Minnesota.*

The whole tendency of modern industry, even with the shortening of hours, is in the direction of increased exertion. The essential element in the machine organization is the human one, the most precious and the most difficult to replace. The energy of a worker in any industry should always be equal to that of the day before. If the pains of labor are heavy the tone of the workman is lowered and his surplus energy disappears, while he tends to become a mere automaton valuable to society for the net surplus he creates for others. The round of production of energy into goods, goods into utilities, and utilities into energy, is broken down by any such heavy burden. We must therefore hail, certainly from the viewpoint of the community, any movement likely to increase its working power. (Page 194.)

The community desires the highest good and greatest energies of its workers through long periods of time. This can be accomplished in most industries without any accompanying loss of productive power, by

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shorter hours of work, as has been proven in the experience of many industries.

. . . In some industries where labor is not employed continuously, but periodically and gathered from any and all sources, the employer finds it to his advantage to push the hours of work to the longest possible limit. Human energies can stand a pace of this kind for a time, and as the employer does not worry about a future supply of workers he expects to win an increased profit by such a policy. These industries have come to be called parasitic. (Page 194.)

(2) Benefit of Leisure and Recreation

After continuous work, a certain amount of leisure and recreation is a physiological necessity. While the overtaxed worker is left stupefied or inclined only to coarse pleasures after excessive labor, the worker who has not exhausted all energies by overexertion turns instinctively to a better use of leisure and recreation. License is replaced by ambition for self-improvement or the enjoyment of legitimate pleasures which react favorably upon the entire organism. Introduction of the shorter working day, therefore, raises the standards of the individual and the community.

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The Eight-Hours' Movement. Tom Mann. *London, William Reeves, 1889.*

Clearly, then, what is required is to develop the mental powers of the workers, and to give them leisure and capacity to assimilate knowledge. Stupidly slaving away like cattle will not give our country any chance in the competition with others. In that struggle, as long as it lasts, the victory will be with the nation that has the most energetic, intelligent, and capable workers—those, in fact, who work the shortest hours and have the highest standard of comfort. (Page 12.)

The Problem of the Unemployed. John A. Hobson. *London, Methuen, 1896.*

The indirect effects of a shorter working-day are not less important. Provided the increased leisure is not purchased by an injurious overstrain

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in the shorter working-day the increased opportunities it will afford for the cultivation of unused faculties and the satisfaction of new tastes, will furnish an ever growing stimulus towards an elevation of the standard of life. By yielding a continuous demand for the satisfaction of new, strong desires it will supply the moral force which, allied with improved intelligence and the more effective means of organization which modern conditions of industry and of life afford, makes powerfully and persistently for enforcing the claims of the working classes to a larger share of the aggregate consuming power of the community. (Pages 109–110.)

Diseases of Occupation from the Legislative, Social, and Medical Points of View. THOMAS OLIVER, M.A., M.D., F.R.C.P., *Medical Expert on the White Lead, Dangerous Trades, Pottery, and Lucifer Match Committees of the British Home Office. New York, Dutton, 1908.*

. . . It is held that no employer has the right to utilize the whole of the working part of a man's day, and thus deprive him of the leisure to which he as a human being is entitled. Since his whole nature has to be developed, it is claimed that the intellectual, moral, and physical powers of man cannot be developed if the hours of employment are too long, the work too hard and of a grinding nature. (Page xi.)

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Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1902. [*Reports of the Factory Inspectors in the Kingdom of Württemberg for 1902.*] *Stuttgart, Lindemann, 1903.*

A reduction of working hours appears to be also needed on moral and spiritual grounds. A widespread craving for improved education has in recent years developed in the masses of workers and demands satisfaction. Likewise the desire for family life has become stronger. (Page 209.)

The Relation of Labor to the Law of To-day. Translated from the German by PORTER SHERMAN. LUJO BRENTANO. *New York, Putnam, 1891.*

Why then does an increase in wages and a decrease in the time of work in general lead to a greater capability for work? Because higher wages and a shorter day's work make it possible for labourers to increase and satisfy their physical and spiritual needs; because better food, more careful fostering, greater and more moral recreation increase the power to work, and because they increase the pleasure in labor. . . . In other words, an increase in wages and a decrease in the time of work lead to a

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greater performance, because they elevate the standard of living of the laborer, a higher standard of living necessarily spurs to greater intensity of labor, and at the same time makes the same possible. (Pages 233, 234.)

Handbuch der Arbeiterwohlfahrt. Bd. II. [*Handbook of the General Welfare of the Working Classes, Vol. II.*] *Edited by* Dr. OTTO DAMMER. *Arbeiterschutz.* [*The Protection of Working People.*] Dr. ASCHER. *Stuttgart, Enke, 1903.*

It is natural that a workman, in the broad sense of the word, who has only a short rest period at his command, should chiefly use that in sleep, to restore his exhausted physical energy; also natural, that, if he has a little free time to spare, as on Sunday, holidays, he should spend it in coarse pleasures. Thus results the weariness of Monday, physical and brain fatigue. . . . If the workman had, instead, enough free time in the week to be able to come home to his family without being tired out—to read, to hear lectures, work in a garden, and so rebuild and restore bodily energy, he would not so misuse the leisure of Sunday. (Page 69.)

Handwörterbuch der Staatswissenschaft. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen; and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

3. The workman perceives that high wages can bring him real family life, a greater share in the gifts of civilization only when reduced working hours shall have enabled him to command some leisure and to retain a certain amount of mental buoyancy. For married working women especially a moderate working day offers the *sine qua non* for useful activity at home. (Page 1204.)

5. The shorter the hours of work, the more time there is for other opportunities, such as participation in public life, general or technical educational courses, and such opportunities are of the greatest value in the social position of the worker. (Page 1204.)

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Evidence Submitted to the Massachusetts Legislature in Favor of the Enactment of a Ten-Hour Law. Lawrence, 1870.

The workpeople of this State as a body have no desire to disturb industrial operations. Their lot is labor; but in toiling for bodily suste-

nance they desire leisure to feed the *mind*. The evidence of mill-operatives is confirmatory of the truth that, in their case, physical exhaustion renders impossible diligent application to mental improvement. (Pages 4–5.)

Report of Pennsylvania Bureau of Industrial Statistics (being Vol. III of Pennsylvania Internal Affairs). 1880–1881.

The agitation of the ten-hour system among the working people of this State began as far back as 1834 and 1835, extending through many years. The custom of working twelve and thirteen hours per day became exceedingly obnoxious to the working classes, and great efforts were made to prevail upon proprietors to reduce the number of hours to ten per day. . . . Injury to health, no time for leisure, recreation, or study, a total deprivation of social and innocent pleasure, by an all-work and bed system, was the great plea of the laborer, while the stereotyped objection of the employer was, that a reduction of the hours would curtail production, and thus render them unable to compete with like establishments in other sections of the country. (Page 100.)

That ten hours per day is fully as much as should be exacted from the employees we think cannot be gainsaid, and such is the spirit of the law, as well as the sentiments of all who take an interest in promoting the welfare of mankind in general and of labor in particular. The justice of both law and sentiment becomes more apparent when we contemplate the class of labor employed in factories and their relation to future generations. To the strong and sturdy male adult the task of being compelled to labor more than ten hours per day might not seem arduous, more especially where the work assigned to him is not of such a character as to be a drain upon his physical constitution; but, while this exception may possibly be granted, its compulsory exaction from the large number of women, girls, and young children employed admits of no excuse. In the returns received by the Bureau, the number of women and girls over fifteen years of age employed are 23,076; boys under sixteen, 4,183, and 3,548 girls under fifteen. . . .

These figures, without special analysis, we presume are sufficient to convince the most sceptical of the wisdom of a systematic enforcement of the ten-hour law by proper legislation, to the end that youth be protected, the condition of life be ameliorated, and the future of our State be promoted. Nor should the law be confined to factories alone, but extended to all industries where women and children are in any manner apt to be employed to the detriment of life and health. (Page 104.)

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Report of the United States Industrial Commission on the Relations and Conditions of Capital and Labor employed in Manufactures and General Business. Vol. VII. 1900.

Testimony of Mr. Rufus R. Wade, Chief of District Police, Massachusetts:

The question may well be asked, what has been the effect upon those operatives whose hours of labor have been lessened and to the children obliged to work in factories whose school privileges have been secured? The benefit to adults, comprising the laboring classes, by the reduction of the hours of labor has been to lift them up in the level of their manhood to thoughts of better things and to an organized demand for the same. It has given needed time for leisure to the operative, it has encouraged self-culture, it has afforded additional opportunity for recreation, and has given the debating school, lecture room, and library an impetus in every city and manufacturing town in Massachusetts. The large circulation which the daily papers have obtained, in my opinion, is due in part to the fact that the laboring people are considering the questions of public movement.

From an experience which has extended many years, not only through the medium of official duty but from personal observation, I would say, with much confidence, that there has been a gradual yet steady change in the conditions once existing, which has operated to the benefit and well-being of the laboring classes in the opportunities for mental and social culture. (Pages 79–80.)

United States Congress. House Report. No. 1793 (4405). Hours of Laborers on Public Works of the United States. Report from the Committee on Labor. 57th Congress, 1st Session. 1901–1902.

No recognized authority to-day combats the proposition that the condition of the laborer has improved with every reduction in the hours of daily service that has up to this time been made. Nobody is disputing that he has become a better consumer with each reduction. . . .

Economists contend with great plausibility that the shorter day results in an increase of wages without an increase of price, as consumption enlarges production, and the larger the scale of production the cheaper the given article is produced; that the laborer, when he has the leisure resulting from the shorter hours, has new aspirations, ambitions, and a greater personal self-respect, and, as before stated, wants a better house, better furniture, better clothes, better food, and becomes a great deal better consumer. (Pages 8–9.)

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United States Congress. Senate Report 2321. The Eight-Hour Law: Report from the Committee on Education and Labor. Fifty-seventh Congress. Second Session. 1902–1903.

Commissioner Carroll D. Wright well says:

The policy of this class of legislation has therefore been settled by Congress, and I need not discuss this phase of the question. All such laws are enacted for the purpose of protecting the laboring man from the injurious consequences of prolonged physical effort, giving him more time for his personal affairs and more time and energy to devote to the cultivation of his moral and mental powers. It has always been expected that they would aid him in the acquisition of knowledge, thus tending to make him a better and more contented citizen. This policy must be admitted by all to be a good one. . . . The Federal government has long been committed to this policy. (Page 2.)

Report of the Michigan Bureau of Labor. 1907.

I would again most heartily recommend that we do something toward obtaining a shorter day for the working girls of our State. . . . When a girl works from 8 A. M. until 8.30 or 9 P. M. she is missing the best part of her life, that part that stands for self-culture, education, and recreation. (Pages 4–5.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part VII. Women Workers in Milwaukee Tanneries. IRENE OSGOOD, *Special Agent.*

Another group much larger . . . is made up of girls who have held on to the good but who have been crushed and deadened by their burdens. The routine of factory work, the home cares that fall to them after work, and the crowded and unhealthful living conditions have dissipated the natural and healthful cravings which stir and arouse bodily and natural activities.

They live a machine-like existence and indifferently perform the functions of labor. They have no leisure for the interests and stimulating activities which they as human beings have a right to enjoy. In no way do they get connected up with the life of the community. Their own home is crowded and offers no place for the entertainment of friends. This is the class of girls that most arouses one's sympathy. They have retained the fundamental virtues. But they and the community are heavy losers because of this dead-level and joyless existence. Either their few years

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in school failed to make them aware of the stimulation of social and commercial life, or, more likely, it is the after years that have robbed them of all spirit. Their only hope is for more leisure, less wearying work in the shop, fewer home cares, and an opportunity for recreation. They need to be re-created, to enjoy the pleasures, and to share in the broader intelligence of the church, the school, and the settlement. (Page 1107.)

The Economic and Social Importance of the Eight-Hour Movement. GEORGE GUNTON. *New York, Amer. Federation of Labor, 1889.*

It is one of the characteristic features of modern industrial life that by its division and specialization of labor, it tends to increase the intensity of the strain upon the nervous energies of the laborer. In no country in the world is this fact more prevalent than in America. The persistency with which industrial energies are intensified in this country have come to be almost regarded as a national characteristic. It has become a recognized fact by medical science that the first step toward remedying this condition is more leisure, more physical and mental repose, more and longer periods of relief from the strain which the specialized industrial life imposes. This has become absolutely necessary for both physical and social reasons. For physical reasons, because it makes wholesome living and normal physical health possible, and socially because without it frequent social contact is prevented or the susceptibility to the socializing influence is destroyed. The great mass of laborers are compelled to work all the year round under the same monotonous condition. This is made indispensable by the very nature of modern methods in industry. Under the factory system the laborers become mere wheels in a colossal machine, in which the presence of all is necessary to the efficient labor of any. (Pages 12–13.)

Discussions in Economics and Statistics. Vol. II. FRANCIS A. WALKER, Ph.D., LL.D. *The Eight-Hour Law Agitation. New York, Holt, 1899.*

. . . I have small sympathy with the views so frequently, and it seems to me brutally, expressed, that the working classes have no need for leisure, beyond the bare necessities of physical rest and repose, to get ready for the morrow's work; that they do not know what to do with vacant hours; and that a shortening of the term of labor would, in the great majority of cases, lead to an increase of dissipation and drunkenness. Is it our fellow-beings, our own countrymen, of whom we are

speaking? It seems to me this talk . . . is the poorest sort of pessimistic nonsense. It is closely akin to what we used to hear about slavery being a humane and beneficent institution. . . .

. . . We may well desire that somewhat more, and much more, of leisure and of recreation should mingle with the daily life of our fellows than is now known to most of them. It is a pity, it is a great pity, that working men should not see more of their families by daylight; should not have more time for friendly converse or for distinct amusements; should not have larger opportunities for social and public affairs. Doubtless many would always, and still more would at first, put the newly acquired leisure to uses that were lower than the best, . . . were even, in instances, mischievous and injurious.

But the larger part of this would be due to the fact, not that the time now granted was too great, but that the time previously granted had been too small. . . . But such men, who might, it is conceded, become even worse men with more leisure, are not to furnish the rule for the great majority, who are decent, sober, and careful, fearing God, and loving their families. (Pages 383–385.)

Fourteenth and Fifteenth Annual Conventions of the International Association of Factory Inspectors of America. Indianapolis, 1900. Niagara Falls, 1901. (*Bound in New York Department of Labor Report, 1901.*)
The Shorter Workday in its Effect upon the Personal Character of the Worker. JOHN HOLBROOK, *Deputy Commissioner of Labor, Michigan.*

. . . Quality of product may be improved by a shorter day, and by this improvement in quality of the product has come to be considered the improvement of the quality of the laborer himself. The greatest capital invested in any enterprise, commercial or industrial, is not of buildings, machinery, and plants, but in the character of the men and women employed, and on this later capital stock there is no return possible of large profits without improvement of personal character.

. . . We reached the second stage of this agitation when the privilege was asked to have opportunities for leisure, for the enlargement of mental grasp, for the cultivation of the home and home life, and for freedom for self-culture. (Pages 562–563.)

A reduction in the hours of labor means for the hand-workers leisure for self-culture and the arts, moralities and the refinements of life. Many causes have contributed toward the elevation of the lot of labor, but one great concurrent cause has been the shortening of the hours. . . .

It has not been shown that the workers' use of leisure has been less

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wise and moral than the use of leisure by the so-called leisured classes. They have learned to use their leisure hours just as rationally and beneficially as have the wealthier classes, and it would astonish an old-time advocate of constant work for labor, lest Satan should find mischief for idle hands to do, how wisely and well these very classes have used their spare hours; they have come to be constant and intelligent readers of scientific and mechanical journals. They have formed a disposition to read the best books and literature, and as a rule the working people are reading more serious and thoughtful books than any other class of society. (Pages 563–564.)

The National Civic Federation Review. Vol. II, No. 8. Jan.-Feb., 1906. The first Annual meeting of the New England Civic Federation, Boston, Jan. 11, 1906.

Marcus M. Marks, President, National Association of Clothing Manufacturers:

There is another consideration which prompts the demand on the part of labor for a shorter work-day; it is the greater desire for self-improvement.

This has been encouraged by the advance in the public school of the system which affects our younger workmen in particular; also by the multiplication of popular free lectures, public libraries, cheap books and newspapers, etc., that have awakened in the workmen's minds the ambition to lead a better life, possible only in the enjoyment of a reasonable amount of leisure. (Page 8.)

(3) Special Benefit of Evening Leisure for Family Life, Education, etc.

In all communities where the regular working day of reasonable length has been established the workers have benefited particularly by the regular evening leisure afforded. Leisure in the evenings, after the day's work, affords the only opportunity for necessary home-life, education, and recreation.

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British Sessional Papers. Vol. XXVI. 1847–1848. Reports of Inspectors of Factories.

Mr. Fishwick (Mill-owner), on this occasion, voluntarily bore testimony to the good effects which have been produced by the legislative protection.

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. . . He mentioned another fact which, although an isolated case, I cannot consider otherwise than as a proof, and one very early shown, of the improvement in the social state of the women employed in factories, which may fairly be expected from their being saved from that excess of daily labour, which cut them off from the duties and enjoyments of domestic life, and by an entire absorption of their time, rendered their lives a mere alternation of work and sleep. Mr. Fishwick stated to me that a young woman who had resided some years in the village, following the trade of a dress-maker, lately came to him and told him that she was going to remove; and on his asking the reason of her so doing, she replied, that her employment had fallen off since the hours in the factory had been reduced to 11, for the young women, in place of getting dresses made by her, now make them themselves at home. (Page 9.)

British Sessional Papers. Vol. XXII. 1849. Reports of Inspectors of Factories for Half-year ending 31st October, 1848.

The object of those who wish to be allowed to work with relays of young persons and women is to extend the working of the mill beyond 10 hours, and if they worked by relays the same number of hours as some are now doing with adult males, one set of the young persons and women might be employed as late as half-past 8 in the evening. All such young persons and women, even if they were honestly limited to 10 hours a day, would therefore be deprived of that which is generally held to be one of the greatest boons to the factory operatives in the Ten Hours' Act, *viz.*, the cessation from work at an early hour in the evening. It is vain to say that they would have the same amount of leisure at their disposal at other times of the day; 2 hours before breakfast, or in the middle of the day, might certainly be employed by some of the women in domestic matters, but to the young men and most of the young women they would be worse than useless. When their day's work is over at an early hour in the evening, and they have 3 hours at their disposal before it is time to go to bed, the factory workers then feel the full value of the shortened hours of labour; they can then take advantage of evening schools or other places of instruction, and turn their leisure to good account in many ways, both for moral improvement and for social and domestic comfort. (Page 7.)

Opinions of the Factory Operatives respecting the Ten Hours' Act:

It must be remembered, too, that there has been more than 2 years of great suffering among the factory operatives, from many mills having worked short time, and many being altogether closed. A considerable

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number of the operatives must therefore be in very narrow circumstances, many, it is to be feared, in debt; so that it might fairly have been presumed that at the present time they would prefer working the longer time, in order to make up for past losses. . . . I have been very much surprised to find so large a proportion of those receiving very moderate wages, and still more of those receiving very scanty wages, preferring to work 10 hours. The reason for their preference assigned by so many young persons and even adults, that it enabled them to attend evening schools, is a gratifying circumstance, as affording a good sign of the character of the factory population. (Pages 16–17.)

Under the present mode of working the 10 hours, according to which the working day of young persons and women, and of the greater portion of adults also, is brought to a close at half-past 5 in the afternoon, the employed may derive the greatest benefit from the curtailment of their labour in the evening; for they are then enabled not only to cultivate the domestic affections, to learn domestic habits and so to elevate the character of the working classes, but to avail themselves of those opportunities of mental culture. (Page 99.)

British Sessional Papers. Vol. XXII. 1849. Reports of Inspectors of Factories for the Half-year ending 30th April, 1849. Appendix. Evidence of the Opinions of Persons Employed in Factories Respecting the Ten Hours' Act, Collected in September, October, and November, 1848.

Letter from Messrs. Sidgwick, Mill-owners: We consider the plan most conducive to the comfort and advantage of the people employed in factories, is such an arrangement of the working time, in which they have to earn a livelihood, as will leave to them the longest possible space of disengaged time, between ceasing work in an evening and resuming it a morning for recreation, improvement, or their private business. (Page 14.)

To the elder females no portion of the day can be more valuable for recreation or attendance to domestic duties than the regular and continuous period this plan (*i. e.*, closing mill at end of 10 hours' work) gives them, at the end of their daily factory labour. (Page 29.)

British Sessional Papers. Vol. XXIII. 1850. Reports of Inspectors of Factories for the Half-year ending 31st October, 1849.

Among those who have carefully watched the operation of each successive restriction, the number, I am satisfied, is now large, who would

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declare themselves content to work only 10 hours a day, . . . and this I believe to be especially the case among mill-occupiers and managers who can from their own experience compare the state and condition of the operative class under the present factory system with their state and condition under the hours of work during which they laboured 20 years ago.

I am assured, that the attendance of young persons at night-schools, and the demand for garden allotments, bear powerful testimony to the advantages of a reduction in the number of working hours, and to the readiness with which the best disposed are willing to make a beneficial use of the additional hours, the present restriction leaves them for recreation and improvement. (Page 41.)

British Sessional Papers. Vol. XXIII. 1850. Reports of Inspectors of Factories for the Half-year ending 31st October, 1849.

It is an early stopping in the evening that the work people chiefly value; and if the free evening hours from 6 to 9 be secured the great object sought for by the Ten Hours' Act will be attained; for then the factory workers will be in what may be called the normal state of the operatives in the generality of trades, and will, like them, have leisure for domestic arrangements, for improving themselves by attending evening schools, with opportunities for healthful and reasonable recreations. . . . Where the law is fully carried out, according to its true intention, the work people appear to value the limitation more and more in proportion as they have longer experience of its effects; and the masters appear to be getting daily better reconciled to it; partly by finding that, by the increased alertness of their work people, by the closer application they are now enabled to give, together with some additional speeding of the machinery not before tried, the produce is much nearer to that of 12 hours than it was conceived possible it could be brought to, but partly also by the marked change for the better which they see in the health, appearance, and contentment of their work people. (Page 5.)

In one of the letters sent to me the following interesting statement was given, representing, as I believe correctly, a picture of domestic life almost unknown in the manufacturing district, especially of a large town like Bradford, until the hours of labor were reduced and regulated by the Legislature. The comfort and feelings here described, though naturally of slow growth, are I hope daily extending their influence, and may be either much encouraged or much retarded, according as the Government and Legislature of the Country exercise a paternal care for the different classes who look up to them for protection:

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. . . "I called in to see an old factory weaver; it was very interesting and delightful to behold the old man sitting with his youngest son; they had a basket of potatoes for sets, and both seemed at a loss, being new gardeners, but were very glad to have an opportunity of learning; he had 3 daughters, and 2 young women lodgers, very busy sewing and knitting, and all teaching each other. . . . I asked the old mother how she liked the Ten Hour Bill. She said very well, she did not know how she must do if the girls worked any longer, they assisted her all they could, and were learning to do household work, and could sew and knit better than she could, and could read very nicely too; they could not do with any more than ten hours. The old father said it was a grand thing, the Ten Hours Bill; he was learning to be a gardener, and would not like to give it up, which he would have to do if they worked any more hours." (Pages 48–49.)

British Sessional Papers. Vol. XVI. 1867. Reports of Inspectors of Factories for the Half-year ending 30th April, 1867.

No exigency of trade can offer any compensation whatever, for the evils of long hours of work, for the wives of the industrial classes. I mention this feeling of the bleachers and dyers, not as their advocate for uniform working hours with factory workers, but as a sincere advocate for uniformity of time for all labour limited by legal restrictions; and from a conviction that, all efforts at night school instruction for adolescents and adults, for their social improvement, and all attempts at closing public houses and beer houses after reasonable hours must be abortive, so long as the great bulk of the wives and daughters of the working men are unable, from sheer ignorance, to render their homes attractive by domestic qualifications; and by a higher standard of moral feeling, to appreciate the value of virtue and self-respect, of which, I am afraid, they are so commonly ignorant. If all labour in factories and workshops had been restricted in future to 6 o'clock at night and to 2 o'clock on Saturdays, the next generation would have repaid the present by a morality which the past has never dreamt of. (Pages 25–26.)

British Sessional Papers. Vol. XIV. 1868–1869. Reports of Inspectors of Factories for the Half-year ending 30th April, 1868.

Nevertheless, the Act has shown itself, as initiating a moral obligation at least upon the employers of juvenile and female labour, in rendering it uniform in its hours; and thus bringing within the ordinary reach of

those who have already made some advances in elementary knowledge, either independently of factory labour or in connection with it, various institutions for intellectual purposes, hitherto languishing for want of pupils, in consequence of their hours of work preventing them from, or unfitting them for, enjoying the privileges such institutions were intended to afford. (Page 83.)

Assuredly the usefulness of the first hours of rational freedom from late employment has not been overrated. The power which the working classes now possess of making arrangements for out-door enjoyments in the summer, and for intellectual advancement of every kind during the winter months, is fully appreciated, and would be most reluctantly parted with. It is indeed spoken of as a boon which they longed to possess years ago, and is most thankfully acknowledged. (Page 277.)

British Sessional Papers. Vol. XIII. 1874. Report of Inspector of Factories for the Half-year ending 30th April, 1874.

It is for the public good that our girls and women shall not be overworked and shall have some leisure in the evening, without which this work would degenerate into slavery, pernicious to mind and body. (Page 58.)

British Sessional Papers. Vol. XVI. 1875. Reports of Inspectors of Factories for the Half-year ending 30th April, 1875.

At the commencement of the year, many manufacturers, on consideration of the health of women, were determined to begin work half an hour later in the morning than they had previously been accustomed to. . . . But it soon became apparent that the employed, as a rule, were opposed to the alteration and dissatisfied; and preferred the additional half-hour's relaxation in the evening . . . the half hour at night increased the opportunities for recreation, improvement and social or domestic duties. (Pages 63–65.)

British Sessional Papers. Vol. XII. 1895. Report from the Select Committee on Shops (Early Closing) Bill.

Witness. T. Flint, Rep. Scottish Shopkeepers' Association:

1178. Do you think a part of the necessity for early closing is based on the fact that later hours in shops mean degeneration in the health of the shop assistants? . . . It certainly affects their life as a whole. They

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do not enjoy the same privileges that other people enjoy, they have not the same time for improving their mental condition, or enjoying the other different phases of life that other people have who are off duty earlier in the day. (Page 50.)

Witness. J. Jamieson, Rep. Scottish Shopkeepers' Union:

3183. I approve of it (the bill) chiefly in the direction of earlier hours in the evening; I think there would be greater mental and physical benefits from that than from anything else. (Page 131.)

The Economic Journal, Vol. XIV. London's Tailoresses. CLEMENTINA BLACK. *London, Macmillan, 1904.*

This prevalence of long- and late-working hours virtually cuts off the young tailoress from the advantages of any technical training that might be carried on in evening hours. She, like other working people—may I not say like other human beings?—is not disposed after a ten-hour's working day for further exertion either of brain or hand. (Page 566.)

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Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. XVIII. 1893. [*Official Information from Annual Reports of the (German) Factory Inspectors, 1893.*] *Berlin, 1894.*

Leipzig:

There can be no doubt whatever, that the shortening of the daily toil of women in factories has a most beneficial effect upon the workers. They can attend better to their homes, cultivate their housekeeping and home-making powers. (Page 148.)

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Report of the New Jersey Inspector of Factories and Workshops. 1893.

In conformity with the principle of regulation the legislature has sought to promote the safety, health, happiness and welfare of the persons designated, by regulating their employment in this State, and in accordance with an enlightened and humane policy, especially towards young persons and females.

It says to the employer, whether a person or a corporation: "you may take all you can fairly get of the labor, skill and industry of your employes, within ten hours of every day and for five hours every Saturday. Beyond that you shall not go. The remainder of the day and night, and the Saturday half-holiday, belong to your employer himself, his family and the community. He may use that time for leisure, rest, recreation, reading,

study, travel, or in any lawful manner whatever that he pleases, or in doing nothing at all." UNITED STATES

Report of the New York Bureau of Labor Statistics. 1900.

The family furnishes the really fundamental education of the growing generation—the education of character; and the family life thus really determines the quality of the rising generation as efficient or non-efficient wealth producers. When one or both parents are away from home for twelve or thirteen hours (the necessary period for those who work ten hours) a day, the children receive comparatively little attention. What was said in the opening paragraph of this section in discussing the importance of a good family life in the training of character needs repeated emphasis, for it is the fundamental argument for a shorter working day. (Pages 70–73.)

United States Congress Senate Document, No. 141. Eight hours for laborers on government work. Hearings before the Committee on education and labor of the United States Senate, 1st session, 57th Congress. 1901–1902.

Argument of James O'Connell, President of International Association of Machinists:

The history of the movement in this country where the hours of labor have been reduced show a higher standard of manhood and a higher standard of intelligence and of excellency in work and in life, a higher and a better home, a happier and better family life, and a more comfortable and better home. In every trade and industry where the hours of labor have been reduced there has been no reduction of the output. (Page 522.)

III. SHORTER HOURS THE ONLY POSSIBLE PROTECTION

A. *Overlong Hours make Lightest Work Injurious*

The length of working hours, irrespective of the kind of occupation, is in itself, a menace to health. Even the lightest work becomes totally exhausting when carried on for an excessive length of time.

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British Sessional Papers. Vol. XV. 1831–1832. Report from the Select Committee on the "Bill to regulate the Labour of Children in the Mills and Factories of the United Kingdom." THOMAS YOUNG, Esq., M.D., *Physician at Bolton. 18th July, 1832.*

10572. This work in factories is now and then attempted to be justified by being denominated "light and easy"; will you state whether it would obviate those effects even if the work were proved to be, as it is denominated, "light and easy"?—I think not. The employment cannot be considered a laborious one in itself or for a short period; but it is one which requires constant attention, it is irksome and fatiguing from its uniformity, the length of time it is followed, and the postures of the body required; it may rather be denominated fatiguing than laborious; it is not hard labour. To illustrate it, let us suppose a female doomed to thread needles as fast as possible, in constant succession and incessantly for twelve hours a day; to thread a needle is by no means laborious operation, but the continued and unvaried employment would be irksome and fatiguing in the extreme. (Page 520.)

10573. Would it not in some measure exhaust the nervous energies or at least fatigue the mind as well as the body, and occasion consequently as pernicious an effect upon the health, and sometime more so, than if the labour were more strenuous, and at the same time more varied?—It certainly would. (Page 520.)

Sir Anthony Carlisle, F.R.S., Surgeon in the Westminster Hospital:

11049. Is not that employment which has been sometimes denominated "light and easy," but being one of uniform and tedious, though not very strenuous exertion, but still producing great fatigue of mind as well as body, more exhausting and injurious to the constitution than changeable locomotive exercise, when endured only for a moderate length of time, with due intermission?—I am convinced of that; because the sensorial powers being exhausted by an uninterrupted succession of muscular actions, must necessarily weaken or exhaust the powers of life; and therefore such exertions cannot be followed without a violation of the laws of animal nature.

11050. So you would not consider it a sufficient apology for this exceedingly long continued labour, if it were alleged truly, that abstractly considered, it demanded very little muscular exertion?—No, I would say, in such instances, it would still be a violation of the powers of nature. (Page 559.)

Sir William Blizard, F.R.S., Surgeon to the London Hospital and lecturer on surgery, anatomy, and physiology:

11199. Is not the employment in question, though it may, if contemplated for a moment, seem light or easy, yet when continued for such a length of time as to induce much fatigue to mind and body, as it is asserted it does, likely to be more prejudicial than even more strenuous labour pursued for a moderate length of time, and with due intervals for rest and refreshment?—I am clearly of that opinion; however light it may be, yet extended as it has been described, the consequences must in my opinion be as stated. (Page 572.)

John Elliottson, Esq., M.D., F.R.S., Physician to St. Thomas's Hospital:

11258. Should you not conceive that labour, sometimes denominated "light and easy" considered in itself, and apparently demanding but little muscular exertion, but continued for so great a length of time as to produce much fatigue of mind and body, and ultimately great exhaustion, is more injurious than a still greater exertion endured for a less length of time, and with longer intermission?—Certainly. (Page 577.)

Charles Aston Key, Esq., Surgeon at Guy's Hospital:

11418. It is alleged by the witnesses, that the labour in question is very fatiguing and exhausting; it is nevertheless stated by some who apologize for this length of labour, that it is "light and easy"; may I ask you, whether an employment which demands such constant and excessive attention for so long a period of time, and mainly in an erect position of the body, has not a more prejudicial effect than more natural exertions, pursued for a moderate length of time, and with due intermissions?—I should consider it matters not of what nature the labour may be, if it is persisted in under an extreme state of exhaustion and fatigue of mind and body; if it be so persisted in, in an erect position, I consider it to be exceedingly injurious to the growth and development of the powers of the body. (Page 591.)

British Sessional Papers. Vol. XII. 1895. Report from the Select Committee on Shops (Early Closing) Bill.

Witness, Dr. Percy Kidd, M.D., of University of Oxford, Fellow of College of Physicians and Member of the College of Surgeons. Attached to London Hospital and Brompton Hospital.

5352. Would this be a fair way of putting it: it is not the actual work of people in shops, but having to be there and standing about and sitting about in bad air; it is the long hours which is the injurious part of it?—Quite so, the prolonged tension. (Page 218.)

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British Sessional Papers. Vol. VI. 1901. Report from the Select Committee of the House of Lords on Early Closing of Shops.

Witness, Sir William S. Church, President of the Royal College of Physicians:

2306. . . . The evils which arise, I think, in these cases are those which arise rather from the long hours of attendance than from the severity of the labour. (Page 108.)

Evils of the Factory System. Demonstrated by Parliamentary Evidence. CHARLES WING. *London, Saunders and Otley, 1837.*

We must judge of the nature of any employment by its effects. Many employments require considerable exertion of strength, and yet, from being less monotonous, from requiring less of continued attentiveness, and from being carried on in daylight and in the open air, may be much less injurious than factory labour. But, however light, however easy, however healthy an employment may be it may be so protracted as to become neither light, nor easy, nor healthy, and that this has been the case with the factory labour no one who reads the evidence brought before the several committees that have from time to time been appointed can for a moment doubt. (Pages xxix–xxx.)

The Eight Hours Day. SIDNEY WEBB, D.B., *and* HAROLD COX, B.A. *London, Walter Scott, 1891.*

The human body needs frequent change of surroundings, change of exercise, to keep it in perfect condition. A man, and still more a woman, will suffer from protracted occupation at one particular task, even if that task in itself is healthy enough. And of all the manual work done in an advanced industrial community to-day, how much is healthy in its nature or done under healthy conditions? (Pages 6–7.)

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Verhandlungen des Reichstags, 101. Sitzung, 16. April, 1891. [*Proceedings of the (German) Reichstag, 101st Session, April 16, 1891.*]

Representative Grillenberger:

If I am told that the laws already protect men from over-long hours in dangerous employments or those which injure the health of the employee, I reply that therein is a proof of our correctness in demanding a general legal working day. The health of the worker is bound to be injured by over-long hours in any line of work, no matter what it is, and if the Bundesrath wishes to be logical, then it must take the position that

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the principle already acknowledged in that section of the law must be extended uniformly. It will be more rational to regulate conditions with foresight, by the law, than to leave them to work themselves out by slower methods. (Page 2364.)

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1907. Bd. III. [*Reports of the (German) Factory and Mine Inspectors for 1907. Vol. III.*] *Berlin, Decker, 1908.*

Bremen.

Women and young workers often fail to obtain the care and consideration for their physical well-being and working powers that should be given them by their employers, the reason being, in general, that the work they do is regarded as "light work," and therefore not harmful.

While it is quite true that in most cases their work is, by itself, not unreasonable in its demands upon their strength, yet when even easy tasks are performed in connection with highly perfected, rapidly speeded machinery, and are continued for hours and repeated thousands of times, they then constitute work that makes very great demands not only upon the physical endurance, but also upon the nervous system. (Pages 24, [4-5].)

Die Krankheiten der Arbeiter. Bd. 2. [*The Diseases of Working People. Vol. 2.*] Dr. Ludwig Hirt. *Leipzig, 1878.*

In the second place the working time must be considered, because in this factor of work lies the greatest possibility of exhausting the strength by forced exertion. (Page 266.)

No attitude of the body is harmful in itself; only in prolonging it until it produces harmful results; all the well-known disturbances, such as varicose veins, etc., etc., arise, not through sitting or standing, but through excessively prolonged sitting or standing. (Page 268.)

Handbuch der Hygiene. Bd. 8[1]. [*Handbook of Hygiene. Vol. 8[1].*] *Edited by* Dr. Theodore Weyl. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. Emil Roth. *Jena, 1894.*

When we take up the question of the effect of special trades upon morbidity and mortality, it must be premised that the idea of industrial diseases or occupation diseases in the ordinary sense of the term is inaccurate, for the specific so-called dangers of trades *as such are not inseparably* bound up with those trades, as the special hygiene of the factory

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proves daily. Only in so far as the length of working time, and severity of physical or mental labor are concerned in the various trades, or the necessarily close crowding in closed rooms in one or another occupation, can we speak of the different effects of different kinds of occupation upon the organism. (Page 8.)

Proceedings of the Fifth Meeting of the International Association for Labor Legislation. Lucerne, 1908. Jena, Fischer, 1909.

Factory Inspector Furst:

A celebrated hygienist of Germany, Prof. Sommerfeld, says: "Overstrain may be either the result of unreasonably hard work, or of hours of work that are too long even though the processes of work do not make special demands upon muscular strength. In both cases the same results appear in course of time, sooner, in proportion as other dangers are involved in the occupation, or the organism of the worker is younger and less resistant, or the social conditions of the workers more wretched. (Pages 124–125.)

ITALY

Revue Internationale de Sociologie, Nov.–Dec., 1895. Le Travail Humain et ses Lois. [*The Laws of Human Work.*] FRANCESCO S. NITTI, *University of Naples. Paris, Giard et Brière, 1895.*

But, says Lagrange, it is not solely the occupation demanding great muscular exertion that produces exhaustion, but it is often, and, in industrial life, almost always, the occupation requiring a great number of hours of work. In such cases, combustion is not very active and its wastes have time to be eliminated; the products of disassimilation do not necessarily accumulate in the organism and there is no auto-intoxication, but what does happen is that much organic material is used up and the organism suffers extensive losses. (Page 1034.)

UNITED STATES

Report of the Illinois Factory Inspectors. 1893.

The lightest occupations are rendered injurious by long hours of labor. (Page 8.)

Journal of Social Science, containing the Transactions of the American Association. No. XXV, Dec., 1888. The Working Women of New York. ELIZABETH STOWE BROWN, M.D. *Boston, Damrell, 1888.*

It must be remembered, also, that a comparatively harmless industry may be carried to a degree that is alarmingly injurious. . . . Eight or ten hours should be the limit of a woman's day of steady application. (Page 86.)

Charities and the Commons, March 6, 1909. Vol. XXI. No. 23. New York. Factory Inspection in Pittsburgh. FLORENCE KELLEY, *Secretary National Consumers' League; Former Chief Factory Inspector, Illinois.* UNITED STATES

Injurious conditions of work.

Industries may be injurious by reason of the nature of the machinery or of the material used (lead, sulphur, acid, etc.) or of dust produced in the process (steel, brass, cork, etc.) or of strain due to heat, cold, glare, darkness, or speed. Finally, an industry not intrinsically injurious may become so in a high degree by sheer lengthening of working hours, particularly when the workers are required to stand. (Page 1112.)

Even where the . . . work was as simple as wrapping caramels or packing crackers, the long hours combined with enforced standing made a harmless process highly injurious. (Page 1115.)

B. *The Remedy: Shorter Hours*

A decrease of the intensity of exertion in industry is not feasible. The needed protection to working women, therefore, can be afforded only through shortening the hours of labor.

New South Wales. Legislative Assembly. Report of the Working of the Factories' and Shops' Act. 1904. AUSTRALIA

That factory life is on the whole, distinctly inimical to the physical and nervous well-being of women seems to me very probable, if not certain; but as it appears to be an inevitable condition of life in highly populated cities, . . . and as it is unlikely that we can ever escape from the system, in view of the increasing difficulty of making a living, the only remedy seems to be to minimize as far as possible the evils which the factory system brings in its train. (Page 13.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichts-beamten. XIV. 1889. [*Official Information from Reports of the (German) Factory Inspectors. 1889.*] *Berlin, 1890.* GERMANY

As to the efforts being made in some directions to abolish factory work entirely for women, it has not been found that the workers themselves,

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even the married ones wish for complete restriction, but they wish for reasonable limitations for the abolition of night work and Sunday work, and for a working day of not more than 10 hours. (Page 93.)

Verhandlungen des Reichstags, 103. Sitzung. 18. April, 1891. [*Proceedings of the (German) Reichstag, 103rd Session, April 18, 1891.*]

Representative Bebel:

Such facts (growth of infant mortality) speak for themselves of the fundamental need of legal protection to put a stop to these evils. . . . That we should take women out of industry is impossible . . . it would also be a catastrophe . . . but, that we are called upon to provide that industry shall not, in its use of the labor of its working women, overstep those bounds which must be preserved if the physical development of women is not to be injured to the utmost limit, is, in my opinion, self-evident. (Page 2420.)

There is this to be remembered, that we owe it to our women and young girls, remembering their inestimable importance to the physical and spiritual progress of the race, as the mothers and teachers of children, to establish laws which shall afford them ample protection for their own physical and intellectual health and development. (Page 2423.)

Die Jahres-Berichte der k. bayerischen Fabrik- und Gewerbe-Inspektoren für das Jahr 1899. [*Report of the Royal Bavarian Factory Inspectors for 1899.*] *Munich, 1900.*

Factory work for women seems to be, under our present social organization, an industrial necessity, and it is only possible, at present, by passing specific protective measures, to ward off from working women those special dangers to health and morals which they would otherwise encounter. (Page 24. Preface.)

Die Beschäftigung Verheiratheter Frauen in Fabriken. Nach den Jahresberichten der Gewerbeaufsichtsbeamten für das Jahr 1899 bearbeitet im Reichsamt des Innern. [*The Employment of Married Women in Factories. From Reports of the (German) Factory Inspectors for 1899, compiled in the Imperial Home Office.*] *Berlin, 1901.*

"And yet" (wrote one inspector) "*the limitation of working hours appears to be the only solution for securing to women enough time to care for their families and for preventing the premature exhaustion of their physical*

strength. It is also to be hoped that the great usefulness of women in factory work will not permit of their general dismissal." (Page 174.)

Jahresberichte des Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1902. [*Reports of the Factory Inspectors in the Kingdom of Württemberg for 1902.*] *Stuttgart, Lindemann, 1903.*

. . . Reduction of hours does not keep pace with advances in technique . . . where there is an obvious tendency to make use of human power to the fullest possible extent. This is especially true in the textile mills, where certain older processes are modified by new contrivances. The result now is that, while the wages of skilled spinners (women) have risen about 12 or 13 per cent, the number of spindles on which they must concentrate attention for 11 hours has been raised from 500 to 750, an increase of 50 per cent. This is not quite the same as saying that the strain upon the spinners is 50 per cent greater, since a certain number of helpers are provided. Nevertheless the attention and skill demanded are much greater than was formerly the case. Such examples make it plain that, with this increasing intensity of strain in work, the hours of work must be correspondingly shortened if the people are to be protected from ruin of their health. (Pages 74–5.)

Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1903. [*Reports of the Factory Inspectors in the Kingdom of Württemberg, 1903.*] *Stuttgart, Lindemann, 1904.*

This uncontested fact of rising claims upon the physical and mental capacity of the workman, which is more or less strikingly evident in every department of labor, has in recent years brought the question of shorter hours to the front. The necessity of compensation through shorter hours is not only recognized by the inspectors, but by many employers as well. (Page 96.)

Handbuch der Arbeiterwohlfahrt. Bd. II. [*Handbook of the General Welfare of the Working Classes. Vol. II.*] *Edited by* Dr. Otto Dammer. *Arbeiterschutz.* [*Protection of Working People.*] Dr. Ascher. *Stuttgart, Enke, 1902.*

The long working hours also explain the well-known fact that waiters and waitresses are "used up" at a comparatively early age. . . . The effect of work carried on during long hours in badly ventilated places is

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also important. . . . It is clear that many of these evils can be remedied only by shortening the working hours. (Page 70.)

Gesammelte Abhandlungen. Bd. III. [*Complete Works. Vol. III.*] *Die Volkswirthschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages.* [*The Economic Significance of a Shorter Working Day.*] ERNST ABBÉ. *Paper read before the Political Society at Jena in 1901. Jena, Fischer, 1906.*

On the one hand, it must be admitted that daily monotonous labor has a stupefying influence; on the other, that technical and scientific demands create a continuous strain upon intelligence; hence there is only one way to restore a balance:—by giving some opportunity for natural intelligence to develop, by concentrating daily toil into the shortest possible time and leaving the longest possible time for rest and intellectual stimulus, that people may not be made stupid, but, in spite of the monotony of their daily tasks, may retain the capacity for interest in other things. (Pages 237–238.)

SWITZERLAND

Sixth International Congress of Hygiene and Demography, Vienna, 1887. Part XIV. Vol. I. Fabrikhygiene und Gesetzgebung. [*Factory Hygiene and Legislation.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector. Vienna, 1887.*

The late evening hours of work running into the night are bitterly complained of. . . . But however desirable, exclusion of women from factories is impossible. . . . One thing, however, is certain,—the need of special protection for women, as well as for children, becomes more and more pressing. (Pages 29–30.)

Untersuchungen über die Gesundheitsverhältnisse der Fabrikbevölkerung der Schweiz. [*Investigations into the Conditions of Health of the Swiss Factory Workers.*] Dr. FRIDOLIN SCHULER, *Swiss Factory Inspector, and* Dr. A. E. BURCKHARDT, *Professor of Hygiene, Basle. Aarau, Sauerländer, 1889.*

There are quite definite types of illness which are prominent in women workers. First of all are to be mentioned constitutional ailments, anæmia, chlorosis, general weakness. They are especially characteristic of working women under 30 years and are frequent also in later years, giving an average of 10 per cent to 17 per cent of all disabilities. It is true that the

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physique of woman predisposes her more readily to these disorders, but besides that, her generally inferior power of resistance to unhealthy influences must not be overlooked. When it is remembered how long may be the duration of constitutional disease, it almost seems as if women should be excluded from mills and factories, or at least their entrance to them made more difficult. As to shut them out is a social impossibility, it follows that their conditions must be improved, and they themselves must be protected, whether this shall be done by raising the working age, or by lowering the maximum hours per day, or by earlier Saturday closing is not to be superficially decided. (Page 170.)

UNITED STATES

Massachusetts Senate Documents. No. 33. 1874.

The Committee on the Labor Question, to whom was referred so much of the Governor's address as relates to Labor Reform, having considered so much thereof as pertains to the enactment of a ten hour law, and having also considered the petition of Wendell Phillips and others for the passage of such a law, Report:

That the advocates of a reduction of the present hours of labor in textile manufactories claim, and produce evidence to show, that ten hours is as long as females or children should be required, or allowed, to work in the close confinement of the mills, if the Commonwealth has any interest in insuring a healthy and intelligent posterity; that working eleven and twelve hours a day in these factories saps the energies and produces a depression of spirits that find relief only in the indulgence of intoxicants.

They claim that the only remedy for these evils is to diminish the hours of labor. (Page 1.)

Report of the United States Industrial Commission. Final Report. Vol. XIX. 1902.

It is certain that any programme for reducing this intensity of exertion must fail. The entire tendency of industry is in the direction of an increased exertion. Any restrictions on output must work to the disadvantage of American industry, and the employers are often right in their demand, usually successful, that such restrictions be abandoned. This being true, there is but one alternative if the working population is to be protected in its health and trade longevity, namely, a reduction of the hours of labor. (Page 764.)

UNITED STATES

Wealth and Progress. GEORGE GUNTON. *New York, Appleton, 1887.*

In proportion as the use of improved machinery is extended, and the specialization of labor is increased, does this labor become physically and nervously more exhausting; and in proportion as this pressure increases, unless the working time is correspondingly reduced, the laborer's susceptibility to the refining and elevating influences of his social environment is lessened and his leisure moments find him dull and indifferent to all moral and political influences. (Page 359.)

Industrial Conference under the Auspices of the National Civic Federation. New York, 1902. The Eight-hour Day. Prof. GEORGE GUNTON, *Institute of Social Economics. New York, The Winthrop Press, 1903.*

The factory system makes this (shortening hours) more and more necessary in proportion as it is perfected in its mechanism. It becomes all the time more and more exacting. The greater the perfection of the machinery or the method, the more attention is required. (Page 173.)

The remedy for this cannot be found in slackening up on the demands for economic output and effectiveness in the machinery. . . . The remedy for that must come on the other side, shortening the day, not slackening the effort. The tension may not be lessened, but the hours may be reduced. The exhaustion on the laborer must be avoided, but it cannot be avoided by reducing production . . . they must have relief by lessening the duration of the pressure every day. (Pages 174–175.)

C. *The Method: Legislation*

Experience has shown that legislation is necessary to protect women from excessive working hours; and that such legal limitation of hours is the most direct, most effective, and most satisfactory method of protection, for all concerned.

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British Sessional Papers. Vol. XX. 1846. Reports of Inspectors of Factories for the Half-year ending 31st October, 1845.

The system involved in these two alterations (i. e. restriction on the labour of female adults and on children), and now so generally, I may say universally approved, as practically beneficial as well to employers as

employed had been long practised by a large and influential body of mill-occupiers; nevertheless, I do not believe there is a single individual who has been acquainted with the proceedings in these cases, but will allow that it would have been vain to hope either the restriction on children or on women would have become general, or could have been enforced, without a legislative provision on the subject. (Page 24.)

British Sessional Papers. Vol. XXII. 1849. Reports of Inspectors of Factories for the Half-year ending 31st October, 1848.

No one doubts that the longer manufacturing machinery is kept in motion, the greater will be the produce; and if it could be kept going all the 24 hours of each day, without compromising the physical and moral health of the human beings by which it is worked, no one would dream of interfering with it. But . . . the Legislature has decided that such persons shall be protected against the temptations held out to them by the capitalist to work in a manner that is inconsistent with a sound healthy state of the population morally and physically. That is the whole question; it is a legislative interference demanded by a strong, overruling moral necessity, superior to all considerations of wealth. (Page 7.)

British Sessional Papers. Vol. XX. 1865. Reports of Inspectors of Factories for the Half-year ending 31st October, 1864.

The condition of the persons employed—shows the absolute necessity for supervision, and has strengthened my opinion—that free labour (if so it may be termed) even in a free country, requires *the strong arm of the law to protect it* from the cupidity and ignorance of parents; on all hands there appears the evidence that most of the workshops of this great commercial country are found to have fallen into the inevitable track of competitive industry when unrestricted by law, namely, to cheapen prices by the employment of women and children in the first instance, and then to increase production by protracted hours of work without much regard to age, sex, or physical capability, or to the need of social requirements. (Page 34.)

British Sessional Papers. Vol. XII. 1886. Report from Select Committee on Shop Hours Regulation Bill. Special Report.

The great majority of witnesses expressed their opinion that though voluntary action had effected much improvement, little could be expected

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from it in the poorer neighborhood and that nothing short of legislation would be effective. . . .

Witness, Thomas Sutherst, Chairman of the Shop Hours' League:

441. Are you acquainted with the Early Closing Association, so called? —Yes.

442. . . .—I believe that that Association has done a considerable deal of good; but why, I think, their efforts are inadequate to cope with the evil is, because they have been in existence for 40 years, and have not called in the aid of legislation, and the hours have not been permanently curtailed to any appreciable extent, whilst in the case of the artizans and mechanics whose labour has directly or indirectly been influenced by legislation, their hours have been reduced to 56 per week. Therefore I argue from that, that with the best intentions, and after working very hard the Early Closing Association has failed to effect that curtailment of the hours which is necessary to meet the evils resulting from them. . . .

The Hygiene Diseases, and Mortality of Occupation. J. T. ARLIDGE, M.D., A.B., F.R.C.P. *London, Percival, 1892.*

. . . When labor is performed in factories and shops with over-heated and impure air, where the workmen are subjected to excessive heat, to steam and noxious vapors and gases, to abounding dust, to industrial details involving strain upon the attention and mental wear, then what may be called an artificial limit to the duration of labour is called for, inasmuch as muscular fatigue has conjoined with it incidents which add an intensity to it as a health factor. (Pages 49–50.)

Women in the Printing Trades. Edited by J. R. MACDONALD. *London, King, 1904.*

Some employers, like Mr. Bell, admit candidly enough that legislation enables them to be more humane (and humanity in this respect pays) than they could otherwise afford to be. The Act is "a great relief," such an employer has said. "Legislation is an excellent thing; existing hours are quite long enough. If a person has not done her work by the time they are up, she never will do it." "The Factory Acts are a very good thing," another has said. . . . "Legislation is a very good thing. I don't believe in long hours. Employers are often shortsighted and think that workers are like machines—the longer you work them the more they do; but this is not really the case; if they work from nine to seven they have done as much as they are good for." "The good done by the Factory Acts has quite outweighed any evils or hardships." (Page 82.)

Reports of the Inspectors of Factories, Ontario, Canada. 1895. CANADA

. . . There is nothing so effective as good legislation. It is through this source that work has been made less burdensome for the laboring people. It is not only occupation that is needed for females, but employment that is hedged round with wise laws, so that the least possible harm can follow. (Page 25.)

Reports of the Inspectors of Factories, Ontario, Canada. 1900.

The law regulating the hours of labor for women and girls requires close attention, if under existing circumstances women and girls must take their places as laborers in factories and workshops, their health, safety, and comfort must not be left to chance. Here, if anywhere, the shield of the law must be invoked against all preventable causes of evil and danger incidental to such employment. (Page 21.)

Annalen des Deutschen Reichs. Bd. 21. 1888. [*Annals of the German Empire. Vol. 21.*] *Der Internationale Schutz der Arbeiter.* [*International Labor Legislation.*] Dr. GEORGE ADLER, *University of Freiburg. Munich and Leipsic, Hirth, 1888.* GERMANY

It is no longer necessary, fortunately, to bring forward lengthy proofs of the need for legal protection of labor. It is now almost universally admitted that modern conditions of industry lead to lamentable consequences for the workers unless the state interferes for their protection. In the course of modern industrial development, evils arose in every nation which, for millions of the working classes, jeopardized all the attainments of civilization. (Page 465.)

Verhandlungen des Reichstags, 103. Sitzung. 18. April, 1891. [*Proceedings of the (German) Reichstag, 103rd Session. April 18, 1891.*]

Representative Ulrich:

The right of organization does not suffice. . . . England, the classic land of industry, shows most plainly that the struggle between capital and labor has increased in intensity and that, in spite of the right of combination little has been gained except by legislation. Women are at present far less in position to protect themselves through organization than men, and consequently we re-double our efforts to obtain legal regulation of their labor without exception. . . . Female labor has assumed

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enormous dimensions, and it should be the duty of government to establish a normal day, wherewith to resist an increasing exploitation of working women. (Page 2411.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. XXI. 1896. [*Official Information from Reports of the (German) Factory Inspectors.*] *Berlin, Bruer, 1897.*

The disadvantages resulting from the fact that legal protection is not extended to workers outside the factory are constantly becoming more conspicuous in the textile and clothing trades. It is becoming obvious that this is only an advantage to those employers and middle men who do nothing for the benefit of their employees, and it will be most unfortunate for restrictive legislation in this field to be so long delayed that the present exploitation of women's health and strength shall have gained the upper hand and be systematically carried on. Düsseldorf. (Page 265.)

. . . The existing conditions call urgently for protective legislation for all young persons and women who are engaged in industry, without exception. Bayern. (Page 265.)

Die Arbeiterfrage. [*The Labor Question.*] Dr. HEINRICH HERKNER, *Professor of Political Economy in Karlsruhe. Berlin, Guttentag, 1894.*

If it is concluded that it be urgent to reduce the hours of work for social, politico-economic, and moral reasons, then it is obviously most effective to bring this reduction about by the simpler and safer method of state intervention. True, well organized workmen are able to win favorable working hours for themselves, better possibly than may be obtained by legislation. Yet, because it is unnecessary to resort to legislative protection for a highly favored élite among workers, it cannot therefore be held as justifiable to withhold this protection from that incomparably larger number who stand in much more urgent need of protection. A legal reduction of hours of work will give many such laborers the first opportunity they have ever had to try to advance themselves. . . .

Not only that . . . but it is more directly conservative of public interests that reduction of hours of work should be brought about by legal enactment than by the bitter, weary and destructive method of industrial war. (Pages 242–243.)

Schriften der Gesellschaft für Soziale Reform. Heft 7–8. [*Publications of the Social Reform Society. Nos. 7–8.*] *Die Herabsetzung der Arbeitzeit für Frauen und die Erhöhung des Schutzalters für Jugendliche*

Arbeiter in Fabriken. [*The Reduction of Women's Working Hours and the Raising of the Legal Working Age for Young Factory Employees.*] Dr. AUGUST PIEPER *and* HÉLÈNE SIMON. *Jena, Fischer, 1903.* GERMANY

Both industry and workpeople are to-day, in Germany, ready for a general establishment of the ten-hour day; but, as there will always be short-sighted and unintelligent employers, the limitation of working hours should not be left to them, but, in consideration of its vast importance, first for the worker but ultimately for industry and for the whole nation, it should be regarded as an imperative duty of the state to end all controversy by a general statute. (Page 73.)

Royaume de Belgique. Commission du Travail. Instituée par Arrêté Royal du 15 Avril, 1886. [*Royal Belgian Labor Commission, 1886.*] *Réponses au Questionnaire concernant le Travail Industriel. T. I.* [*Questions and Answers on Industrial Work. Vol. I.*] *Brussels, 1887.* BELGIUM

Question 15. As to length of hours and regulation of work of women and children, etc.

Answer: 1194. . . . For many years the need of regulating the labor of women, children, and even adult men, in factories, mills, and workplaces, has been acknowledged. . . . Even giving full weight to objections interposed on grounds of liberty . . . I believe that such legislation is becoming more indispensable every day. . . . Without interfering with the needs of industry, could we not advantageously fix intervals of rest for adult workers, and above all for youthful workers, women and children. . . . (The Governor of West Flanders.) (Pages 153 and 154.)

1195. We need legal restrictions. Simple justice demands it.

Above all we need to prevent by legislation the excess of work to which I have (previously) alluded. (Countess de Stainlein-Saalenstein.) (Page 154.)

Royaume de Belgique. Conseil Supérieur du Travail, 9e Session. 1907. [*Belgian Higher Council of Labor. 1907.*] *Réglementation de la Durée du Travail des Adultes.* [*Regulation of Hours of Work for Adults.*] *Brussels, 1907.*

M. G. Helleputte:

Many wish that private initiative should effect a general reduction of hours. We shall not hesitate to contest this. . . .

Private initiative, however well meaning, is not sufficient to shorten

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hours of work. For isolated efforts are naturally powerless to act successfully in opposition to competing interests and even if they could oppose the majority without injury, prejudices and timidity often prevent them from assuming the risk. The first employer, who, merely for his own profit, compelled his workmen to work at night, deprived them of the weekly day of rest and imposed exhausting hours of work on them, was guilty of treason to humanity; but those who came after him were not always free to do otherwise than he did. . . . Private initiative being powerless, must we resign ourselves to the existence of social wrongs: May we not rather appeal to the social power whose business it is to watch over the general interests? (Page 7.)

The academic argument concerning the liberty of the individual would have much strength if the laboring man were really free to regulate the length of his working hours as he wished. Such liberty may be enjoyed by the isolated workman working for himself, but wherever men work in common, and above all where they work at different parts of the same product, the length of their working hours is regulated by the length of hours of their comrades, and this in turn by competition. . . .

The single workman then has, in reality, no power to decide as to the length of his working day. (Page 10.)

Les Projets de Limitation de la Durée du Travail des Adultes en Belgique. [*Proposals regarding Limitation of Hours of Work for Adults in Belgium.*] HECTOR DENIS. *No. X of the publications of the Belgian Section of the International Association for Labor Legislation. Liége, Benard, 1908.*

Agreement (in the discussion in Parliament, 1896, on the report made by M. Van Cauwenberg on labor legislation) was unanimous as to the principle underlying the intervention of law in labor agreements. It was recognized as legitimate to prevent abuse of the laborer's strength. (Page 6.)

It was recognized that the individual workman's position is less independent than that of the employer . . . that, therefore, contract is not entirely free . . . it was generally admitted that organization is not yet sufficiently well developed to equalize the workman's freedom in contract and no one wished to delay (until organization should become so developed) a reform which is held to be indispensable to the conservation of health and to the physical and moral progress of the working population. (Page 6.)

Berichte der eidg. Fabrik und Bergwerkinspektoren über ihre Amtstätigkeit in den Jahren 1902–1903. [*Reports of the (Swiss) Factory and Mine Inspectors. 1902–3.*] *Aarau, Sauerländer, 1904.* SWITZERLAND

Women and children have profited least from the rapidly progressing voluntary reduction of working hours. Here it seems to me, is a sign pointing plainly in the direction that legislators need to take and that they must take. (Page 68.)

Proceedings of the Fifth Meeting of the International Association for Labor Legislation. Lucerne, 1908. Proposition of the Commission on the Maximum Day. HERR GRIESBERTS. *Jena, Fischer, 1909.*

2. In addition to the gains secured or likely to be secured by organization, the intervention of legislation is essential in order to make possible the general establishment of a maximum working day. (Page 82.)

Massachusetts House Document. No. 185. 1852. Minority report on sundry petitions for legislation limiting hours of labor. UNITED STATES

While the *men*, employed in machine shops, have political power, which makes them feared and enables them to *demand* justice, the *women* of the factories have none of this influence, and consequently are at the mercy of their employers. . . . The legislation of this State is nobly distinguished for the regard which it has paid to the infirm, the insane, the idiotic, and the criminal. But it has done very little to preserve the health and strength of its own people. (Page 9.)

Massachusetts House Document. No. 122. 1853. Minority report on regulation of hours of labor in establishments of incorporated corporations.

The vast inequality of condition, as to power and influence, between the corporate employers and their employees, leaves no possible ground for hope that the hours of labor can ever be reduced by the efforts of the operative classes, unaided by the legislature. (Page 4.)

In considering the expediency of the proposed legislation, it should be borne in mind, that the corporations are creatures of the legislature,—that the promotion of the public welfare was the end and aim of their creation, and that the stockholders have by no means an exclusive interest in their management and control. The power that created corporations is in duty bound to control them, and put them under such regulations and restrictions as will best promote the public welfare. (Page 5.)

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Report of the New Jersey Inspector of Factories and Workshops. 1885.

Regulation of Women's Labor. A legal regulation of the employment of women in manufactories has become a pressing necessity in the interest of justice and humanity. (Page 44.)

Report of the New York State Factory Inspector. 1887.

. . . As the law does not fortify them in their objections to overtime, they dare not openly protest. We think that an investigation would satisfy any one that ninety-five per cent of the females working in the State, who are over twenty-one years of age, favor a limitation, by law, of their hours of labor to sixty a week, and were they organized that would be one of the first rules they would adopt and enforce. (Page 27.)

New Hampshire. Governor's Message, 1887. GOVERNOR CHAS. H. SAWYER.

While it would be unwise and contrary to the spirit of our institutions for the State to make laws that would interfere with the freedom of individuals, in the transaction of a lawful business, to buy or sell when or where, with whom and upon such conditions as may suit their own will and convenience, yet it is right and proper to establish such limitations by general and practical laws and regulations as will serve to protect the worker from undue hardships, which often result from business competition. (Page 8.)

Report of the New York Factory Inspector. 1893.

The tendency of the age is toward a shorter work-day for all classes of workers. The employees of the State and of several cities in the State have had eight-hour laws passed for their benefit, and the trade organizations, composed mainly of men, are agitating for the establishment of an eight-hour work-day, and some of them have already succeeded in getting it. The others will no doubt succeed in time. But the women, who are a constantly increasing element in industrial life, and the children, who are certainly entitled to all the legal benefits possible to bestow, cannot organize successfully to obtain a reduction of their hours of labor, although from a physical standpoint, at least, they are more entitled to consideration in this direction than are the members of the trades unions as a rule. An illustration of the need of legislative assistance to obtain for women

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and children an equal work-day with the organized members of the same trades is seen in the cigarmaking business.

The Cigarmakers' Union has for a number of years enforced an eight-hour work-day among its membership, which comprises a vast majority of the journeymen of that trade. The women and children, who are employed as strippers, however, who have no union, and who are the poorest paid workers in the trade, must work for the same employers two hours longer each day. Their work is just as laborious and confining as the actual making of cigars, and, to them, comparatively more unhealthy than cigarmaking is to cigarmakers.

It will be seen from this that the women and children can only look to the legislature to obtain the relief which nature and existing industrial conditions demand for them. (Pages 25–26.)

Report of Chief of Massachusetts District Police. 1894.

While great reforms have been made in legislation in the last few years in the interest of women employed as operatives and in similar ways, there are special reasons why incessant vigilance must be exercised to secure for them adequate protection from injustice, and the best attainable sanitary conditions. If any considerable number of men so employed suffer from preventable evils, arising from conditions adverse to their welfare in any respect, they have the means of immediate and sure correction. They may alter, amend, or make laws to remove their grievances and better their condition as workmen. It is not claimed that the Commonwealth is indifferent to the welfare of women employees,—the legislation in protection of their rights as workwomen shows the contrary; but because they cannot by direct and personal effort shape the laws intended to protect wage-earners, it is incumbent upon us to secure the best possible conditions of employment for them. (Pages 75–76.)

Report of the United States Industrial Commission on the Relations and Conditions of Capital and Labor Employed in Manufactures and General Business. Vol. VII. 1900. Testimony of Mrs. Fanny B. Ames, former Factory Inspector of the State of Massachusetts.

We may find that it is desirable in time to do by law what a few persons are doing voluntarily. It is in that way that the original ten-hour law was tried tentatively in England; a few manufacturers tested the matter in their own factories and found that their people could do as much in ten hours as they theretofore had been doing in twelve and thirteen; that made the law seem reasonable. (Page 64.)

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Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part III. Industrial Hygiene and the Police Power. Being a Reprint of a Paper on the Legitimate Exercise of the Police Power for the Protection of Health. By HENRY BAIRD FAVILL, M.D.

Voluntary effort inadequate. It is not likely that mere voluntary and even co-operative regulation is the best solution. Rules applied to an industrial establishment, which are not purely related to the immediate product of industry are difficult of enforcement and liable to controversy. There is no prospect of such general development of intelligence and co-operative spirit amongst employers as will ensure sufficient uniformity of process. There is no way to ensure the acceptance on the part of laborers of conditions which may be to them distasteful, except through authority backed up by universal custom. There is no reasonable doubt that it is in the interest of employers, not only from an economic standpoint, but in respect to the practicability of instituting reform, that these measures be mandatory and the expression of a very radical state policy. (Page 483.)

Bulletin of the United States Bureau of Labor. No. 80. January, 1909. Woman and Child Wage-earners in Great Britain. VICTOR S. CLARK, Ph.D.

Even where hours of work are shorter than those permitted by law the factory acts applying to them still serve a purpose. The poor economy of excessive factory hours is now understood; but it is a truth that has to be learned anew by so many employers, and there are so many particular and temporary exceptions to its general application that abuses, though infrequent, can be checked only by statute. Laundries have recently been made subject to factory regulation. Evidence showed that prior to this women were obliged to work in them beyond normal hours, and occasionally even to the limit of physical endurance. And while legislation is not the sole cause for the shorter working-day of women and children, and might not have secured this end without other assisting influences, it has been a potent cause, and without this legal intervention conditions in some industries might not have improved materially during the past century. (Page 53.)

Discussions in Economics and Statistics. Vol. II. FRANCIS A. WALKER, Ph.D., LL.D. *The Eight-hour Law Agitation. New York, Holt, 1899.*

And, in the first place, let it be said that there is no fatal objection to the intervention of the state in the contract for labor. The traditional

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position of the economists in antagonism to such legislation upon principle, is one which ought never to have been taken, and which cannot be maintained. The factory acts of England, which have become a model to the world, are in themselves a monument of prudent, far-seeing, truly wise statesmanship, which employs the powers of the State to defend its citizenship against deep and irreparable injuries, and truly helps the people to help themselves. . . .

If one course gives a man a legal right to do anything, but results in his being so helpless, and brings him into such miserable straits that he can, in fact, do but one thing, and that thing which is most distressing; while another course, although it may keep a man somewhat within bounds, actually conducts him to a position where he has a real choice among many and good things, which course affords the larger liberty?

. . . Theoretically, he will not work in any mill where he is not well treated, where the sanitary arrangements are not at least tolerable, where machinery is not fenced to prevent death and mutilation, and where the hours of labor are not kept within the limits of health and strength. Certainly, he will not do this if he be really free. Practically, however, in the absence of factory legislation, the operative will have no choice but to work as long as the great wheel turns, be that ten hours, as so generally now, or twelve or fourteen, or sixteen, as in the days before the factory laws; he will see his companions bruised and mangled by unguarded machinery; he will all the time breathe air deeply laden with poisonous particles or deadly gases. (Pages 380–382.)

IV. ECONOMIC ASPECT OF REGULATION

A. *General Benefit to Commercial Prosperity*

The experience of those manufacturing countries which have longest had legal regulation of working hours for women shows that commercial prosperity is not hampered by such regulation. The increased efficiency of the workers due to shorter working hours, together with the general improvement of industrial communities in physique and morals, react so favorably upon output that commercial prosperity is heightened rather than impaired by legal limitation of hours.

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British Sessional Papers. Vol. XXVI. 1847–1848. Reports of Inspectors of Factories for the Half-year ending 30th April, 1848.

Many occupiers of factories, who were originally adverse to legislative interference, have, again and again, stated to me that they had seen reason to alter their opinions; that the restriction of the labor of young persons and women has had a very beneficial influence upon the factory population, and the vast increase in the number and extent of cotton mills, which has taken place since 1834, is a convincing proof that it could not have had any injurious effects upon trade. (Page 4.)

British Sessional Papers. Vol. XXIII. 1850. Reports of Inspectors of Factories for the Half-year ending 30th April, 1850.

I am happy to be able to give some strong proofs that the Ten Hours' Act has not been productive of those ruinous consequences to trade which some predicted would inevitably follow, and that it has not had the effect of deterring persons from entering into the business and investing fresh capital in it, whether in building new mills or in extending works already existing, from an apprehension that ten hours' work could not yield a remunerative profit. There are many instances of additional machinery where there was previously unemployed power, and numerous instances of a change in the firm, implying also new investments of capital. And if we take into account the vast increase since 1834, not only of cotton mills, but of woolen, worsted, flax, and silk factories, it may be confidently maintained that the legislative restrictions imposed in that year and since, while they have vastly improved the condition of the operatives employed in them, cannot be charged with having thrown impediments in the way of a steadily progressive improvement in all these branches of trade. (Pages 5–6.)

British Sessional Papers. Vol. XL. 1852–1853. Reports of Inspectors of Factories for Half-year ending 30th April, 1853.

If those who in 1833 predicted (and there were some of great authority among our political economists who did so) the ruin of our manufacturers if the then proposed restrictions on factory labour were adopted, will now fairly and candidly look at the results of this great practical experiment in legislation, whether in relation to the improved condition of the factory workers, or to the increase of mills and to the fortunes since made in every department of manufacture subject to the law, they must, I think, admit that they have seen ground to make them pause before they in future con-

demn measures for elevating the moral and social condition of the humbler classes by the regulation of their labour, as being opposed to principle; for the factory legislation has been proved to be in entire accordance with principle, even with that of the production of wealth, when the term principle is understood in an enlarged and comprehensive sense. (Page 21.)

British Sessional Papers. Vol. XVIII. 1856. Report of Inspector of Factories for Half-year ending 31st October, 1855.

So far from this protection to children, young persons, and women having done injury to trade, all the branches subject to the law have prospered and as regards cotton factories to an extent that they have been multiplied by at least one-fourth since the Act of 1833 came into operation. . . . The Factory Act of 1833 set the bold example to other nations of a great manufacturing country limiting in the face of formidable competitors the hours of labour in factories for the manufacture of textile fabrics. The example of England had followers on the continent. Other countries in which the evils of unrestricted and excessive labour in factories had become apparent, though the evils had become apparent to the Governments under different circumstances from those which excited attention in England, acknowledged that the limitation of the hours of labour within moderate bounds was as necessary for the welfare of the population as it had proved to be in England, and might be carried out with as little risk to the general prosperity of the manufacturer as it had been in England. (Page 57.)

A vast number of the employers of labour assert the soundness of the principle of limiting the duration of labour and the development of the principle in this country has certainly attracted followers rather than created opponents. . . . The factory laws were enacted for the benefit of the employed, but under the full persuasion that they would prove innocuous to the interests of the employers, that anticipation, I believe, has in the main been verified; and in referring to the factory laws of France and their operation, I speak as fully persuaded that the uniform application of the principle of limited interference between employer and employed is advantageous to both, and certainly not mischievous to the former. (Pages 76–77.)

British Sessional Papers. Vol. XII. 1859. Report of Inspector of Factories for Half-year ending 31st October, 1858.

It is most satisfactory to reflect that the experience of nearly a quarter of a century has proved the wisdom of Parliament in this humane legislation; that while the condition of persons employed in factories has been

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greatly improved by their protection from excessive labour, the restrictions have in no degree interfered with the prosperity of those branches of trade to which the Acts apply, as I shall presently show by the clearest evidence. . . . It has been repeatedly said to me by mill owners and other persons living in the manufacturing districts that the Factory Acts have immensely improved the character, manners and general condition of the operatives. That they have in no way interfered with the progress and improvement of the branches of trade to which they apply is demonstrated by the following facts. . . . In 22 years the number of cotton mills is nearly double and the persons employed therein more than doubled; that the number of woollen and worsted mills has considerably decreased, but that the number of persons employed therein has more than doubled, showing that the larger mills have extinguished a considerable proportion of the smaller ones; that the same thing may be observed, although in a less degree, with regard to the flax mills; and that the number of silk mills has been doubled and the number of persons employed in them nearly so. (Pages 8–9.)

British Sessional Papers. Vol. XXXIV. 1860. Report of Inspectors of Factories for Half-year ending October 31, 1859.

The experience of nearly twenty-six years, extending throughout the whole time that the existing law has been in operation, convinces me that the legislative interference for the regulation of the labour of children, young persons, and women in factories is now viewed by a great majority of the occupiers of those works as having done, and as continuing to do, a great amount of good without any injurious interference with the prosperity of their trade; and I firmly believe that if it were proposed to repeal the law there would be a very stout resistance on the part of masters, independently of all consideration of the opposition that would be made by the operatives and of their own appreciation of the moral and social improvements which the law has effected and sustains. (Page 8.)

With regard to production, an analysis of the value of our exports in 1858 shows an increase of £21,231,032 over 1844, when the amended Factory Act came into operation. Of course I am not claiming this large increase on account of the Factory Acts, far from it, I only quote it to show that production has not been interfered with by them. (Page 53.)

British Sessional Papers. Vol. XXIV. 1866. Reports of Inspectors of Factories for Half-year ending 31st October, 1865.

Moreover, to assume that so to limit the hours of labour would be to destroy any branch of a particular trade is to assume that we have arrived

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at the end of mechanical and chemical science, and that there remains no more capital to be expended. . . . In no trade already under restriction, from the longest possible hours to 60 hours' work a week, has production been diminished, or have the interests of the masters been injuriously affected; whilst it has become an axiom that overwork is never good work, seldom profitable, and always prejudicial to the physical and moral condition of the workers. (Page 82.)

British Sessional Papers. Vol. XIV. 1868–1869. Reports of Inspectors of Factories.

In conclusion we think we may point with satisfaction to the results of past legislation in this direction, seeing that in spite of the opposition, and the deterring predictions hurled against it, our commercial intercourse and prosperity is extending with a corresponding increase of national wealth. (Page 314.)

A Shorter Working Day. R. A. HADFIELD, *of Hadfield's Steel Foundry Co., Sheffield, and* H. DE B. GIBBINS, M.A. *London, Methuen, 1892.*

There are two very important sets of facts to be obtained upon this question of the previous effects of a reduction of working hours, and these facts come, not from Australia or any other country whose conditions we might grant were different from our own, but from England itself. We refer to the results shown in the working of the Factory Acts which reduced the hours of labour not by one or two, but by three, four, and even six hours per day, and which nevertheless, as everybody now admits, have been of immense benefit, not only to the working classes, but to the nation at large, and have caused no decline whatever in the rate of production. . . . During the successive reductions of working hours the price of cotton yarn has fallen from 25.71 pence per pound in 1821 to 12.82 pence per pound in 1884. (Pages 102–103.)

As it is found that where labour is best paid that there are the best and, with certain qualifications, the cheapest products, so also will it probably be as regards reduced hours. (Page 114.)

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Le Travail de Nuit dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation.. Preface by* ÉTIENNE BAUER.] *La Réglementation légale du*

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Travail des Femmes en Allemagne. [*German Labor Laws for Women.*] *Jena, Fischer, 1903.*

Dr. Fuchs, Factory Inspector, Baden:

No fact indicates that industry suffered any under the new régime. The production which had in some industries been slightly checked at first quickly recovered ground, thanks to the greater zeal of the workmen. The figures of the following table, taken from the statistics of German exports, do not in any case allow the assertion that the legislation exercised a paralyzing influence on the industry.

Kind of goods	Value of Exports in Millions of Marks					
	1890	*1891*	*1893*	*1894*	*1899*	*1900*
Cotton goods	167.7	146.7	154.3	144.8	206.1	244.7
Woollens	246.8	227.8	217.9	186.7	217.2	235.8
Silks	175.9	146.5	152.6	103.9	142.7	139.5
Vestments, lingerie, etc.	121.3	67.6	61.7	60.4	92.3	99.6
Silver plate jewelry	36.1	31.3	23.9	25.4	48.7	73.5
Toys	26.8	28.4	30.3	29.4	43.0	53.4
Sugar	216.0	227.8	221.2	209.2	203.6	216.3

There resulted only certain difficulties and certain temporary disadvantages for some industries. . . . The limitation of the hours of work is especially felt by the export houses, though it is not possible to state that an industry has been injured. (Pages 12, 13.)

UNITED STATES

Report of Massachusetts Bureau of Statistics of Labor. 1871.

England has found that increased leisure for the operative has brought increased wages, increased invention, increased production, and increased consumption; for there and everywhere the rule holds good, that the rise of wages, following the reduction in hours of work, gives a brisker market. There is another reason, and an important one, why there will be no diminished production; and that reason is found in the fact that human machinery,—brain, hands, and feet,—will not, cannot work midst the whirl of machinery, however favorable the rooms, above a certain point to any productive advantage. (Page 560.)

Report of the New York Factory Inspector. 1894. UNITED STATES

New York has about doubled its manufacturing resources and capacity in the decade referred to (1880–1890), notwithstanding the many laws which have been passed regulating the employment of the weaker elements of factory employees. To say that the passage of such laws and their strict enforcement injures trade or industry is a patent absurdity in the face of the facts shown, and is contrary to the history of all States and countries. . . . The gauge of the States' progressiveness and prosperity is not the wealth of its richest citizen, but rather the poverty of its poorest industrious laborer is a fairer test. When the conditions under which the latter strive are improved, the entire mass of citizens is benefited. Therefore, it is a reasonable proposition that factory laws, instead of being a detriment and a check to business, are in reality promoters of energy and productive of a greater earning and competing capacity. (Page 14.)

Report of the New York Bureau of Labor Statistics. 1900.

Fortunately, statistics are at hand which afford simple but fairly effective tests of the assertion that Massachusetts industries are threatened with ruin by restrictive labor legislation. In the first place, Massachusetts' cotton industry, the business chiefly affected by short-hour laws, has fully kept pace with that of rival States in the North. (Page 54.)

Certain facts appear with distinctness, one of which is that the cotton industry of Massachusetts has not only grown steadily throughout the period of short-hour legislation, but—what is far more impressive—has made larger gains than are shown by the adjacent States with less radical short-hour laws. In 1870, four years before the enactment of the ten-hour law, Massachusetts had 39.5 per cent of all the cotton spindles in the North Atlantic States; six years after the passage of that law Massachusetts' proportion was 45 per cent; in 1890 it was 47.5 per cent, and in 1900 53.5 per cent. It is difficult to see what clearer proof could be demanded of the beneficial results of the Massachusetts short-hour laws of 1874 (sixty hours a week) and 1892 (fifty-eight hours). (Page 55.)

B. *Effect on Output*

The universal testimony of manufacturing countries tends to prove that the regulation of the working day acts favorably upon output. With long hours, output declines;

with short hours, it rises. The heightened efficiency of the workers, due to the shorter day, more than counterbalances any loss of time. Production is not only increased, but improved in quality.

On the other hand, with excessive working hours, output is inferior both in quantity and quality. After the workers become overfatigued, "spoiled work" increases with each additional hour of labor.

(1) SHORTER HOURS INCREASE EFFICIENCY, AND THUS RESULT IN SUPERIOR OUTPUT.

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Hansard's Parliamentary Debates. Vol. 74. 1844.

Lord Ashley:

"It is a mistaken notion," writes this Gentleman, "to suppose that the produce of yarn or cloth from machinery, would be curtailed in an arithmetical proportion to the proposed reduction of working hours from 12 to 10, because in very many instances the workman can produce much or little during the day, as he feels disposed, or as his strength enables him; and in my own trade in which we employ at least 1200 hands, I have proved beyond a doubt, that whenever we have reduced the hours for working from 12 to 10 per day, which is equal to one-sixth the quantity of work produced has not fallen below one-tenth or even one-twelfth. . . . All men will be able to work much harder for 10 hours than they can for 12." (Pages 901–902.)

The countervailing advantages of reduced time are so great, as compared with a reduction of wages, that they readily accept the loss, and find their interest in the improvement of health of body and mind; in social and domestic comfort; in the practice of household economy; and especially in the prolongation, by 3 or 4 years, of their working life, of their physical capacities to obtain a livelihood. (Pages 904–905.)

Mr. Shaw:

. . . If we were by legislation to prescribe the hours beyond which the weaker classes of women and young persons were not to work, we should name a period not greater than the ordinary day's labor of nature and robust men, namely 10 hours, exclusive of meals and rest. Ten hours' healthful and vigorous labor would yield a greater profit than 12 hours under the influence of overwork, and its consequent listlessness. (Pages 1072–1073.)

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British Sessional Papers. Vol. XXV. 1845. Reports of Inspectors of Factories from 1st October, 1844, to 30th April, 1845. ROBERT GARDNER, *Mill-owner.*

. . . I am quite satisfied that both as much yarn and power-loom cloth may be produced at quite as low a cost in 11 as in 12 hours per day; at least, that it has been so the last 12 months, in my mills at Preston. . . . It is my present intention to make a further reduction of time to 10½ hours, without the slightest fear of suffering loss by it. I find the hands work with greater energy and spirit; they are more cheerful, and apparently more happy. All the arguments I have heard in favour of long time appear based on an arithmetical question,—if 11 produce so much, what will 12, 13, or even 15 hours produce? This is correct, as far as the steam engine is concerned; whatever it will produce in 11 hours, it will produce double the quantity in 22. But try this on the animal horse, and you will soon find he cannot compete with the engine, as he requires both time to rest and feed. (Page 27.)

. . . It is, I believe, a fact not questioned, that there is more bad work made the last 1 or 2 hours of the day, than the whole of the first 9 or 10 hours. There can be no doubt but 11 hours are quite sufficient for any one to exhaust the whole of his or her strength in any one occupation, situation, or atmosphere, although the work is not laborious.

It can be no small gratification to any employer of a large number of hands to see them healthy and happy, with an opportunity of improving their minds. I beg to state that about 20 years ago we had many orders for a style of goods much wanted. To increase the quantity of the work, I requested they (his young women employees) would work, instead of 11, 12 hours. At the end of the week I found they had got a trifle more work done; but supposing there was some incidental cause for this, I requested they would work 13 hours the following week, at the end of which they had produced less instead of more work. The overlooker told me the hours were too long, and invited me to be in the room with them the last hour of the day. I saw they were exhausted, drowsy, and making bad work and little of it, I therefore reduced their time 2 hours, as before. Since that time I have been an advocate for shorter hours of labour. (Page 27.)

British Sessional Papers. Vol. XXIII. 1850. Report of Inspectors of Factories for Half-year ending 30th April, 1850.

I continue to receive favourable accounts of the working of the Ten Hours' Act. That great experiment, dangerous as it appeared to many,

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and to myself among others, because of so sudden a change from twelve to ten hours, has succeeded, so far as it has yet been tried, beyond what the most sanguine of those who were favourable to it ventured to anticipate. Where the law is fully carried out, according to its true intention, the workpeople appear to value the limitation more and more in proportion, as they have longer experience of its effects; and the masters appear to be getting daily better reconciled to it; partly by finding that, by the increased alertness of their workpeople, by the closer application they are now enabled to give, together with some additional speeding of the machinery not before tried, the produce is much nearer to that of 12 hours than it was conceived possible it could be brought up to, but partly also by the marked change for the better which they see in the health, appearance, and contentment of their workpeople. (Page 5.)

British Sessional Papers. Vol. XXIII. 1851. Reports of Inspectors of Factories for Half-year ending 31st October, 1850.

The unexpected and gratifying result mentioned in former reports of the amount of work turned off in 10 hours, having kept up so much nearer to the produce of 12 hours than was conceived by any one to be possible, has been confirmed by many instances stated to me during the last half-year. This is accomplished partly by an increased speed of the machinery, but chiefly by the closer attention which the people give to their work, and are enabled to give by the shortened duration of the daily strain upon their physical powers. (Page 5.)

It is also worthy of note, that during a portion of the last period the greatest amount of restriction ever contemplated, either as to ages or as to hours of work, has been in operation, and making every possible allowance for the period during which the daily working hours of young persons and women were reduced to 11, and then to 10, the power of production has increased beyond that of any other period. (Page 65.)

British Sessional Papers. Vol. XL. 1852–1853. Reports of Inspectors of Factories for half-year ending 30th April, 1853. Letter to Leonard Horner from William Grant, concerning the effect of the ten-hour day.

We employ nearly 600 hands, and out of that number I have no hesitation in saying there is not one person would prefer to work even one hour per week longer than they do at present. By extra attention, knowing that their hours are shorter than formerly, and a little increase to the speed, they make quite as much money as ever they did. (Pages 20-21.)

British Sessional Papers. Vol. XXX. 1876. Factory and Workshops Acts Commission. GREAT BRITAIN

Witness, Phillip Grant, representing operatives:

8582. During the agitation for the ten-hours bill in the year 1844 or 1845 he (a cotton-spinner at Preston) reduced his time voluntarily to eleven hours instead of twelve, and at the end of twelve months he reported, as Mr. Hugh Mason did, that he had got a better quality of work and more of it in the eleven hours than he had in the twelve, and that is obvious to anybody who understands the process of following a machine. (Page 418.)

British Sessional Papers. Vol. XII. 1895. Report from the Select Committee on Shops (Early Closing) Bill.

583. You think in the shorter hours you would do as much as in the longer hours?—Decidedly, we have proved that by fact under the voluntary efforts when we have had the shorter hours, and although it lasted for some months we had no loss in drawings; the cash turnover was as good; and it lasted till either some one broke away, or some new start went into the later hours. (Page 25.)

The Half-holiday Question. JOHN LILWALL. *London, Kent, 1856.*

. . . It is a well-ascertained fact that the amount of work done, whether in the case of a man who makes an article or of him who sells it, does not depend so much on the extent of time devoted to any given employment, as upon the degree of application, energy, and cheerfulness of spirit which are brought to bear thereon. The human frame and the human mind are so constituted that they are capable of only a certain amount of continued effort. Let the natural bounds be but systematically extended, and so far from such excess being productive, it will ordinarily be found that there will be really less work done than when due regard is paid to the capacity of the agent, and that it will also be of an inferior description. This statement is borne out by the experience of many scientific and practical, observant men, who have recorded their opinions on the subject.

. . . Mr. Robert Baker, surgeon, of Leeds, also observes:

"There is more work done now in ten hours and a half in the factories in England than ever was in twelve or fourteen, and there is no greater

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fallacy in the employment of physical strength than to suppose that long hours are conducive to its profitable use." . . .

Mr. Leonard Horner, Government Inspector of Factories, says:

"It will be satisfactory to you to learn that the last year has afforded fresh proofs that the restrictions now regulating the labour of children, women, and young persons in factories, which have immensely improved their condition in many respects, have not been attended with the injurious effects upon trade which were apprehended. . . . This is accounted for, partly by the increased stimulus given to ingenuity to make the machinery more perfect and capable of increased speed, but it arises far more from the workpeople, by improved health, by absence of that weariness and exhaustion which the long hours occasioned, and by their increased cheerfulness and activity, being enabled to work more steadily and diligently, and to economize time, intervals of rest while at their work being now less necessary."

Mr. Henry Millward of the firm of H. Millward and Sons, extensive needle manufacturers, of Redditch, writes:

"In reply to your note, I cannot have the slightest difficulty in your stating . . . the excellent effect I have found the Saturday half-holiday and a general short time in the week, has had on my people. I have adopted it now more than two years, and it is valued by the men. I have no hesitation in saying that *my orders are got out quicker and better than they were previous to it.*"

I think this varied testimony, considering its distinctness of character, and the practical and highly respectable parties from whom it emanates, must be admitted as conclusive by proving two points: First, that a curtailment of the period of labour does not necessarily involve a diminution of the work done; and secondly, that such curtailment as is advocated in these pages would, as a rule, be advantageous to the employers of industry. (Pages 34–37.)

Lectures on the Labour Question. The Nine Hours Movement. THOMAS BRASSEY. *London, Longmans, 1878.*

A reduction in the hours of labour does not necessarily involve a corresponding reduction in the amount of work performed. . . . A few years ago M. Dolfuss, the great manufacturer of Mühlhausen, offered to reduce the working hours in his establishment to the extent of one hour a day, without reduction of pay, provided his work-people would undertake to do an equal amount of work in the shorter day. In a month after the offer was made the hands in the employ of M. Dolfuss had succeeded in

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making the production of the shorter day equal in amount to the production of their former longer hours. (Pages 9–10.)

Overwork is equally undesirable in a moral and an industrial point of view. Adam Smith has said truly that the man who works so moderately as to be able to work constantly, not only preserves his health the longest, but in the course of the year, executes the greatest quantity of work. (Page 12.)

Factory Act Legislation. The Cobden Prize Essay for 1891. VICTORINE JEANS. *London, T. Fisher Unwin, 1892.*

"The great improvements," wrote one of the inspectors in 1858, "made in machines of every kind have raised their productive power very much. Without a doubt the shortening of the hours of labor . . . gave the impulse to these improvements. The latter, combined with the more intense strain on the workman, have had the result that at least as much is produced in the shortened (by 2 hours, or one-sixth) working day as was previously during the longer run."

We may fairly conclude, then, that the first result of the Factory Act was this—it fostered the growth of the factory system.

. . . The second great result,—the increase in the vigor and intelligence of the laborer, and therefore, to some extent at least, in his capacity for work. . . . It is perfectly certain that a fair portion of the increased production may quite justly be put down to the improved physical and mental energy of the mill-hands themselves. That was Lord Shaftesbury's great argument. . . . He brought forward a great many cases of equal or increased production arising simply from improved vigor on the part of the workmen in mills where owners had voluntarily reduced their hours by way of experiment.

"I could not understand," one master wrote, "how it was that our men could turn off as much work (and some a little more) in 11 hours as ever they did in 12. I said to one of them, 'John, will you tell me how it is that you can do more work in 11 hours than you did in 12?' 'Why,' said he, 'we can lay to in 11 hours a day better than we could in 12, because we get more rest at night and we are in better spirits all the day through, and besides, the afternoons were not so long.'"

"He could spin, he said, 10 years longer if Mr. G. would keep on 11 hours." . . .

The truth is, there is a law of "Diminishing Returns" from labor as from land. . . . Dr. Cunningham's verdict is concise and to the point. "There is an amount of tension," he writes, "which the human frame can

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bear, and to prevent men from going beyond it was really to establish the textile industries of Great Britain on a far firmer economic basis." Factory legislation thus helps forward production in the textile industries in two ways: by hastening the development of production on a large scale or the factory system, and, secondly, by heightening the efficiency of each individual worker. But . . . the first result has always a certain tendency to weaken the force of the latter. (Pages 31–34.)

Eight Hours for Work. By JOHN RAE. *London, Macmillan, 1894.*

Short hours carry with them general habits of briskness, which are communicative, and soon pervade the whole establishment. Work is more continuous during the whole day. (Page 116.)

Men need leisure, and if they are not granted it, nature will evidently take her revenge by wasting in the end more genuine working time than the length of the relaxation she is denied. (Page 121.)

The world takes a long time to appreciate adequately the enormous productive value of mere contentment and cheerfulness of mind. . . . One of the first and most marked effects of shortening hours has been the greater satisfaction and cheerfulness which the laborers feel in their work. They come back to it in the morning with a new spring and relish and they leave it in the evening with hope and spirit. . . . The cheerful mind carries a spontaneous vigor into labor, and dispenses with much of the necessity of constant superintendence and goading. (Pages 123–125.)

The Economic Journal. Vol. XVIII. 1908. London. Gaps in our Factory Legislation. B. L. HUTCHINS.

There is a great mass of evidence which tends to show that labour carried on for comparatively short hours, under the best sanitary conditions, and for high wages, eliminating the competition of child labour, is very much more productive than is the work of sweated industries, where the opposite conditions prevail. (Page 221.)

It may be remarked that in non-textile factories it has for some time been customary not to work the full legal hours. About nine hours is the rule, for instance, in the Birmingham brass works; an employer in this trade once very kindly explained to me in detail how it was that he found it actually bad economy to keep going more than nine hours, because the girls could not keep their attention fixed longer, made more "scrap" and wasted material. (Page 223.)

Reports of the Inspectors of Factories, for the Province of Ontario, Canada, 1903. Toronto, 1904. CANADA

As a rule the working hours are well observed. In many factories they begin work at 7.30 or 8 A. M., quitting at 5.30 or 6. The owners of these establishments have assured me that they get as much work out of their help by giving them easy hours. (Page 31.)

Verhandlungen des Reichstags, 101. Sitzung. 16. April, 1891. [*Proceedings of the (German) Reichstag, 101st Session, April 16, 1891.*] GERMANY

It has sometimes been assumed, perhaps too optimistically, that shortening hours of work would effect a very considerable diminution of the unemployed. The latest statistics prove that this would not result in the degree formerly expected, as, by dint of more intensive labor and improved machinery a part of the time so lost in output is made up. Yet there will always be some part formerly produced under an 11 and 12 hour day which will not be made up, so that a certain proportion of additional labor will always be required, and to this extent diminution of the unemployed will follow. That will, of course, mean some little falling off in profits, but of insignificant extent, as is shown by the statistics of various other countries. In Switzerland, for instance, with the shorter day production fell off, at first, at the most, in some few instances, from 4, 5, or 6 per cent; in some industries, however, only a bare 1 per cent. It is only a question therefore of an unimportant percentage (a couple of per cent) loss for the business. (Pages 2363–2364.)

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. XVIII. 1893. [*Official Information from Reports of the (German) Factory Inspectors.*] *Berlin, 1894.*

In most establishments the working day was eleven hours, but the ten-hour day was introduced in certain ones. The shorter day turned out well in all cases. (Liegnitz.)

In a cigar-box and wrapper-mould factory all adult workers were given uniform working hours in summer and winter,—a nine-hour day, from seven to six, with two hours free time at noon. The owner asserts that in this shorter time no less work is done than formerly in the longer time, the eleven-hours day. (Kassel.) (Page 155.)

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Ibid. for the year 1895.

The reports of amount and value of the work done in the reduced working day are also of interest. The fact that the value of the work is not in proportion to the hours of work is but slowly understood. A wool factory reduced their working day by one hour, in accordance with the law of June 1, 1891; subtracting the rest periods, it now amounts to ten and one-half hours. The owners assert that the amount and value of work done by both males and females remain the same, while calls upon the sick fund have greatly diminished. (Page 370.)

Ibid. for the year 1898.

In one laundry in Plauen, where the hours of the workers have been reduced from eleven to ten hours, it has been proved that the women accomplish fully as much as before this reduction. In a jute spinning and weaving factory in Cassel the ten-hour day was provisionally introduced at the request of the hands in September. Thus far it has worked so well that the shorter day will probably be retained. (Page 106.)

Jahresbericht der Grossherzogliche Badischen Fabrikinspektion für das Jahr 1901. [*Reports of the Factory Inspectors of Baden. 1901.*] *Karlsruhe, Thiergarten, 1902.*

The chemical works in Durlach resolved not to dismiss any workmen in a certain slack season, shortening the hours of labor instead. But the expected decrease in output did not occur, so that occasional closing for a day had to be resorted to. After this experience the firm resolved to retain the shorter hours even in recurring seasons of full orders, believing that they can institute an even shorter day without any reduction of product worth speaking of. (Page 22.)

Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1901. [*Reports of the Factory Inspectors in the Kingdom of Württemberg, 1901.*] *Stuttgart, Lindemann, 1902.*

The productivity of the workers in the (previously mentioned) trades where shorter hours have been established has not fallen with the reduced hours of work, and thereby fresh proof has been given that the quantity of output does not rise and fall with length of working hours. (Page 13.)

Ibid. for the year 1902.

Special report made on questions as to the possibility of shortening hours.

Industry would suffer no injury from shortening the working day for women by an hour. (Legal day 11 hours.) Such a reduction would finally bring about a general 10-hour day in all industries where men's and women's work was correlated, and, while some diminution of product and wages might take place for a time, output would finally be restored to its former level by greater activity and improved devices, and wages would also tend to return to their previous rate. (Page 179.)

Ibid. for the year 1903.

Many employers corroborate the assertion that 11 hours work is far too much for working women, by the fact that the 11th hour of the day does not show an 11th part of the output, a proof of the relaxation of zeal and energy and the overstrain under which the 11th hour is finished. . . . Ten hours of intensive work day by day for the week, is enough, considering that modern machinery requires the greatest possible attention, to use up all the strength that a woman has at her command. (Page 139.)

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1903. Bd. I. Preussen. [*Annual Reports of the (German) Factory and Mine Inspectors for 1903. Vol. I. Prussia.*] *Berlin, Decker, 1904.*

The so-called English time has been introduced in several shoe factories: The resultant reduction from 10 to 9¼ hours has not brought about any reduction in output. Employers and workers are both pleased. (Page 219.)

Employers seem more and more inclined to establish the ten-hour day; various mills which formerly had long hours, have adopted the ten-hour day without having experienced any disadvantage; others intend to introduce it. (Page 275.)

The prejudice against a ten-hour day is fast disappearing, as it comes to be understood that the productivity of the worker in the eleventh hour is proportionately low. (Page 295.)

Ibid. for the year 1905. Vol. I. (*Prussia.*)

The experiments mentioned in last year's report, by two of the largest industries in the district [a rubber works of the General Electric Company

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at Oberspree and Borsig's smithworks] reducing the hours of labor respectively from 10 to 9 and from 9½ to 8½ hours, have been declared to be thoroughly satisfactory. (Page I.[40·])

The efforts of workingmen to obtain shorter hours of work are continually resulting in success. Hours of 9, 8¾, 8½ or even 8, daily, are now not at all uncommon in Frankfurt A. M. The employers are in general not opposed, as they find that the output of the shorter day is quite equal to what it was before. (Page I.[344·])

Ibid. for the year 1906. Vol. II. (Baden.)

Many reductions of the hours of labor in women employing industries are reported for the current year. The entire textile industry of Wiesenthal has adopted the ten-hour day in response to vigorous demands. (Page 5.[33·])

(For additional examples see also pages 2.[15] and 4.[69-71·])

Ibid. for the year 1907. Vol. III. (Hesse.)

An important example of reduced hours while wages remained the same was given last year by the biggest employer in the district. (C. Heyl.) Now, also, the large leather works of Doerr and Reinhart have carried out their long contemplated plan of a shorter working day, with the result that 4,615 leather workers or about one-third of the entire working population of Worms have gained the advantage of an 8¾ hours working day.

The firm has come to the conclusion that a more economical use of machine power, daylight, and working time will be attained, quite aside from the benefit to the men. With day wages raised somewhat, the workman will earn quite as much as before, or even rather more. With punctuality in beginning and stopping work the pieceworkers will produce and will earn as much as before. (Pages 6.[32] and [33·])

Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1905. [*Reports of the Factory Inspectors in the Kingdom of Württemberg, 1905.*] *Stuttgart, Lindemann, 1906.*

Earlier fears that the Saturday half holiday would bring reduced output and lower wages have not been realized.

The unanimous verdict of the employers affected by the Saturday closing is rather a repetition of the opinions given upon the shorter working

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day—that the working capacity of the women improves with the shorter hours, and that, as a result, the interests of neither employer nor employee are damaged. (Page 41.)

Many employers say that, with shorter hours, "blue Monday" has almost disappeared, and that men are more punctual. Amount of production is hardly if any less, and the saving in light and heat is considerable. (Page 51.)

International Conference in Relation to Labor Legislation. Berlin, 1890.

Alone, the nations hesitate to reduce the hours of work for fear of competition, although, with modern machinery, experience has abundantly proved that the countries with the shortest working day attain the maximum of production. These are the countries that produce under good conditions most cheaply; that are most prosperous, and most feared as competitors in the world's markets. (Page 88.)

Archiv für Soziale Gesetzgebung und Statistik. Bd. VI. 1893. Ein Experiment mit dem Achtstundentage. [*An Experiment with the Eight Hour Day.*] Dr. Otto Pringsheim. *Berlin, 1893.*

That production remains at the same height when working time has been reduced by 18.4 per cent has been recently proved in Holland. In a cigar-factory in Gouda, with 26 workers (7 of these minors), the hours in accordance with the law passed in 1889 were shortened from 11½ to 9½. At the end of 1890 it was shown that the output was even greater than before and the wages as high also—in some cases higher. (Page 14.)

Hours and Wages in Relation to Production. Lujo Brentano. *Translated by* Mrs. Wm. Arnold. *London, Sonnenschein, 1894.*

Where, however, a rise in the standard of life has come about as a consequence of increased wages and shorter hours, experience shows that it induces greater intensity of labour, since men whose requirements are larger and their hours shorter are compelled to greater industry, and that at the same time it makes that intensive labour possible, owing to the fact that favourable bodily circumstances and greater pleasure in labour make the greater industry easier to such workmen than to those whose requirements are small and who are badly nourished, weary, and depressed. (Page 48.)

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Handbuch der Hygiene. Bd. 8[I]. [*Handbook of Hygiene. Vol. 8 [I].*] *Edited by* Dr. THEODORE WEYL. *Allgemeine Gewerbehygiene und Fabrikgesetzgebung.* [*General Industrial Hygiene and Factory Legislation.*] Dr. EMIL ROTH. *Jena, 1894.*

It is found to be a fact that workmen often produce 50 per cent more in the first half of their working day than in the last half. (Page 27.)

Die Arbeiterfrage. [*The Problem of Labor.*] Dr. HEINRICH HERKNER. *Berlin, Guttentag, 1894.*

Chap. I, Part III. The relation of wages and hours to production.

The raising of wages and the reduction of hours which have taken place in the last few decades are not due solely to state intervention and the pressure of labor unions. Increasing competition at home and abroad continually demands increasing efficiency. Experience has proved that really good work can be permanently given only by well paid workmen who are not overworked. Schoenhof and von Schultze-Gaevernitz have amply demonstrated that the heightened demands made upon the workman by the pressure of competition in the markets of the world have also been instrumental in procuring more favorable conditions for him. Keen-sighted employers have long understood that the highly paid workers, not the cheap ones, are the most economical ones in the long run. Similar experiences have been collected in regard to hours. Under modern conditions of production it is not the long, exhausting work day of 13–14 hours, but the moderate day of 8–10 hours, that yields the best output. (Page 186.)

So, in every instance where wages have been raised and hours reduced it has been proved that none of the fears of those opposed to the change have been realized. (Page 187.)

Archiv für Unfallheilkunde, Gewerbehygiene, und Gewerbekrankheiten. Bd. I. Über den Gesundheitsschutz der Gewerblichen Arbeiter. [*Protection of the Workingman's Health.*] Dr. SCHAEFER. *Stuttgart, Enke, 1896.*

Occupation hygiene teaches us that after brief over-exertion the reproduction of working strength ceases, and a rapid descent to incapacity takes place. It has been thoroughly demonstrated by observations lasting over a long period of time that the workman produces, on an average, almost twice as much in the first half of his working hours as in the last half of his day. (Page 204.)

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Schriften der Gesellschaft für Soziale Reform, Heft 7–8. [*Publications of the Social Reform Society, Nos. 7 and 8.*] *Die Herabsetzung der Arbeitszeit für Frauen and die Erhöhung des Schutzalters für Jugendliche Arbeiter in Fabriken.* [*The Reduction of Women's Working Hours and the Raising of the Legal Working Age for Young Factory Employees.*] Dr. AUGUST PIEPER *and* HÉLÈNE SIMON. *Jena, Fischer, 1903.*

Such reduction of working hours as is absolutely necessary for conservation of health and of the intellectual and moral riches of civilization is also a mandate of economic good management. Those potential sources of energy whose misuse is prevented will be thereby preserved and maintained in higher efficiency for production instead of being lost to it by premature ruin. (Pages 48–49.)

All the known instances of a systematic reduction of working hours both at home and abroad, whether by voluntary action or as a result of legislation, show indubitably that no ill results have followed either to the output or to the workers.

Output and wages have remained the same, or have actually risen as a consequence of heightened energy and perfected plants. (Page 73.)

Le Travail de Nuit dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *La Réglementation légale du Travail des Femmes en Allemagne.* [*Labor Legislation for Women in Germany.*] Dr. FUCHS, *Factory Inspector, Baden. Jena, Fischer, 1903.*

Before the enactment of the German Imperial Law of 1891 restricting the hours of labor of women there, overtime work was already, in the industries concerned, occasional and irregular. The very great majority of the establishments affected were working regularly eleven hours a day or less as early as 1892.

Not one fact indicates that industry suffered under the restriction. The output, which, in a few establishments, diminished at first, soon regained its normal dimensions, thanks to the greater energy evinced by the employees. (Page 12.)

Gesammelte Abhandlungen. Bd. III. [*Complete Works. Vol. III.*] *Die Volkswirthschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages.* [*The Economic Significance of a Shorter Working Day.*]

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ERNST ABBÉ. *Paper read before the Political Society at Jena in 1901. Jena, Fischer, 1906.*

Beside the effect on production and international competition involved in shorter working hours, the question arises as to the effect of a shorter day on the workman's strength. If he produces as much in shorter hours, does he do this at the cost of his reserve energy? In a word, does he use up his strength sooner by more intensive work? If he did, this fact would be of far-reaching social and economic import. (Page 204.)

The experiment made in the optical works in whose management I had a part, and where the working day was abruptly reduced from a 9 to an 8 hour day at a time of the most active production, . . . confirms, in the most important and leading points, all that the far more extensive experiences of England had demonstrated as to the effect of shorter hours on output.

Our researches proved that this reduction from 9 to 8 hours, that is, of more than 10 per cent at one bound, brought about not the least diminution of the daily output, but increased it demonstrably even if only to a slight extent. . . . It would not be worth while to add our testimony to that of England, if it were not for the fact that we worked out our results in exact figures. (Page 205.)

Our inquiries have this further credit, that they give a decisive answer to the question: Does reduction of hours mean a greater expenditure of strength for the individual? Is the work more wearing to the workman or not?

Our observations enable us to reply with certainty in the negative: the workmen are subjected to no greater strain by executing in 8 hours what they used to do in 9, although they do, certainly, work with greater intensiveness during the shorter period. We gained an insight into the actual factors that enable efficiency to rise with shorter hours, and to rise in such degree that the results are the same. To the question whether the difference is accounted for by such special motives as good will or ambition for personal interest (as in piece work), we say, decidedly: no. The satisfactory result is obtained independently of such motives. And I regard this as one of the most important points that our experience has brought to light.

Finally, our observations have enabled us to explain the connection between rapidity of work and shorter working hours, and to show how the equalizing of efficiency is brought about. I am under the impression that this has never been explained. (Page 206.)

Our working hours were first reduced gradually through a period of 30–35 years, from 12 hours to 9, then to 8. . . .

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Some slight differences in output were noticeable from the standpoint of the age of workers, but so insignificant that they are negligible. The youngest workmen had, to be sure, the best results, yet in no instance was there any lagging worth mentioning among the older ones. (Page 211.) From our results it may be concluded: Success under shorter hours is attained equally, with but slight variations, by older and younger workmen. (Page 212.)

The testimony of different individuals on time work agreed that after the first few days no conscious effort had to be made to keep up the pace of work. . . . Many were unconscious that they had done more until I proved it to them. . . . All, even the older ones, averred that the work was not more wearing; the last half-hour was not harder than before. (Page 218.)

Piece workers, who, at first, made an effort that they could not keep up, found that they had at first in reality attempted to do much more than they had ever done before. After relaxing to the pace that was permanently endurable, they discovered that their output and earnings were the same as previously, or slightly more. (Page 219.)

(*Condensed from original*)

1. Reduction of working hours is not followed by a reduction of output. Frequently a distinct increase in output results. In our works, in a year, 30 men have done as much under the 8 hours as 31 men had done in the year before under 9 hours. (Page 222.)

2. In spite of good will and obvious self-interest, increased output is only temporarily attainable by lengthening the hours of work, and after a short time the output under lengthened hours falls back to what it was in the shorter day.

3. Even where workmen have no interest in doing as much in the shorter hours; where on the contrary they have interests in *not* doing as much, nevertheless the same result is obtained:—no diminution of product occurs.

4. This seems to me conclusive evidence that the rate of speed (short working hours resulting in heightened intensity and long ones in diminished intensity) is an automatic and involuntary adjustment not realized by the individual; that many persons have no idea of it, and indeed do not believe it until the proofs that they have accomplished more in a short day are shown to them. (Page 223.)

In saying that recuperation must equal fatigue, I am speaking of real things. . . . We may discern three plainly separable factors in the pro-

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duction of fatigue, and these, when added together, make an important total.

1. The first is the amount of the daily output, quite independent of the time in which it is produced. When, for instance, a man at a turning lathe, one who is distinctly skilful, has about 50 similar objects to make, he must make a certain number of motions of the hand in sequence and must exercise a certain number of sense perceptions in order to control his work. He needs also to exercise a certain number of impulses of the will. Now, if instead of 50 objects he makes 100, then he has done all these things twice as often—quite independent of whether he has worked 5, 6, or 10 hours.

The amount of output gives an estimate by which to measure the amount of strength expended. This is different with different persons. Greater experience, skill, or quickness enables one to work with less expenditure of strength than another. . . . Yet on the whole, with persons who are working under similar conditions, there is always a large number whose expenditure of strength in the daily working hours is wholly proportionate to the amount of their output.

II. The second factor in fatigue depends on the speed with which work is done. In general it might be supposed that when a given piece of work was performed in a shorter time, a greater exertion of strength would be necessary. But this is only true beyond certain limits. Within certain reasonable limits, the same piece of work can be done somewhat faster without increased outlay of strength. If, for instance, one walks, say, four kilometres, it is quite the same whether one walks a little faster or slower, so long as one does not actually run. This second factor, speed, is an important one in producing the same result with a shorter work day. (Page 229.)

III. The third, however, is the most important, in my opinion, and is entirely analogous with what is called in technical language concerning machinery, "waste of power," when the machines are running dead. (Kraftverbrauch für Leergang.) . . .

The consequence of the previously mentioned division of labor is that, with few exceptions, all details of industry are performed by persons who must either sit or stand all day; few have any chance for change within the limits of their working time. If we picture to ourselves what it would be for a man to be obliged to sit, or stand, without doing any work, but maintaining a fixed position of the body for 8 or 10 hours, we know at once that he would be fatigued even though he had done nothing. My contention is that, as this fatigue represents an outlay of strength required solely by sitting or standing in the position needed by his work, and in the

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environment of work (with noise, confusion, the need of attention to protect himself and others from danger)—as this purely passive fatigue, I repeat, forms a large part of the day's work, every reduction of hours which results in concentrating the usual output within the shorter working day is a clear gain for the worker's strength.

If a man can do a certain day's work in 8 hours, and he is compelled to spend 10 hours at it, then it is just as if we said to him: you may do your work in 8 hours, but then you must sit here for 2 hours more, in the same position, listening to the same noise, paying the same attention, being careful to avoid danger, but without doing anything. And I maintain that, just as the shorter time has been a definite saving for the "wasted power" of the machine, so the shorter day is a corresponding saving of human strength, avoiding a waste of power in men. (Page 230.)

The length of working hours, therefore, comes up for consideration three times—twice in estimating the expenditure of energy (1. Shortened hours and increased intensity: exertion the same if certain limits of speed are not exceeded. 2. In estimating the "wasted power" of man, analogy with the machine), and thirdly in considering recuperation (shorter work —longer time for rest). (Page 232.)

Without pressing mathematical conclusions further it is evident that, when this relation of work to rest is correctly grasped, the shorter day not only leaves the day's output unchanged, but may improve it. (Page 232.)

It must be true that, if we could accurately gauge the mathematical relation, we would find that there was an "Optimum" for each person, namely, the shortest possible time in which the largest possible product could be achieved. Where this lies will depend largely upon the thoroughness with which the single elements of fatigue are studied.

How great the outlay of strength in lost time, wasted energy, and speed is in individual cases, is essentially a question of investigation. (Page 232.)

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Berichte der eidg. Fabrik und Bergwerkinspektoren über ihre Amtstätigkeit in den Jahren 1898–1899. [*Reports of the (Swiss) Factory and Mine Inspectors. 1898–1899.*] *Aarau, Sauerländer, 1900.*

The reduction of hours from 12 to 11 has justified itself; it has had none but good results; it has contributed largely to restore order and regularity to industry.

The adversaries of the 11-hour day who predicted the total ruin of many industries have had to abandon their prejudices; they now see, as

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we do, that instead of being ruined our industries are developing in a most gratifying way. We hope soon to have a similar experience with the 10-hour day.

The man who works 11 hours per day will probably produce more on a given day than he who works 10, but this advantage is more apparent than real, and vanishes with time, since prolonged work results in fatiguing the workman.

Workers who are overstrained by long hours are less efficient and less skilful than others, and in the end they produce less.

. . . It is also an incontestable fact that reduction of hours has a good moral effect. It is generally admitted by employers that the deplorable habit of not working on Monday is tending to disappear more and more among the employees with reduced hours of work. (Page 146.)

An das Schweiz. Industriedepartement. Bern. Die Eidgenössischen Fabrikinspektoren. [*Report of the Swiss Factory Inspectors to the Swiss Department of Labor on the Revision of the Factory Laws.*] *Schaffhausen, 1904.*

. . . We have to examine the effects of shorter hours upon our industry to find out whether they can be introduced without injury to business. The statements and opinions expressed by the various factory inspectors in the course of recent years, as to the results of experience in shortening the working hours wherever this has been tried, have brought us to the conclusion that a generally shorter day may be introduced without injury. (Page 23.)

It will be readily seen that these two questions,—the extension of legislation to workers now unprotected by law and the reduction of working hours are the most important for revision. As to the latter we here state our conviction that Swiss industry is well able to substitute a ten-hour for an eleven-hour day. This has indeed been done in the majority of factories now subject to the law and is moreover required by law in various cantons without, indeed, having brought ruin upon industry. (Page 5.)

In no case where the 10-hour day has been introduced is there any tendency to return to the 11 hours, because both employers and workers find advantages in the shorter time. Not only from individual branches of industry, but even from the ranks of the cotton factory owners, who constituted the majority of the opposition, the sentiment of all who have established the 10-hour day is favorable to it. (Page 26.)

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Bulletin de l'Office du Travail. Ministère du Commerce, de l'Industrie, des Postes, et des Télégraphes. Paris, 1903. [*Bulletin of the (French) Labor Office, 1903.*]

There are establishments in which it may be affirmed, according to the statement of a district inspector of Nantes, that the production per hour increases as the number of hours per day decreases. These are the industries in which the personal qualities of the worker are an important factor in production. (Page 807.)

La Revue Socialiste. T. XLI. Jan.–Juin. 1905. La Journée de Huit Heures. [*The Eight Hour Day.*] ÉTIENNE BUISSON. *Paris.*

The seemingly paradoxical result of equal production with shorter hours of work can be attained, at least to a certain degree, in industries where human labor plays the most important part,—in a word, in all those lines where the worker is not simply an attendant for a machine which performs the work. In such industries the product may remain equal, in spite of shorter hours, by reason of the worker's increased application to the work. This augmentation of output is quite possible. Physical strength and concentrated attention cannot be exerted during 10 or 11 hours with equal intensity. According to the time of day, or the feelings of the moment, the worker has more or less energy for his work; nevertheless he is human; he is not a machine, and he is liable to ups and downs. Then, in the workshop itself there are causes for distraction; in brief, without going into details, there are various causes for inattention, or interruption, which constitute a waste time or a loss of output. These losses in many trades may easily make a total of 45 minutes, or an hour, or even more in a day of 10 or 11 hours. This is true of day work; and a comparison of day work with piece work in the same kind of trade will always prove it. (Pages 642, 643.)

La Revue de Paris. T. V. Sept.–Oct., 1907. La Journeé de Huit Heures. [*The Eight Hour Day.*] MAXIME LEROY.

In his testimony during this inquiry (1902) M. Grillet, a factory inspector in Brittany, said: "If we do not go below a certain limit, say 8, 9, or 10 hours, according to the different industries, we find that the reduction of working hours has produced no appreciable loss of production, and on the other hand, it has brought about an often striking improvement in the quality of the product."

He adds: "It is certain that in proportion as working hours lengthen,

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the hourly output of the worker diminishes. What does the employer want to have from his employee? Work, not simply his presence during so much time. And what does the employer need to do? To utilize the workman's strength to the best advantage." (Pages 838, 839.)

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Maine Senate Document 19: Public Documents, 1848. Report on Petition praying passage of law making ten hours legal day's work.

Everyone knows by observation and experience, that a man can endure a certain amount of labor every day, and that he must have a certain amount of rest; and that if he is compelled to toil on day after day from early morning till late at night, he may for a few days do more work, but if long continued, he actually becomes unable to accomplish as much per day as he could do if permitted to divide his time more equally. . . . And your committee are firmly of the opinion, from all the facts and information they can procure, that men accomplish more work in ten hours, where that system is reduced to practice, than where they work as long as they can see. (Pages 2–3.)

Report of the Massachusetts Bureau of Statistics of Labor. 1870–1871.

A man can work ten hours in the mill, and working with a will, and with the object of gaining one hour for himself, he will make a machine produce in ten hours as much as it will in eleven. He would be more attentive and try to make as much pay as in eleven hours. I think it will be found that much of the cloth made during the eleventh hour is of poorer quality than the rest, and that the necessity of looking it over the next day and fixing it all night, lessens the product of that next day. If we were to suppose two sets of operatives in the same business, one working 11 hours and one working 10 a day, other things being equal, there is no doubt that the 10-hour set would hold out more years than the 11-hour set. I certainly believe that the productive capacity of a set of work-people may be lessened by increasing the hours of their daily labor. (Pages 499–500.)

Argument of Hon. WILLIAM GRAY *on Petitions for Ten-Hour Law before The Massachusetts Committee on Labor. February 13, 1873. Boston.*

There are facts which . . . will show you . . . the actual result of the introduction of ten hours nearly six years ago. This corporation entered upon that change in June, 1867. (Page 17.)

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The speed of the looms was increased about four per cent the first month, and other machinery in about the same ratio. All work which could be made job work was so made . . . and the first month after the change showed these results.

Observe the time had been reduced from 10¾ hours to 10 hours; the product was reduced 4 to 5 per cent; the cost of labor was increased 2¾ per cent; the wages paid were not essentially changed. In three years and a half from the time of the change, the product of ten hours was fully equal to the product of 10¾ hours at the previous date. . . . With no material change in machinery, the following results appeared. . . .

First. We saw an improvement in the operatives directly after adopting ten hours,—which improvement has been going on; and we have now the best set of workers that have been in the mill for fifteen years. . . .

Second. We have had more continuous and uninterrupted work throughout the year than before. (Page 18.)

Report of the Massachusetts Bureau of Statistics of Labor. 1873.

The overseer (of Pemberton Mills, Lawrence) informed us that they took the result of every half-hour's work, and upon inquiring the relative product of the different hours, he assured us that invariably the last hour was the least productive. (Page 246.)

Hon. William Gray, Treasurer of the Atlantic Mills, Lawrence, began the ten-hour experiment with the operatives in his employ, June, 1867, and his testimony concerning its practical and financial success may be regarded as nearly, if not quite, authoritative and decisive.

Massachusetts Senate Documents, No. 33. 1874.

The Committee on the Labor Question to whom was referred so much of the Governor's address as relates to Labor Reform, having considered so much thereof as pertains to the enactment of a ten-hour law, and having also considered the petition of Wendell Phillips and others for the passage of such a law, Report: . . . Your Committee find that the manufacturers of Fall River voluntarily adopted ten hours as the length of time their operatives should work, and continued on this basis for twenty-one months. They ceased only because the other manufacturers *in the State* would not adopt the same regulation. They find further, that the Atlantic Mills, in Lawrence, have long been run on these hours, and in both these instances the corporations have paid large dividends. Your Committee, therefore, are of the opinion that while the lessening of the hours of labor as contemplated may reduce the profits, it will not diminish

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them so much as to prevent a fair and honorable return for the capital invested, and that the question seems to be, whether the health, intelligence, and morals of a large class of the women and children of the Commonwealth shall be sacrificed in order that the manufacturers opposed to this measure may reap, not large and paying dividends, but as large as are received when the hours of labor are more. (Page 2.)

Report of Massachusetts Bureau of Statistics of Labor. 1881.

It is apparent that Massachusetts with ten hours produces as much per man or per loom or per spindle, equal grades being considered, as other States with eleven and more hours; and also that wages here rule as high, if not higher, than in the States where the mills run longer time. (Page 457.)

But perhaps the most emphatic testimony is that of another carpet mill employing about twelve hundred persons. This mill, which has been running but ten hours for several years, and has during this period tried the experiment of running overtime, gives the following results. The manager said, "I believe, with proper management and supervision, the same help will produce as many goods, and of superior quality, in ten hours as they will in eleven. I judge so from the fact that during certain seasons, being pushed for goods, we have run up to nine o'clock, and for the first month the production was increased materially. After this, however, the help would grow listless, and the production would fall off and the quality of the goods deteriorate." (Pages 460–461.)

The reason is, the flesh and blood of the operatives have only so much work in them, and it was all got out in ten hours, and no more could be got out in twelve; and what was got extra in the first month was taken right out of the life of the operatives. (Page 461.)

Report of the Chief of Massachusetts District Police for the year ending December 31, 1883.

It has been stated by those who have specially watched the operation of the ten-hour law that "its enforcement has increased production and advanced the wages and moral standing of the masses." (Pages 17–18.)

Ibid. for the year ending Dec. 31, 1886.

One manufacturer stated to me a short time ago that he had run his mill 66 hours per week, supposing that by so doing he increased the production nearly one-eleventh, but was persuaded last January to reduce his running time to 60 hours per week, and at the end of six months found

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that the production of his mill had increased nearly ten per cent while the quality of the work done was more perfect. He also stated that no amount of argument could have convinced him that the results would be as they have proven. This shows that an operative can perform only a certain amount of labor though seemingly light when such labor is required every working day in the year. (Pages 71–72.)

Report of the Connecticut Bureau of Labor Statistics. 1886.

Down to a certain point, the nations who work shorter hours not merely do better work, but more work than their competitors. In Russia the hands work twelve hours a day; in Germany and France, eleven; in England, nine. Yet nine hours a day of English work mean more than twelve hours of Russian work.

The laborer receives better wages, and at the same time the manufacturer gets a larger product—so much larger that it is the Russian, the German, or the Frenchman who requires protection against his English competitor in spite of the longer hours and lower day's wages. (Pages 16–17.)

Report of the New York State Factory Inspector. 1887.

. . . As a rule, at the end of a year, they (women working over 10 hours a day) would not have so much working time to their credit as those who were not so overworked. It can be deduced from this that it does not pay even the employer to insist upon excessive hours of toil, and, indeed, the invariable testimony of the proprietors of those mills which, before the present law was passed, ran eleven hours a day, is to the effect that their product was not decreased by the reduction to ten hours, but that the quality of the work was superior, the employees worked more steadily, and were less interfered with by sickness. (Page 28.)

Ibid. 1890.

. . . Every important manufactory in this State, which formerly required sixty-six or more hours of labor as a week's work, is now running on sixty or less hours' limit, and the testimony of the proprietors thereof is to the effect that their production increased instead of diminished at the same time. This enhancement of the productiveness of their employees has not come through increasing the speed of machinery, as some people suppose, but it is believed that it has grown out of the more contented minds and better rested bodies of the operatives. (Page 26.)

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Fourth Annual Convention of the International Association of Factory Inspectors of North America. Boston. Wright and Potter, 1890. The Restriction of the Hours of Labor in Factories and Workshops. L. R. CAMPBELL, *Maine.*

The history of all successful movements for less hours to constitute a day's work, as a rule, is that they have been followed by a greater production in their several lines; and, also, these reductions in the hours of labor were generally followed by an increase of wages. (Pages 43–44.)

In my state, since the adoption of the ten hours in lieu of the eleven hours, in mills and factories where machinery is employed, it is the universal verdict of manufacturers that their product is as great under the ten-hour system as it was under the eleven-hour system, and I think that the same answer comes from every State that has adopted the ten-hour system. (Page 47.)

Report of the New York Factory Inspector. 1894.

It must be said that not only was the time reduction (60 hours a week) hailed with satisfaction by the hands in the factories, but their employers, within a short period from the date on which the law took effect, almost unanimously acknowledged that there was no reduction whatever in the amount of labor performed or the product of their plants. (Page 32.)

Report of the Pennsylvania Factory Inspector. 1895.

I have come in contact with a number of operators who state that their experience in working long hours had been detrimental to their business, and injurious to the employees, and by working shorter hours they get a better production per hour, and a superior article, and are now running their establishment less than the sixty hours a week required by law. (Page 6.)

Report of the Michigan Bureau of Labor. 1899.

All the young women in the employ of the Company (National Cash Register) are allowed to come in one hour and a quarter later than the men. . . . At night they go home 15 minutes earlier than the men. They are given one-half holiday each week to do their shopping and a full day's holiday each month. . , . These same women, says Mr. Patterson, do the same amount of work as when they worked 10 hours per day and its quality is much improved. They give us better and quicker work for our kindness and it has been a great source of profit to us. (Page 85.)

Report of Chief of Massachusetts District Police. 1899. UNITED STATES

One question has been raised from the beginning, which is, whether or not legislation of this kind does not make it impossible for our manufacturing industries to compete successfully with those of other States of the Union not having laws fixing the limit of hours of labor for women and minors. . . . To shorten the hours of labor, it was said, would reduce the production of our factories, and increase the running expenses, unless wages should be cut down to meet the changed condition. The evils predicted have not come to pass. It is at least probable, if it cannot be claimed as an ascertained fact, that, taking a reasonable period for the basis of comparison, better work and more of it is done by the operatives than under the former system of unrestricted hours of labor. . . . It may be assumed that no legislation in this Commonwealth would insist upon maintaining a policy whose effect would be the destruction of our manufacturing supremacy. . . . It cannot be shown that the laws in question have wrought injury to any interest; but it is true that they have been highly beneficial to those most deeply concerned. The condition of operatives, of women and minors as well as men, have been greatly improved. (Pages 11–12.)

Report of the United States Industrial Commission on the Relations and Conditions of Capital and Labor employed in Manufactures and General Business. Vol. VII. 1900. Testimony of MRS. FANNY B. AMES, *former Factory Inspector of the State of Massachusetts.*

It is also claimed that a shorter day would not lessen production even in hand work. Perhaps you would be interested in the experiment of a gentleman who had an establishment in Fitchburg where were made the balls used in bicycle bearings. When he first took charge of the establishment they were running ten hours a day, with the exception of Saturday, when they ran eight, making fifty-eight hours a week. Women were employed in inspecting the balls. They do this by touch, which becomes very perfect in time and sensitive to the least imperfection; the balls are dropped into boxes, the perfect balls into one box and the imperfect ones into others, graded according to the imperfection. In the afternoon the work done by one woman in the morning is inspected by another, and thus there is a double inspection. He became persuaded that there was a certain strain in this work on the eyes, the fingers, and the attention, and finally he made up his mind that shorter hours would be better for the women and would not lessen the amount of work done—it would be better

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for their health and quite as well for the business. Accordingly he directed the women's department to be run but nine hours a day. At first the women were very much distressed. As they were paid by the number of thousands of balls inspected, they thought it would permit them to earn less money; but they soon found that they did just as many balls in the nine hours as they had heretofore done in the ten; and they had besides ten minutes' vacation in the middle of the morning session and in the afternoon. Later, the time was shortened to eight hours and a half. There was not so much objection as at first, because they began to see what the object was, and they soon found they did just as much in eight and a half as in nine. At last accounts the time had been shortened to eight hours, and it was believed it could be cut down to seven and one-half. (Page 63.)

What I wanted to show was that the trend of intelligent business management is to the conclusion that when a person who is doing the work has less strain upon him, he will get out more work up to a certain limit, in less time; and where the work is done by the piece it is done with less dawdling and more diligence, nor is it so hard to work with that severe attention for less time as it is to work longer hours with less attention. (Page 64.)

Report of the New York Department of Labor: On Factory Inspection. 1901.

It was feared by employers that to reduce the hours of labor was to reduce the quantity of products, and that in the competition for markets the longer hours would have a decided advantage over the shorter hours; but it has been demonstrated that the lessening of the hours of labor does not, within certain limits, result in a decrease, but rather in an increase of products instead.

Another phase of the subject has also come to the front gradually in the course of this agitation for a shorter work-day. It is that quality of product may be improved by a shorter day, and by this improvement in quality of the product has come to be considered the improvement of the quality of the laborer himself. (Page 562.)

Report of the United States Industrial Commission. Final Report. Vol. XIX. 1902.

Those States which are just now advancing to the position of manufacturing communities might well learn from these examples the lesson

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that permanent industrial progress cannot be built upon the physical exhaustion of women and children. . . . A reduction in hours has never lessened the working people's ability to compete in the markets of the world. States with shorter work-days actually manufacture their products at a lower cost than States with longer work-days. (Page 788.)

United States Congress. House Report, No. 1793 (4405). Hours of Laborers on Public Works of the United States. Report from the Committee on Labor. Fifty-seventh Congress, 1st Session. 1901–1902.

No reasonable person would, for a moment, entertain the proposition that the work day should again be lengthened to fourteen or twelve hours. . . . It is nowhere claimed, so far as your committee is aware, that any reduction in the hours of labor has had a detrimental effect on business, on manufacturers, on labor as a unit, or individual laborers. The advocates of the short-hour theory, on the other hand, trace the moral, social, and financial improvement of the laborer to this cause, and allege that business was at no time injured, but improved, if affected, and that production was stimulated and consumption increased. (Page 9.)

Report of the Wisconsin Bureau of Labor Statistics. 1903–1904.

Manufacturers maintain that by enforcing shorter hours they are unable to compete with those factories which are not hampered in this way. In order to test the truth or falsity of this claim, the Salford Iron Works of Manchester, England, voluntarily reduced the number of hours required for a day's work to eight. After giving the system a fair trial, the management declared that the character of work performed and wages paid remained about the same; that although a depression in trade took place about the same time this experiment was being made, and competition was exceedingly fierce, the output was greater and the receipts larger than under the old system. The Salford Iron Works continue the eight-hour system to the present day, and other allied industries and the arsenal works and dock-yards are following example. (Page 142.)

Eleventh Special Report of the United States Commissioner of Labor. 1904. Regulation and Restriction of Output.

Considered solely with reference to speed or intensity of exertion, a moderate reduction in the number of hours of labor each day usually

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tends to increase the speed rather than to restrict it. From the standpoint of exertion a reduction of hours is exactly the opposite from a restriction of output. (Pages 15–16.)

Discussions in Economics and Statistics. Vol. II. FRANCIS A. WALKER, Ph.D., LL.D. *The Eight-hour Law Agitation. New York, Holt, 1899.*

There is little doubt that all the successive reductions in the working day which have thus far taken place among certain laboring populations have resulted in an immediate gain to productive power in the generation following. It has probably never occurred that a reduction of working time has been all loss, since a somewhat increased activity, a somewhat enhanced energy, has characterized each part of the time remaining. (Page 387.)

Factory People and their Employers. E. L. SHUEY. *New York, 1900.*

Among the most desirable things is the matter of shorter hours for women. The experience of a number of leading manufacturers has indicated that equal results may be obtained in many forms of manufacture in the shorter hours. Fels & Co. of Philadelphia gradually reduced the time of their women from ten to eight hours, girls working five days in the week. At the same time wages have been practically increased. The Levy Bros. Co. (England) has had a similar experience. The National Cash Register Co. in the same manner reduced its hours for women from ten to eight. (Page 113.)

Fourteenth and Fifteenth Annual Conventions of the International Association of Factory Inspectors of America. Indianapolis, 1900. Niagara Falls, 1901. (Bound in New York State Department of Labor Report, 1901.) The Shorter Workday in its Effect upon the Personal Character of the Worker. JOHN HOLBROOK, *Deputy Commissioner of Labor, Michigan.*

. . . It was feared by employers that to reduce the hours of labor was to reduce the quantity of products, and that in the competition for markets the longer hours would have a decided advantage over the shorter hours; but it has been demonstrated that the lessening of the hours of labor does not, within certain limits, result in a decrease, but rather in an increase of products instead. (Page 562.)

American Economic Association Quarterly. (Formerly, Publications of the American Economic Association.) Third Series. Vol. IX. No. 3. 1908. Factory Legislation of Rhode Island. JOHN KER TOWLES, Ph.D. *Princeton.* UNITED STATES

Perhaps the strongest reason for the observation of the statute is the fact that the mill managers have found that a reduction of the average working day to ten hours has not curtailed production. Such influences, rather than any activity on the part of the factory inspectors, caused the manufacturers, during the normal periods of business, to comply with the law. (Page 72.)

(2) LONG HOURS REDUCE EFFICIENCY AND THUS RESULT IN INFERIOR OUTPUT

British Sessional Papers. Vol. XIII. 1843. Children's Employment Commission. JOHN LAWSON KENNEDY, Esq., *Lancashire.* GREAT BRITAIN

408. . . . Practically it has been found that the attention of the workman, on which the application of his skill and the productiveness of the machine under his care depend, cannot be sustained beyond a certain daily period. From this cause, namely, the impossibility of keeping up the attention, care, and skill of the workman in applying the machinery, night work has been generally abandoned in the cotton-spinning trade; and it is, moreover, an important fact that those establishments in this district which resorted systematically to night work have almost without exception become bankrupt. I have been assured by printers themselves that the rule as to the unprofitableness of long hours of work for long continued periods is equally applicable to the (calico-print) trade. I have been favoured by an influential house in the print trade with an inspection of those books which show the rates of production in their roller printing machines during a period of 4 months when they worked unusually long hours, *viz., 15 hours a day,* under a peculiar stress of business. The machines never stopped from morning till night and there was no intermission at the dinner hour. From the beginning of the first month to the middle of the second the production kept very steady, scarcely varying from week to week, with a comparatively low proportion of spoiled work, towards the end of the second month a gradual decrease in the production of the machines was perceptible, attended by an increased proportion of spoiled work. Towards the end of the third month, and throughout the fourth, the production of the machines arrived at their minimum, and the

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proportion of spoiled work its maximum. The proportion of spoiled work from the beginning of the first to the end of the fourth month actually doubled itself, whilst the average production of the machines decreased from 100 to 90 per cent, during the same time. In fact the amount of spoiled work increased to such an alarming degree that the parties referred to felt themselves compelled to shorten the hours of labour to avoid loss, and as soon as the alteration was made the amount of spoiled work sunk to its former level. The men were paid extra wages for their extra exertions, and there was no intention or motive on their parts to produce this result. It is, I am informed, the general experience of this branch of trade that under whatever circumstances night work is tried the produce is distinguished by a larger share than ordinary of spoiled work. (Page 72.)

Hansard's Parliamentary Debates. Vol. 73. 1844.

Mr. Vernon Smith:

But he would venture to say, that though the diminution of time was one-sixth, the diminution of profitable labour would be much less because the last 2 hours would be the least efficient owing to the exhaustion caused by the previous 10 hours of labour. But he could not think that the commerce of this country was really in so ticklish, hazardous and perilous a state, as to depend upon so small an amount, more or less, of additiona. labour. . . . If the proposed diminution of labour should induce some evils as regarded our commerce, it appeared to him that the change would be attended, on the other hand, with great advantage to the country. (Pages 1404–1405.)

Hansard's Parliamentary Debates. Vol. 74. 1844. Letter in Bolton Free Press (April, 1844).

"There is also another consideration for employers, namely, that in a day's work of 12 hours, the last hour by reason of the exhaustion and listlessness of the workers, is the least productive in quantity, and the least satisfactory in quality." (Page 911.)

"The probability is, that the twelfth hour produces more spoiled work than any other 2 hours of the day." (Page 911.)

Hansard's Parliamentary Debates. Vol. 92. 1847.

The Earl of Ellesmere:

. . . Deductions are made, when the article is brought in by the operative, for waste and spoil. . . . from such information as I can obtain, it

is my firm belief that nine-tenths of that spoiled will arise in the last weary hours of the operatives' present average toil. I have never met with any man of any class, conversant with the subject, who has not laid much stress on this circumstance. (Page 898.)

The Bishop of Oxford:

Could they for a moment conceive, that by limiting the labour of the factory worker to 10 hours a day instead of 12, they would sweep away all the manufacturers of the country, and drive them abroad? . . . Let them remember that he was speaking of young females who had to follow the rapid motions of the machinery of a mill; . . . and remember also the fixedness of the attention which was necessary for these young women to maintain when walking in the midst of a factory, where danger threatened them at every turn, and where a single instance of negligence might be attended with loss of life or limb. . . . Could their Lordships believe that upon the last 2 hours' labour of that trembling hand, tending upon that machinery after long, unceasing, and heart-consuming attention, when nature almost refused to perform her functions—could their Lordships believe that upon those 2 last hours depended all the profits and accumulations of the manufacturers? He believed that the work done in those 2 last hours was infinitely inferior in quality to that which was done in any other portion of the day. It was demanding work when nature refused the power of working. (Pages 939–940.)

British Sessional Papers. Vol. XXI. 1894. Report of Chief Inspector of Factories and Workshops.

Overtime (*i. e.*, over ten and a half hours daily) allows but scanty opportunity for leisure. . . . The consequent effect upon the health of the workers is exceedingly injurious. Some employers, too, hold that in proportion as the workpeople suffer in health, their work suffers in execution. (Page 11.)

Eight Hours for Work. JOHN RAE. *London, Macmillan, 1894.*

But for the last 60 years we have been slowly learning the lesson that all this successive prolongation of working hours, which was near eating the heart out of the labouring manhood of England, was also, from the standpoint of the manufacturers' own interest, a grave pecuniary mistake. In their haste to be repaid their expenditure on machinery, the manufacturers were really wearing down the most precious machine they had got —their great machine mère, as Blanqui called it, on which the success of all the rest depended. They found that with this flesh and blood machine

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an hour's more running in the day did not mean an hour's more product in the day, but that really, after a certain limit, an extra hour of repose has much higher productive value than an extra hour of work. . . . A French manufacturer once said to Guizot: "We used to say it was the last hour that gave us our profit, but we have now learnt it was the last hour that ate up our profit," and though we still hear much fright expressed about the competition of the pauper and long hour labour of other countries, we are coming more and more to perceive that Mr. Mundella is probably right in saying it is really their long hours that save us from their competition, because their long hours impair the personal efficiency of their labour and the competition between the nations is growing every day more and more to be mainly a competition in personal efficiency. (Pages 11–12.)

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Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1903. Bd. III. [*Annual Reports of the (German) Factory and Mine Inspectors for 1903. Vol. III.*] *Berlin, Decker, 1904.*

Mecklenburg Schwerin.

Abnormally long hours of work are gradually disappearing, partly by the influence of the trade unions and their demands for a shorter day, partly because of the legal restrictions, but also because employers are generally beginning to realize their ineffectiveness. (Page $7^{\cdot 5}$.)

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1904. Bd. III. [*Reports of the (German) Factory and Mine Inspectors for 1904. Vol. III.*] *Berlin, Decker, 1905.*

Elsass Lothringen.

The abandonment of extremely long hours in Lothringen is due less to the efforts of the unions than to the effect of legislation. It is due most of all to the steady if slow increase of insight among employers, that a permanently long working day is useless. . . . Only force of habit and the stupidity of some employers—also of some workers—explain the persistence of long hours in the face of all the favorable testimony for the shorter day. (Page $26^{\cdot 62}$.)

Hours and Wages in Relation to Production. LUJO BRENTANO. *Translated by* Mrs. WM. ARNOLD. *London, Sonnenschein, 1894.*

Before the passing of the Ten Hours Act, individual manufacturers who were agitating for that law had set on foot experiments in their

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factories, with the view of testing the assertion that the lowering of the working day from 12 to 10 hours would ruin the cotton industry. These cases made it quite clear that the question was not merely the arithmetical one,—if 12 hours produce *x*, what will 10 produce? It was found that the work done in the last two hours was so small that in the experimental shortening of the working day from 12 to 10 hours the output was not one-sixth but only one-twelfth less than formerly. In addition to this, it was found that just in those last two hours a great deal of material was spoiled by the wearied and therefore careless operatives. When, therefore, the Ten Hours Act was actually passed,—it became generally apparent that, as Ernest von Plener said in his work on factory legislation, "the mere lengthening of the working day of a workman was not equivalent to the increase of his productive capacity; the operatives, especially the younger ones, no longer exhausted by excessive bodily effort, produced the same amount, and frequently even turned out more in the shorter time." (Pages 29–30.)

It has been everywhere observed that the workmen in countries where work-time is short produce more than in those where it is long. . . . I myself was told in March, 1890, by an overseer in Mr. Mathers' machine works in Salford, . . . that he had worked in Dresden, England, and America; and he said that the greater efficiency of the American workman was a result of his shorter hours. In the same way he had observed an increase of production in Salford as often as the worktime was shortened; in Saxony, on the other hand, one of the chief reasons of the inferior efficiency of labour was the length of the working-day. . . . And Brassey says of the Russians, that one English workman produces as much in ten hours as two Russians in sixteen.

In complete harmony with the above, it has been further observed that in one and the same country, workers with regularly short hours outstrip those who regularly work longer. (Pages 32–33.)

At the congress of Hygiene at Vienna, in 1887, the Swiss factory inspector, Schuler, reported that in Switzerland experience had shown that the legal reduction of the working day from twelve to eleven hours, *i. e.*, by 8½ per cent, had led, in short, to a falling off in the less well-equipped cotton-spinning factories of only 3 per cent in production, while in the well-equipped ones it was only 2 to 1½ per cent. In Mühlhausen, Dolfuss reduced his working day from twelve to eleven hours, and promised his operatives that their wages should remain unaltered if they produced the same quantity of work as before. At the end of a month it was seen that not only as much work was done in eleven hours, as formerly in twelve, but 5 per cent more. (Pages 35–36.)

FRANCE

Bulletin de l'Inspection du Travail. Ministère du Commerce, de l'Industrie, des Postes et des Télégraphes. Fasc. 5 and 6. Travaux originaux des Inspecteurs. [*Original Contributions by the Inspectors.*] *Étude sur l'Influence de la Réduction de la Journée de Travail sur le Rendement Industriel.* [*The Effect of Shorter Hours on Production.*] M. GRILLET, *Inspector at Rennes. Paris, 1902.*

The most striking and happy results of the reduction of hours effected within the last four years (brought about in two steps: first to 10½, then to 10 hours) has been, that many employers are more ready to agree to the principle of limiting the adult worker's hours of labor; that the general and uniform application of a shorter day has been facilitated, and that upright and reliable employers are able to affirm that this reduction of $\frac{1}{22}$ in the length of hours has not brought about any sensible loss of output. (Page 425.)

One thing is certain: in proportion as the daily duration of working hours is prolonged, the production per hour decreases. What does the employer want of his workmen? Hours of work, not hours of presence. What does he need? To secure the best possible use of his workman's strength. Now, to attain that, it is essential that the worker should have rest periods sufficiently long to completely repair his vitality. (Page 426.)

M. Rivière in a report to the International Congress for Labor Legislation in Paris, July 1900, set forth in masterly fashion the disadvantages of long hours of work from the industrial, not the sentimental point of view. We have reached the same conclusions by a different route.

Now, if workmen are employed steadily eight hours a day for a certain time, say two months, then 9 hours for an equal period and then in succession for 10, 11, 12, 13, 14 hours, it can be shown that the production per hour is at first nearly the same (in 6, 7, 8, or 9 hours of work) and that, consequently, the daily output is directly proportioned to the length of the working day. After that, in proportion as length of working time increases, production per hour decreases and as a result, daily output does not keep pace with daily hours of work. (Page 426.)

It can be stated positively that the workman's daily output diminishes progressively, starting with such a period as we have just mentioned, and becomes stationary after from 8 to 15 days have elapsed. It is natural that it should be so. Taking one single day, after a certain number of hours have elapsed fatigue comes on (later, if the workman is fit; sooner if he is already fagged by previous work) and his productive capacity sinks. The hourly output decreases toward the end of the day while at

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the same time duration of work is prolonged. Then, when the workman resumes his work on the following day, his fatigue of the day before has not all disappeared. His daily output, is then, a little less every day than it was the day before, working hours being the same, until finally at the end of a certain period, an equilibrium is arrived at.

It is evident that the contrary will be true if hours of work are reduced. The output per hour will rise until, again, an equilibrium is established.

The result is, that when the employer increases working hours considerably, and for a considerable length of time, the final hours of every day bring him a certain loss, varying in different industries.

The personal interest of the employer, then, is, not to overpass the "maximum day," that duration of time during which the worker's productivity is at its best. (Page 426.)

Our observations enable us to say positively: If it is not carried beyond a certain limit of hours (eight, or nine, or ten a day according to the industry) reduction of working hours has not only *not* caused any sensible diminution in output, but instead, has resulted in an often notable improvement in the quality of the product. (Page 428.)

These results have not only been demonstrated in hand work, where the workman's share in production is direct but also in machine work, where the workman's part is primarily to supervise the machine. For then, by reason of the shorter sojourn in the factory the workman is more alert, more ready: he loses less time; feeds his machine more rapidly, and this quite unconsciously, just because he feels more able. (Page 428.)

M. Benedict B—having successively tried the 12, then the 11, 10, and finally the 8 hour day in his factories, definitely established the 8 hour day because it assured him not only the best hourly output but also the best daily output. . . . Naturally (he told us) one of his women could produce more in 9 or 10 hours, but only temporarily. According to his opinion, every industry has its maximum day which ought not to be overpassed and . . . in his, this maximum is eight hours. If a rush of work comes, he requires his workwomen to work for nine hours, and the output keeps up if two conditions are observed: 1. that supervision is good: 2. that overwork does not last for a long stretch of time. (Page 434.)

M. Moussard, carriage maker, said:

In our shop the men do as much in 10 hours as formerly in 12, because, with 12 hours they became fatigued and worked without energy. In ten hours they work steadily. (Pages 435.)

BELGIUM

Royaume de Belgique, Conseil Supérieur du Travail, 9e Séssion, 1907. [*Belgian Higher Council of Labor, 9th session, 1907.*] *Réglementation de la Durée du Travail des Adultes.* [*Regulation of Hours of Work for Adults.*] *Discussion.*

M. G. Helleputte:

It has been established by figures which it is impossible to disregard that what is lost in time is regained in work-intensiveness, and this is not surprising. It is impossible that product should be proportioned to the number of hours, for the work of a fatigued organism is not as effective as that of a fresh and able organism. We have but to recall our own experiences to see this. If one could trace from hour to hour the curve of effectiveness of the workman, one would very probably find that it rose in the morning, rapidly attained a maximum, and fell toward evening to a point which descended as the working day increased in length.

Cut off the last hour experimentally and you do not reduce, proportionally, the output of a given workman: cut it off permanently and the workman, thanks to the longer rest, becomes more alert and vigorous. His curve of work will be enlarged. It is understood, of course, that this reduction is not carried to extremes. (Page 13.)

SWITZERLAND

Berichte über die Fabrikinspektion. 1884: 1885. [*Reports of the (Swiss) Factory Inspectors, 1884 and 1885.*] *Aarau, Sauerländer, 1886.*

The argument that hours of work, if prolonged beyond a certain point, result in increased production has been disproved by the experience of a factory where . . . to avoid over-production the hours were reduced to one-half the usual number during the summer. According to calculations the output should have been reduced by 50 per cent; actually it only fell 10 per cent. True that in this factory hand work played an important part; yet does not this result prove that workmen, overstrained by excessive toil and worn by fatigue in excess of their strength undergo a deterioration of their productive facilities? In proportion as fatigue enfeebles in them that master faculty—application—they come in fact to produce less and less in the same extent of time. (Page 65.)

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Archiv für Soziale Gesetzgebung und Statistik. Bd. VIII. 1895. Zur Verkürzung der Arbeitszeit in der Mechanischen Textilindustrie. [*The Reduction of Working Hours in the Mechanical Textiles Industry.*] RUDOLF MARTIN, *Referendar in the Statistical Office of the Kingdom of Saxony.*

The mechanical textile industries of Germany suffered greatly after 1830, because, protected by a high tariff but with no protective labor laws

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she sought her economic salvation through long hours of work and low wages—in a word, through defective conditions of labor. Depending on her long hours and low wages she neglected to improve her technic, whilst England, with a ten-hour day for women and children established as far back as 1850, and higher wages . . . made vast strides. . . . The melancholy result was that the history of cotton mills . . . in the '70's was a history of bankruptcy. (Page 261.)

ITALY

Revue Internationale de Sociologie, Nov.-Dec., 1895. Le Travail Humain et ses Lois. [*The Laws of Human Work.*] FRANCESCO S. NITTI, *University of Naples. Paris, Giard et Brière, 1895.*

The workman who persists in working despite his fatigue not only makes a greater organic effort with more trouble but produces an inferior mechanical result. (Page 1029.)

. . . These facts explain how it is that people subjected to long hours of work finally produce inferior output; and they explain, too, what seems at first an economic paradox, that the whole cost of industry is ordinarily less in countries where the hours of work are short than in those where they are long. (Page 1029.)

One of the most intelligent of the Swiss factory inspectors said long ago on this point, "Germany and France, apparently will not reduce their hours of work; Austria has an animated opposition going on to reduction of hours; Italy retains night work. Their workmen will become less and less capable of productive labor whilst ours will advance and then we shall see once more what we have seen several times before, namely, that we shall excel our neighbors." (Page 1029.)

UNITED STATES

Report of the Massachusetts Bureau of Statistics of Labor, 1871.

The operatives vary in perfectness and productiveness as the day progresses; and if there should be a reduction to ten hours there would not be a loss of one-eleventh of the product. . . . I think it will be found that much of the cloth made during the eleventh hour is of poorer quality than the rest, and that the necessity of looking it over the next day and fixing it all right lessens the product of that next day. . . . I certainly believe that the productive capacity of a set of work-people may be lessened by increasing the hours of their daily work. The question is not legitimately one of arithmetic, nor can it be settled by argument about one-eleventh less or one-tenth more. It is a question to be settled by actual results on long-continued trial. (Pages 499–500.)

UNITED STATES

Report of the Chief of Massachusetts District Police for the Year Ending Dec. 31, 1885.

It must of course be admitted, that there is a limit to human endurance. If one labors twelve hours a day, it cannot be maintained that he will do as much work in the last two hours, nor do it as well, as in any previous two hours of the same day. Jaded by excessive toil, the brain becomes sluggish and the fingers clumsy. It is not an assumption, but an acknowledged fact that under the improved condition resulting from shortening the number of hours of labor, operatives produce in the shorter period at least the same amount of work; and many manufacturers admit that in the last two hours in any given day under the old system, work so much inferior was produced, that what was gained in quantity was lost in quality. The shortening of the number of hours of labor, if the time thus gained for leisure is used for proper purposes, becomes one of the best means for the elevation of the people thus affected. (Pages 19–20.)

Getting a Living. The Problem of Wealth and Poverty, Profits, Wages, and Trades Unionism. GEO. LEWIS BOLEN. *New York, Macmillan, 1903.*

CHAP. 15. SHORTER WORKDAY.

If in the tenth hour as much work has been done as the average for the previous nine hours, a reduction of time to nine hours per day, at the same pay, would be an increase of wages by eleven and one-ninth per cent, unless the extra hour of rest increased the hourly product. But in any work not fixed in speed by steadily running machinery, less is done in the tenth hour, by reason of weariness, than in other hours; and the work of the last hour, like overtime work at night, weakens a person for the next day. It is this weariness that causes accidents to occur two or three times as frequently in the last hour as in other hours—a fact proved by European statistics. With the steady machinery, too, weariness, as a rule, either lowers the quality of the work done, or by frequent stoppage lessens its amount—often causing both these losses. (Pages 407–408.)

C. *Incentive to Improvements in Manufacture*

The regulation of the working day has acted as a stimulus to improvement in processes of manufacture. Invention of new machinery and perfection of old methods have followed the introduction of shorter hours.

British Sessional Papers. Vol. XII. 1859. Report of Inspector of Factories for Half-year ending 31st October, 1858. GREAT BRITAIN

But the increase in the actual number of mills is not the only measure of progression, for the great improvements that have been made in machinery of all kinds have vastly increased their productive powers, improvements to which a stimulus was doubtless given, especially as regards the greater speed of the machines in a given time by the restrictions of the hours of work. These improvements and the closer application which the operatives are enabled to give have had the effect as I have been again and again assured of as much work being turned off in the shortened time as used to be in the longer hours. (Page 10.)

Factory Act Legislation. The Cobden Prize Essay for 1891. VICTORINE JEANS. *London, T. Fisher Unwin, 1891.*

Each succeeding experiment has proved legislation to be justifiable not only on grounds sanitary, educational and moral, but also when judged by the "strictest rules of Political Economy." All the English economists were against the Act of 1844; probably there is hardly a single writer of note who would wish to see that or any subsequent act repealed to-day. The expected economic results nowhere came to pass, because, wherever legislation penetrated it acted as a stimulus to "invention" in the best and widest sense of the word.

. . . Production will increase with the improved vigor of the workpeople and the use of better appliances, wages will rise, foreign trade can be only temporarily injured; the whole basis of the industry must in the end be made wider and stronger. (Pages 83–84.)

A Shorter Working Day. R. A. HADFIELD *of Hadfield's Steel Foundry Co., Sheffield, and* H. DE B. GIBBINS, M.A. *London, Methuen, 1892.*

Yet production has not suffered. The reason is that necessity, here as always, showed herself to be literally the mother of invention, and the decrease of hours was amply compensated by an increase of new machinery, appliances, and devices which have brought the development of the manufacturing industries up to the present point. Some fear that we have gone as far in our inventions as it is possible for us to go, and that if we were to reduce the hours of labor now we could no longer compensate by increased facilities of production. But we can hardly believe that this is the case. To take but one example: The steam engine alone is as yet

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practically in its infancy, and one can hardly believe that there is no room for further invention when we remember that only 10 per cent of the power generated by coal in the steam engine is utilized while the remaining 90 per cent is wasted. (Page 88.)

The Case for the Factory Acts. Edited by Mrs. Sidney Webb. *London, Richard, 1901.*

But the exemption from regulation is also responsible for corresponding deficiencies in the technical administration of the industry. The very fact that the employers are legally free to make their operatives work without limit, and to crowd any number of them into one room, makes them disinclined to put thought and capital into improving the arrangements.

. . . We might indefinitely prolong the list of examples of the effect of the Factory Acts in improving the processes of manufacture. (Page 53.)

History of Factory Legislation. B. L. Hutchins *and* Amy Harrison. *Westminster, King, 1903.*

If it could be shown that this regulated industry, far from suffering in competition with others, went ahead, improved its machinery, and developed a higher standard of comfort than its rivals, then, although the improvement might not be due to the legislation, there would be, at all events, a strong presumption that good and not harm had been done. And this is what has taken place. . . . The improvement in the regulated industry was clear and conspicuous. (Page 121.)

FRANCE

La Femme dans l'Industrie. [*Woman in Industry.*] R. Gonnard. *Paris, Colin, 1906.*

The inspector of labor of Lyons says:

"It has come about that this decrease of the legal maximum limit of hours of labor (ten hours a day), which went into effect the 28th of March, 1902, obliging the employer to pay a higher wage for overtime hours, has urged the manufacturers to replace their former equipment by machines of great producing power. In short, for the manufacturers in question, the regulation has become a powerful stimulus, which has driven them to do away with methods of manufacture already somewhat superannuated." (Page 78.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics, 1903–1904. UNITED STATES

Wherever a uniform standard of wages, hours of labor, and wholesome sanitary conditions have been uniformly enforced, the result has been that laborers have been stimulated to render greater services to their employers, and, in turn, employers strive to excel in improved machinery and devices for the protection of employees, sanitation, and methods of production in general. (Page 138.)

That the enforcing of a certain standard in regard to hours of labor, wages, and sanitary conditions compels employers to continually seek more improved machinery and methods of production is as true in practice as in theory. (Page 140.)

D. *Effect on Scope of Women's Work*

The establishment of a legal limit to the hours of woman's labor does not result in contracting the sphere of her work.

British Sessional Papers. Vol. XX. 1878. Report of Inspectors of Factories for the Half-year ending 31st October, 1877. GREAT BRITAIN

. . . The argument that the tendency of the Factory Acts is to place an artificial restriction on the employment of women, and thus to depreciate the market value on their labour, is refuted on every hand by practical experience in the textile manufactories. Here the restrictions upon women's work are the most stringent; and yet the tendency for a long series of years has been the opposite, the proportion of women employed has steadily increased. The same observation applies to many of the trades and occupations carried on in London. As for the rate of wages paid, there is not an employer in the metropolis who will hesitate to acknowledge that there has been during the last ten or fifteen years a very substantial and important advance in the remuneration given to women for their work. (Pages 15–16.)

Labour Laws for Women. Their Reason and their Results. Independent Labour Party, London, 1900.

If you go to the employers and ask them if they would employ more women and pay them better if their hours were not restricted, they tell

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you such an idea never entered their calculations; and the thoughtful ones will often tell you that they welcome the legal limit because it enables them to withstand unscrupulous competitors, and to refuse unreasonable customers who rush in the afternoon with work which they want done for the next morning. (Pages 17–18.)

Special inquiries sent round to the secretaries of trade unions in which there were women members, for the purpose of this tract, have elicited a large concensus of opinion that women are by no means being driven out of work by regulation. Over and over again in the answers we find such statements as these: "Shortening of hours has made women's labour more valuable because they do their work better; they are not so tired and worn out."

The Case for the Factory Acts. Edited by Mrs. SIDNEY WEBB. *London, Richard, 1901.*

We thus find, on comparing men and women workers, that a real difference does exist between the two classes, a difference which covers, not the whole indeed, but the greater part of the industrial field. This difference consists primarily in the fact that while men are permanent, women are temporary industrial workers. From this primary difference arise secondary differences of need and desire, leading to inferior training and inferior skill on the part of the women, and to a consequent differentiation of work. . . .

But, it may be objected, that although Factory Legislation would improve the women, it annoys the employer, and makes him inclined to get rid of women altogether and employ men. As a matter of fact, this course, though often threatened beforehand, is not in practice followed. Where women can be employed, their labour is so much cheaper than that of men that there is no chance of their being displaced. The work of men and women tending automatically to differentiate itself into separate branches, it follows that there is very little direct competition between individual men and women. (Page 209.)

The introduction into any trade of machines which can be successfully worked after a short period of training, and which demand neither very much physical strength nor very much mechanical knowledge, will, for instance, be pretty certain to promote the employment of women. On the other hand, the introduction of large, heavy and intricate machinery will, as certainly, be favorable to the employment of men. Pages 208–212.

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Journal of the Royal Statistical Society. Vol. LXV. 1902. Factory Legislation considered with Reference to the Wages, etc. of the Operatives Protected Thereby. GEORGE HENRY WOOD. *London, The Royal Statistical Society, 1902.*

An important aspect of factory legislation is its effects on the numbers of protected and unprotected workers employed. If the regulations are irksome and hamper industry, changes might be expected in the direction of employing unprotected male adults in the place of protected women, young persons, and children.

There are, however, two important reasons why this may not have taken place. First, the protected workers are usually employed in routine process, where the employment of an adult male would not bring about a sufficient increase in the amount produced to pay that worker a reasonable wage. Second, the regulations of the trade unions which the male worker might join would probably become as stringent in relation to hours of labour as the Factory Acts, and as the hours now allowed by the Acts are above rather than below the average working week in industries where men are chiefly employed, it is reasonable to suppose that trade union action would reduce the hours in textile and other factories also, and the employer would not be the gainer in the hours which his machinery might run. (Page 309.)

. . . The percentage of children employed diminished after 1835 until the "sixties," when the expansion in the textile trades brought about a marked change. The increase continued for only a few years, and though the small proportion of 1850 has not yet been reached, a considerable decline has taken place. Males between thirteen and eighteen years have declined almost consistently, their places apparently being taken by females over thirteen years. This is only the substitution of one class of protected workers for another, and cannot be due to any movement to evade the Factory Regulations. It may be and probably is, due to the increased efficiency of the labour of female young persons and women, and in so far as this increased efficiency may be ascribed to Factory Acts, it is in the nature of an indirect effect. Women's labour was not regulated until 1844, so any change in the relative employment of men and women before that date is not traceable to the Acts, and since then the percentage of men employed has varied little. On the whole there seems no evidence of a movement in favour of the substitution of unprotected for protected workers, and the chief result of the changes has been a substitution of the protected adult and young person for the similarly protected child. In

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the interests of coming generations, this seems a most satisfactory and desirable direction in which to move. (Page 311.)

Report of the 72nd Meeting of the British Association for the Advancement of Science. 1902. London, Murray, 1903. Women's Labor. Second Report of the Committee . . . appointed to investigate the Economic Effect of the Legislation Regulating Women's Labor.

Of all the factors which decide whether women or men shall be employed on a particular machine, it appears to me that the restrictive laws are the least important, the relative expense of the labor of the two sexes, the suitability of the work, local custom, the demand for labor in other industries, all have great influence; but the cases where men are preferred to women, because of the 56½ hours law are far to seek. (Page 292.)

Report of the 73rd Meeting of the British Association for the Advancement of Science. 1903. London, Murray, 1904. Women's Labour. Third Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labour.

It is suggested that women are prevented from taking positions of responsibility, and from taking advantages of the possibilities of new skilled occupations, by their restriction from working extra hours at times of pressure; but no specific cases are given, and considering that it is rare that work is carried on more than 60 hours a week, or that women can work efficiently for longer hours, any effect in this direction must be very small. (Pages 336–337.)

History of Factory Legislation. B. L. Hutchins *and* Amy Harrison. *Westminster, King, 1903.*

It is surely extremely significant that whilst the attack on the regulation of women's labor has been fruitless in better organized industries—that is, in those which can make their wishes felt—it has taken effect precisely in those industries which are unorganized and collectively inarticulate. By the admission of the opposition itself, the women whose trades have been under State control for thirty, forty, or fifty years are now so strong, so efficient, so well organized that even those who most strongly disapprove of State control do not wish to withdraw it from them. Yet we are to believe that to those who are still working long hours, in unsanitary conditions, State control would mean lowered wages, perhaps ruin. (Page 193.)

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Le Travail de Nuit dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Nightwork of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Le Travail de Nuit des Femmes dans l'Industrie Anglaise.* [*Nightwork of Women in English Industry.*] GEO. H. WOOD, F. S. S. *Jena, Fischer, 1903.*

The restrictions imposed on the employment of women, girls and children have not resulted in any displacement of female labor by male labor, except in the branches of the lead industry in which the employment of women is absolutely prohibited. Considering the entire textile industry the proportion of women employed has remained comparatively stable during the last sixty years, and the successive raising of the age at which children may be employed in factories has been the means of increasing the proportion of adults employed in these trades in the place of young women and children. In other trades the regulations of the hours of work for women has not resulted in impeding the employment of women, nor in increasing the proportion of women doing work at home, nor even in diminishing the number of women working in mills. (Page 244.)

The Economic Journal. Vol. XIV. 1904. The Employment of Women in Paper Mills. B. L. HUTCHINS.

The question may be asked, "Has the regulation of women's hours caused any restriction of women's employment?" . . . No evidence is forthcoming to show that women have been dismissed or set aside owing to the regulations of the Act; no employer and only one foreman thought the regulations had any such tendency. . . . The prohibition of overtime is sometimes considered an inconvenience; but not one of a nature to cause displacement of women. (Pages 239–240.)

To sum up it would seem at first sight that women are especially handicapped in paper-making owing to the fact that night work is considered essential, is prohibited to women, and is permitted under certain conditions to the most formidable competitors of women, viz., male young persons. Nevertheless, the demand for women workers seems to be steadily increasing, and no displacement can be shown except that which has been brought about by the process and development of the industry on its mechanical side. The hours worked by the majority of women are about 25 per cent shorter than the legal maximum, and this arrangement is mainly due to conditions inherent in the industry itself, the main features and characteristics of which have been little affected by the provisions of

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the Factory Act. As regards the minority, certain grave abuses have been checked, night work and overtime have been abandoned, and there is no evidence that the employment of women has been thereby hindered. Wages have risen though hours are shorter. . . . The demand for women's labour is greatest and their earnings are said to show most of the upward tendency, in the lighter, cleaner, and more dexterous employments. In these better skilled branches, where healthy conditions are necessary to maintain efficiency, the regulations of the Act, so far as they enforce those conditions, do not hinder but promote the employment of women, and tend indirectly to divert their labour into those channels where it is least at a discount and most in demand. (Pages 247–248.)

Women's Work and Wages. EDWARD CADBURY, CÉCILE MATHESON, *and* GEORGE SHANN, M.A. *London, Unwin, 1906.*

It is often stated by those who oppose regulation of women's work by legislation that the effect of such legislation is to displace women in favour of men. Our inquiry seems to prove, however, that this idea is erroneous, and that in the large majority of cases . . . it is other questions altogether that determine the division of labour between men and women. A great deal of light has been thrown on the question of women's work and wages generally by the elucidation of the fact that as a rule men and women do different work, and the relation between men and women workers is, on the whole, that of two non-competing groups. It is quite true that that marginal division between the two groups is constantly shifting, but in the particular trades where this is the case the questions considered are the difference in wages between the two groups, their aptitude and physical fitness for certain work, and the fact that women expect to leave work when married. (Page 39.)

BELGIUM

Royaume de Belgique. Rapport présenté à M. le Ministre de l'Industrie et du Travail. [*Report made to the Belgian Minister of Commerce and Labor.*] *Travail de Nuit des Ouvrières de l'Industrie dans les Pays Étrangers.* [*Night Work of Women in Industry in Foreign Countries.*] MAURICE ANSIAUX. *Brussels, 1898.*

With reference to the French law of 1892:

It has been often stated to me that the general effect of the law was a diminution of employment of women, a diminution which otherwise would not have been noticeable.

Nevertheless on the whole the number of adult women and young women of ages 18 to 21, employed in industry,—that is to say the number

of female workers subject for the first time in 1892 to legal regulation— has increased both absolutely and relatively. That at least is what appears to result from a comparison of the years 1893 to 1895. In 1893 the number of female workers of more than 18 years was 338,486; the year following it was 412,400; in 1895 it was 445,712; the increase was respectively 78,914 and 33,312; these figures are surely considerable. In 1894 the female labor force of all ages represented 32.8 per cent of all French workers; in 1895 this proportion reached 33.6 per cent. These facts would seem to contradict the assertion reproduced above. (Pages 34–35.) BELGIUM

The fact is, far from decreasing, the number of women working in regulated establishments (in Germany) has continually increased since the enactment of the law of 1891, and a very marked ratio, as the following table shows.

Years	*Total No. of Women Workers of 21 years and over in all Industries*	*Total No. of Women Workers of More than 16 Years in all Industries*	*Textiles*	Women More than 21 in		
				Paper and Leather	*Food Preparations*	*Clothing*
1892	346,795	576,433	170,002	21,321	49,055	24,855
1893	367,411	616,620	186,225	22,233	53,091	27,573
1894	383,094	633,783	192,439	23,462	55,968	28,830
1895	403,813	664,116	202,644	24,533	59,501	29,548

M. Morgenstern, chief of inspection of the kingdom of Saxony, has communicated to me an interesting set of statistics comprising the years 1890 to 1896 inclusive, thus embracing a period of time more extensive than the general table above and therefore meriting reproduction here.

It follows that from 1890 to 1896, the total number of persons occupied in industry in Saxony increased 87,144, of whom 32,373 were adult women. (Pages 234–236.)

Years	*Number of Adult Women*	*Total of all Workers*
1890	105,492	369,258
1891	107,756	371,541
1892	110,222	364,636
1893	120,212	394,426
1894	123,309	404,010
1895	128,375	420,499
1896	137,865	456,402

GERMANY

Schriften der Gesellschaft für Soziale Reform, Heft 7–8. [*Publications of the Social Reform Society, Nos. 7–8.*] *Die Herabsetzung der Arbeitszeit für Frauen und die Erhöhung des Schutzalters für Jugendliche Arbeiter in Fabriken.* [*The Reduction of Women's Working Hours and the Raising of the Legal Working Age for Young Factory Employees.*] Dr. AUGUST PIEPER *and* HÉLÈNE SIMON. *Jena, Fischer, 1903.*

The reports of factory inspectors for 1894 showed that as a result of the establishment of a maximum day women had only been dismissed in those industries where they had been on night work, now forbidden for women. Moreover, in many factories which had previously made extensive practice of overtime, additional women workers were taken on. (Page 75.)

UNITED STATES

Bulletin of the United States Bureau of Labor. No. 80. January, 1909. Women and Child Wage-Earners in Great Britain. VICTOR S. CLARK, Ph.D.

When the early factory laws of Great Britain went into force women workers opposed provisions in the factory acts limiting their hours of work for fear that such limitation would lead to the displacement of women by men. Women had been substituted for children in textile mills when the hours of the latter were first limited, and it was perhaps natural that the women should fear being in turn supplanted. But while the factory law has doubtless caused some redistribution of employment among workers of different age and sex it has not upon the whole lessened the demand for female labor.

It is true that there has been a decrease in the proportion of the female population working in industrial occupations since the factory acts first went into force, but there has been an increase precisely in those occupations where those acts might have been expected to have most influence. The following table gives the number of female employees in every thousand workers in several of the more important industries where the hours of labor have been restricted by factory legislation, by 10-year periods, from 1861 to 1901.

NUMBER OF FEMALES IN EVERY 1000 EMPLOYEES, BY INDUSTRIES, 1861 TO 1901

Industry	*1861*	*1871*	*1881*	*1891*	*1901*
Bookbinding	450	488	527	554	603
Boots and shoes	154	115	160	185	210
Cotton manufactures	567	598	620	609	628
Pottery and porcelain	311	354	384	385	392
Tailoring	208	254	330	427	471
Tobacco manufactures	221	296	435	548	601
Woolen and worsted manufactures	461	513	561	557	582

UNITED STATES

The influence of the factory law in discouraging child employment has been re-enforced by the growing complexity of industry, which places a greater premium upon mature and intelligent workers. (Page 67.)

There is a prevalent opinion in England that the proportion of women is increasing in the industries. Commenting upon this, the chief lady statistician of the Board of Trade says that this is due to the entry into the labor market of middle-class women, who engage in new occupations, and to the substitution of skilled workers employed full time for a larger number of unskilled workers intermittently employed. (Page 67.)

E. *Effect on Women's Wages*

Wherever the legal regulation of women's working hours has been long enough established to show any effect on their wages, statistical evidence tends to show that wages are not decreased but increased by the limitation of hours. In some cases there may be temporary decrease for a short time, before industry adjusts itself to a change in hours, but after a short period the gain in the workers' efficiency from shorter hours and their consequent increase in output completely balances the curtailment of their working time. Women's wages are universally higher in the industries subject to legal limitation of hours, than they are in the unprotected trades.

Moreover, even when regulation has resulted in a slight temporary decrease in wages, the majority of workers have willingly suffered the slight reduction, in order to gain the increased health and leisure consequent upon shorter hours of labor.

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British Sessional Papers. Vol. XXII. 1849. Reports of Inspectors of Factories for Half-year ending 30th April, 1849.

Referring more particularly to the Cotton district, it may be premised that, shortly before the passing of the Ten Hours Act, a general reduction in the rate of wages, to the extent of 10 per cent, was adopted by the masters, and submitted to by the work people; but this did not produce, even at that critical moment, any remonstrances on the part of the work people against the law, which was then impending over them, for further limiting

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their hours of work, whence it may be inferred that they had calculated not only what would be its effects upon their earnings *in the factories*, but also how it would affect their condition *in other particulars*. . . .

From the inquiries which I have made, I find it indeed, to be generally represented that, notwithstanding this reduction in the rate of wages and the abridgment of the hours of work, the Ten Hours Act has not effected any diminution in the earnings of the work people which is not practically counterbalanced by some equivalent advantages which they gain from the shortening of the working day. In the first place, it would seem that the diminution in the amount of net wages, actually received in cash at the end of the week or fortnight, is by no means proportioned to the reduction in the number of the hours of labour; for it is stated that the "two last" hours of the 12 were not those in which the greatest energy, activity, and vigilance were available; that, by shortening the day, the hands are now enabled, in 10 hours, to do more work, and to it better, than they could in the first 10 hours of a longer working day; that by improvements in the construction as well as by accelerating the speed of the machinery, a greater amount of work is turned off in the same time than before, that, in fact, they get through their work with more hearty good-will, with greater care and attention, and in better spirits, and that, by turning their work better out of hand, their earnings are not diminished by so many abatements, stoppages, and fines for negligence and for bad or damaged work, as used to curtail their receipts under the system of longer hours. . . .

Furthermore, it is stated, that any diminution in the amount of wages earned at the factory, is fully compensated by what is gained in other wages; thus the females are now enabled to attend to various household duties, which must be discharged by some one, and for which, under the system of long hours at the factory, they had been obliged to pay for the services of a hireling, that the money formerly spent in this way is now saved by the leisure afforded to the females of a family, under the 10 hours' system, which enables them to perform their own duties themselves; and that it is this saving of expenditure *at home*, which in great measure enables them to withstand a diminished rate of wages, accompanied by shorter hours of work. (Pages 19–20.)

Ibid. Appendix. Evidence of the Opinions of Persons Employed in Factories, Respecting the Ten Hours Act, Collected in September, October, and November, 1848.

Cotton Mill A. No. 2, Manager, and No. 3, Bookkeeper, spoken together: . . . added, that the spinners are making nearly as much (in 10

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hours) as they did when working 12 hours, partly by a little increased speed, partly by some improvements in the machinery, but chiefly by greater attention and economy of time; that by shortening the hours they are able to keep up their exertions. (Page 27.)

Nos. 29, 30, 31, 32. Adult males. Mule spinners. All said they would much rather work 10 hours with less wages than go back to 12 with higher. "No one who has felt the good of the 10 hours would willingly go back to 12." They said that they have better appetites and better health. (Page 28.)

Cotton Mill F. No. 16. Manager. . . . Many of the hands in this mill make nearly as much as they used to do; there has been no alteration in the speed of the machinery, "but they stick closer to their work." (Page 27.)

Nos. 75 and 76. Adult males. Weavers. Say, that there is not so much difference in the amount of work they can turn off, so that their wages have not been much less than when they worked 12 hours; they make it up by increased exertion, and they do not find themselves so much fatigued by thus working more closely as they were by the long day's work. (Page 29.)

Cotton Mill W. No. 89. Owner. Afterwards added since the 10 hour restriction began, they have paid the overlookers by piecework instead of fixed wages as formerly, and they are making nearly as much in the 10 as they did in 12. That by their greater vigilance in looking after the workers the produce has been increased. (Page 30.)

Cotton Mill E. No. 14. Mill-owner. Extract from letter to Mr. Horner, dated 18th October, 1848:

. . . My weavers do not suffer in their wages to the extent of reduction in the working hours. I pay more money now than I formerly did in proportion to the time worked. I account for this by unusual exertion on the part of the work people, coupled with greater strength for the work, from having more time to recruit themselves. (Page 37.)

No. 143. Overlooker of the card room. . . . He was not averse to the reduction either in time or wages, and remarked that "towards the close of the 12 hours' day, he could not do his duty satisfactorily, as the hands were too much jaded to attend to their work, and many of them fast asleep." He added, "that there is not half the number off sick since the 10 hours have been worked, that the hands work more cheerfully, and that there is less trouble in keeping them up to it." He had never heard one express a wish to return to longer hours. For his own part, he declared, that although he now has less money to spend, there is much greater happiness in his family. (Page 72.)

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No. 218. Adult female. Reeler: She much prefers the 10 hours, although she receives less wages, and says, "What is the use of getting more money if I have no appetite or other means of enjoying it?" After working 12 hours she was so tired and weak at the close of the day that she could never do anything at home. (Page 76.)

No. 219. Adult female. Winder: Said that she was always sick when working 12 hours a day, but now that she is less in the factory her health is quite recruited. She would rather work the present hours, however small the wages. (Page 76.)

British Sessional Papers. Vol. XXXIV. 1860. Reports of Inspectors of Factories for half-year ending 31st Oct., 1859.

Two other arguments formerly in great repute with the opponents of any Factory Bill these Acts have entirely refuted; the one the certain reduction of wages concurrent with the reduction of the working hours; the other, the "pro-rata" limit which the same reduction of hours would place upon the textile production of the country to the disparagement of our commerce. In no branch of textile labor are wages reduced since 1833, but there is an average increase of 12 per cent and in one instance of 40 per cent. I do not mean to say that whole branches of manual labor have not ceased, nor to deny that machinery has replaced it here and there, but if it has other branches of industry have supervened. (Page 53.)

British Sessional Papers. Vols. XXIX and XXX. 1876. Factories and Workshops Acts Commission.

Vol. XXX. Minutes of Evidence:

5310. If you reduce the hours that women may work by 5 per cent, 21 women will be required to do the work that 20 women do now, there will be a greater demand for women's labour and women's wages ought to go up 5 per cent in value so that so long as the restrictions are not excessive it seems to me that they will benefit the women pecuniarily. (Page 267.)

British Sessional Papers. Vol. XXXIX. Part I. 1893. Royal Commission on Labour. Minutes of Evidence.

Mr. Henry Meyers Hyndman:

8411. The trades which are best paid to-day are precisely those that

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work the shortest hours, and as was got out by one member of the commission on inquiry of Mr. Giffen, it appeared that during the last 20 years, although undoubtedly the hours have been consistently reduced, especially in the higher skilled trades, such as the engineers and so forth, the amount of wages which have been paid has increased. (Page 595.)

A Few Words on the Ten Hours Factory Question. EDMUND R. LARKIN, M.A. *London, Richardson, 1846.*

It is consolatory and encouraging to find that so far as experience can be a guide to us in determining this important question, it goes to prove that the diminution of profits and wages would not be so great under a system of shortened time, as to deter us from making trial of this great social experiment. . . . The trial has been made, not indeed of reduction to Ten, but to Eleven hours of work; and the result has been not merely so slight a diminution of produce as to justify a further experiment, but no diminution whatever thereof, nor, consequently, of the wages of the producers. (Pages 21–22.)

Labour Laws for Women. Their Reason and their Results. London, Independent Labour Party, 1900.

Then as to the lowering of wages, though women's wages are deplorably low now, as a whole they have risen since the time of the first Factory Acts. Again, it is impossible to prove definitely either that they would have been higher or lower without regulation, but it is a very important and significant fact that if we want to instance the most horribly low pay, we have to go to the home industries, where the hours are absolutely unlimited. . . . While for the highest wages, and the wages which have steadily increased for the past fifty years, we go to the highly regulated textile factories, and the most skilled branches of such work as bookbinding which is also subject to regulations. But the argument that it is the special legal restrictions on women's labour which keep down their wages, is completely settled by the fact that where men and women work under practically the same conditions which are not differently affected by the law, the women's wages are lower than the men's. (Page 15.)

In fact the absence of limitation of hours is the very thing which the greedy or careless employer uses to screw more work out of his workers for the same pay, or to let his work be so disorganized that the women waste hours doing nothing, and then make up by overtime. This kind of over-driving most effectually lowers wages, for it exhausts the workers,

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and renders them unfit for their work, and they either do it badly and have to accept less pay, or become ill, and so lose employment. (Page 16.)

The primary evils of women's work, as we have tried to point out, lie in its casual and unsettled nature, and regulation tends to steady it, and so to make it more effective. . . . Though the limiting of hours . . . may not seem directly to raise her wages, it does so indirectly, because a rise in the standard of employment at one point really raises it all round; and it is not an accident but direct cause and effect that such regulations and good wages go together and *vice versa*. (Pages 20–22.)

Journal of the Royal Statistical Society. Vol. LXV. 1902. Factory Legislation considered with reference to the Wages, etc., of the Operatives protected thereby. GEORGE HENRY WOOD.

In summing up the impressions gathered from the foregoing review, we find that in one or two cases the limitation of hours of labour by Factory Acts has, for the time being, reduced wages, especially of time workers, but that as soon as the industry affected has become settled under the new conditions, wages have risen to a higher point than previous to the passing of the Act, and that this has been ascribed by competent observers to the increased efficiency of the operative and the increased intensity of the work. (Pages 305–306.)

During the era of Factory Legislation, that is, since the "Ten Hours" Act, and its extension, in a more or less modified form, to other industries than textiles, women's wages have risen by about 66 per cent, while the average increase for the United Kingdom is about 45 per cent. . . . But the chief point to be noticed is that factory legislation has not lowered wages, but has been accompanied by a decided and progressive increase. How far this legislation has *caused* this increase I am not prepared to say, but in so much as by reducing hours of labour, raising the minimum age of entrance to the factory and so insuring a certain amount of education, improving the sanitary and other accommodations of the worker, and regulating dangerous trades it has increased the standard of efficiency and encouraged a higher standard of living; it seems to have been a factor making for the increase. (Pages 308–309.)

We may now shortly summarize in a few words what we have seen. It is not certain that there is always a direct connection between Factory Legislation and women's wages, but as a rule the effect of each limitation of the hours of labour has been to raise wages, though for a while they may have fallen a little. This usually operates through an increase in the efficiency of labour, which maintains or increases the former output

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in the lessened hours. While such an increased efficiency is maintained, the expenses of production are not increased, and no damage is done to foreign trade in the product of the industry affected. . . . All these effects have been for the general good,—women have shared in the progress of the past sixty years, and their wages have risen with men's but at a faster rate and more consistently. (Page 313.)

Report of the 72nd Meeting of the British Association for the Advancement of Science. 1902. London, Murray, 1903. Women's Labour. Second Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labour.

. . . To the third question (whether legislation restricting women's labour has raised or lowered wages) the answer (from the employers) was in almost every instance that wages had not been affected. Many were agreed that the legislation on the whole had improved health, and consequently efficiency. (Page 290.)

Report of the 73rd Meeting of the British Association for the Advancement of Science. 1903. London, Murray, 1904. Women's Labour. Third Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labour.

The experience of a merino factory in Nottinghamshire is very interesting: "The reduction of hours in 1875 did not reduce wages. The men and girls at first asked for a rise of piece prices as compensation for an anticipated loss. The employer promised to consider it in a while, if the loss actually took place and became permanent. In 4 weeks it was found, however, that earnings were equal in 56½ hours to what they had been in the previous 60-hour week. To the employer there was, in the winter, an actual gain, as the same work being done in 3½ hours less, and the hours not worked being taken off the evening when artificial light was needed, less gas was burnt. The same firm reduced to 55½ hours voluntarily in 1900, and again no loss was occasioned to the operatives." (Page 338.)

Women's Wages in England in the Nineteenth Century. Women's Industrial Council, London, 1906.

The calculations made by Mr. G. H. Wood, F.S.S., demonstrate the important fact of a steady rise in women's wages in those industries for which we have reliable information. It is significant that those industries

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are precisely those which have been most peculiarly influenced by the Factory Act. It was formerly in cotton that the hours were longest, the toil most strenuous, and the conditions most entirely subject to unrestricted competition; it was cotton that was first put under State control, it was the textile industry that was so seriously threatened by legal regulations that over and over again social reformers were accused of driving trade from the country. Yet in textiles and most especially in cotton the improvement in women's wages has been extremely marked. Without wishing to claim that the rise in wages has been due to the operation of the Factory Act, for it is no doubt due to many complex causes, we may point out that wages have certainly not been reduced under the Act, except quite temporarily here and there. In recent years, however, the line of opposition to factory regulation has taken up the wages argument on different lines.

It is more usual now to throw up the attack altogether as regards highly organized industries like cotton, and to say that legal regulation does no harm, has even been a success, in highly organized textile industries, where women are strong enough to bear it, but that in the non-textile, less fully developed industries, unless women may work at night, and overtime, and so on, they are at a great disadvantage, and will either be superseded by men or lose in wages. But I do not think there is any sign of women being superseded by men in non-textile industries, for the last census shows a larger increase in non-textile than in textile trades; and as to wages, surely the opponents of Factory Legislation cannot be allowed to use their arguments backwards and forwards as they choose. They used to say, you must not legislate for cotton, the workers are so poor they will starve; yet now that cotton has been regulated and the women, so far from starving, get higher wages than they used, the cry is that the cotton trade is so strong and the women so well paid, even the Factory Act cannot pull down their wages, it is on the other industries it falls so heavily. But it is rather significant that the longest regulated and most strictly regulated industry is the very one that shows so great a rate of improvement, and we need not be afraid that the status of laundry women, or even of home workers, will be injured by stricter regulation or stricter administration of the existing law; perhaps, on the contrary, their wages also will rise. (Pages 3–4.)

. . . As Mr. Wood's table shows, increasing strictness of administration has not hindered a considerable rise in wages. It is not certain that there is a direct connection between factory control and women's wages, but as a rule the sequel of each limitation of hours has been a rise of wages, though for a while there may have been a slight fall. The rise is partly

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due to progressive restrictions on child labour, which have increased the demand for women's labour, and partly to an increase in the efficiency of labour, which maintains or increases the former output in the shortened time. There are certain manufacturing industries where the masters voluntarily work 9 hours or even 8 instead of 10, because they find they can get better work done. In these cases the reduction is not directly due to the Factory Act but to considerations of economic efficiency. (Pages 5–6.)

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Report of the Massachusetts Bureau of Statistics of Labor. 1871.

I have worked what is called ten hours a day, and the ten-hour system always has a good influence on the work-people. We don't lose one-eleventh of the pay—everybody knows that. I didn't lose a single cent, because I didn't get so much exhausted. (Page 498.)

To prove the soundness of the ten-hour claim, the operatives instance the reduction in the past, from sixteen to fourteen, to thirteen and to twelve, and from twelve to eleven hours. They also point to the twenty-one years' experience in Great Britain, where the reduction was made in 1850 from twelve to ten, a reduction of one-sixth of the working day. (Pages 557–558.)

Report of the Massachusetts Bureau of Statistics of Labor. 1881.

It is apparent . . . that wages here rule as high if not higher than in the States where the mills run longer time (i. e., than ten hours a day). (Page 457.)

Still another case is that of a carpet mill employing about seventeen hundred persons. Twenty-five years ago the hours were reduced directly from twelve to ten. . . . The establishment has been run by the same management from then till now, without a break and with great success; and yet the average pay in it is higher than in any other mill, with possibly one or two exceptions, which we found. (Page 460.)

The Willimantic Linen Company of Connecticut ran its mills eleven hours per day till about two years ago, when it was determined as an experiment to run ten hours. . . . Wages have remained intact so far as the hours of labor are concerned. (Page 461.)

. . . It was quite generally conceded (by manufacturers) that even if, at first, there was a reduction of wages, yet by a year's time (only one person said more) the market would have readjusted itself, and the wages for ten hours would have become the same as they were before

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for eleven. A half-owner of six mills stated the case thus: "If all the mills would run but ten hours, there would be a diminution in the product of perhaps five per cent. That slight diminution would after a while so empty the market that prices would rise much more than five per cent, and so we could pay the same prices for ten as now for eleven hours' work, and then make more money than we are now making." And the principle involved in this statement was very generally conceded by manufacturers. . . . That is, a large portion of the manufacturers have come to see, what is undoubtedly true, that the width of the margin between cost and price, and so the possible amount of wages which can be paid, are not so much determined by the volume of the product alone, as by the relation between the amount produced and the amount consumed. (Pages 462–463.)

Within a year's time the market would adjust itself entirely to the shorter day, the operatives would have as good a living with ten, as now with eleven, eleven and a half, and twelve hours. (Page 464.)

Report of the New Jersey Bureau of Statistics of Labor and Industry. 1886.

The Factory Acts were believed to be the death-blow to English manufactures, and they have made labor more efficient, more intelligent, more decent, and more continuous without trenching on profits. (Page 231, footnote.)

In 1851 and 1852 those who advocated that ten hours should be a legal day's work were denounced as demagogues, and the ten-hour plan as a humbug which could only tend to reduce the wages proportionately, while all kinds of evil results were sure to follow its application, especially to agricultural labor. But we have seen ten hours become the rule; wages have not fallen, and many of those who prophesied disaster are now as loud in their praises of its beneficence as the friends of the change. (Page 232.)

Report of the New York Factory Inspectors. 1894.

This material reduction (from 10 to 15 per cent in many industries) in the working time was not accompanied by any reduction in the pay of those interested. (Pages 31–32.)

Report of New York Bureau of Labor Statistics. 1900.

In all those departments of the factory in which wages are paid by piece-work—and these constitute probably not less than four-fifths of

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the whole, the proportion to fixed daily wages being daily on the increase —it has been found that the quantity produced in ten and one-half hours falls little short of that formerly obtained from twelve hours. In some cases it is said to be equal. This is accounted for partly by the increased stimulus given to ingenuity to make the machines more perfect and capable of increased speed, but it arises far more from the workpeople by improved health, by absence of that weariness and exhaustion which the long hours occasioned, and by their increased cheerfulness and activity, being enabled to work more steadily and diligently and to economize time, intervals of rest while at their work being now less necessary. (Pages 49–50.)

Bulletin of the United States Bureau of Labor, No. 80. January, 1909. Woman and Child Wage-Earners in Great Britain. VICTOR S. CLARK, Ph.D.

It is no longer argued by people familiar with industrial history that shorter hours necessarily mean lower wages. But this argument was used extensively when the earlier British acts were passed. Here again, as in case of the shortening of hours, it is difficult to separate the effect of state regulation from the effect of other causes, but the upward tendency of the wages of women and children during the past century is a matter of statistical verification. The following table gives the most authoritative statement of the increase of the wages of women since 1820. The table shows the average relative wages of all women wage-earners, by decades, as stated in percentages of the average wage during the ten years ending with 1900. To show that there was more than a normal increase in women's wages, as compared with the wages of unregulated men's labor, the relative wages of workers of both sexes combined, using the decade ending with 1900 as the base, is given in a parallel column.

RELATIVE WAGES IN THE UNITED KINGDOM, 1820 TO 1900

Decade Ending	*Relative Women Employees*	*Wages of Employees of Both Sexes*
1830	58	65
1840	56	60
1850	58	60
1860	62	65
1870	75	75
1880	93	95
1890	95	90
1900	100	100

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Between 1830 and 1850 women's wages may have declined less than those of men because they were already near the subsistence level. An English authority, to whom these statistics are due, says: "Factory legislation has not lowered wages, but has been accompanied by a decided and progressive increase." It is not to be understood that factory laws are given as the cause of this increase, but they may have contributed to it by improving the efficiency of workers.

The wages of women in industries regulated by the factory acts are generally better than those in unregulated industries. Among the best-paid women factory workers of England are the cotton operatives of Lancashire. This condition, however, is probably less an effect of the law than of the fact that the law happens to apply to a better grade of workers. (Pages 53–54.)

Trades may be mentioned, like some kinds of decorating and polishing, where neither machinery nor labor unions have influenced conditions, in which wages have risen as working hours grew fewer. But workers in these trades were benefited by the rising standard of living of their fellow-workers in other industries, and their rate of compensation was affected by the competition for labor caused by high wages in other occupations.

The statistics available indicate that the enactment of the successive laws shortening the hours of labor did not, in the particular industries affected, interrupt the progressive improvement of wages that has marked the last century. (Page 55.)

The Arena. Vol. XXIV. 1900. New York, Alliance, 1900. The Eight-Hour Day by Legislation. EDWIN MAXEY, *Southern Normal University, Tenn.*

According to the best authorities wages are more likely to be raised than lowered, though it is possible they may remain stationary. . . . New York State witnessed, in 1887, 2,256 strikes for shorter hours, and in every one of the trades where a reduction of hours was obtained a positive increase in wages is also reported. In 1860, six years after the enactment of the ten-hour law in Massachusetts, as a result of an argument made before the legislative committee by Edward Atkinson, who had always been an active opponent of the law on the ground that its operation was injurious to the working man (as they had to work for one-eleventh less than similar laborers in other States), the legislators ordered the Labor Bureau to investigate the hours of labor and wages paid in Massachusetts, the other New England States, and New York. This was done, and the result was as follows:

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In Maine, average hours	66⅛	;	average wages per week,			$7.04
" New Hampshire	" 66½	;	"	"	"	7.44
" Connecticut	" 66¼	;	"	"	"	7.81
" Rhode Island	" 66	;	"	"	"	8.01
" New York	" 65¼	;	"	"	"	7.57
" Massachusetts	" 60	;	"	"	"	8.32

The result of this investigation—proving as it did that the average wage in Massachusetts was 65 cents more for 5½ hours less per week than the average in Maine, New Hampshire, Connecticut, Rhode Island, and New York—was far more eloquent than any words Mr. Atkinson could utter. (Pages 236–237.)

F. *Adaptation of Customers to Shorter Hours*

Experience shows how the demands of customers yield to the requirements of a fixed working day. When customers are obliged to place orders sufficiently in advance to enable them to be filled without necessitating overtime work, compliance with this habit becomes automatic.

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British Sessional Papers. Vol. XXIX–XXX. 1876. Factory and Workshops Acts Commission. Vol. XXIX. Report.

A very large number of the orders of customers, which it has been usual to keep back till the last minute, and then throw upon the already fully burdened workers, not merely can be quite as easily given so as to have plenty of time for their completion, but also will be so given, and are in fact so given, when and so often as the customer is made to recognize that he otherwise runs the risk of not having his orders completed in time to suit his own convenience. It is from their feeling that this is so that the workers in some of the most overworked of trades, and a few of the sub-inspectors, have represented to us that what is needed from a reform of the Factory Acts is not a further restriction of hours, but the total abolition of all modifications whatever. We so far concur in this that we believe it is not necessary to retain in all the Acts any provisions by way of relaxation which it is unadvisable to grant once and for all to the whole trade. We trust in time that the use of overtime in trades of this class may be restricted down to the vanishing point. (Pages xli–xlii.)

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British Sessional Papers. Vol. XXI. 1894. Report of Chief Inspector of Factories and Workshops.

Most of the employers with whom I have discussed the matter confirm my own impression that overtime working does not pay (that is, when the rate of wages is the same for overtime as for regular working hours), but that it is so important not to disappoint a customer that it has to be done. . . . I am sure there is nothing, beyond habit, in the nature of the trade to make overtime a necessity, and if women find out by 1 or 2 disappointments that a dress ordered, for instance, on Thursday, cannot be received finished on Saturday, they will soon find it possible to order it a little sooner. (Pages 15–16.)

British Sessional Papers. Vol. XI. 1900. Report of Chief Inspector of Factories and Workshops for the Year 1899.

I am glad to be able to report that it is exceptional, and increasingly so, to find employers and supervisors of labor who do not recognize that overtime is injurious both to employers and employed. They deplore, and I believe in general sincerely, the necessity when it arises. They point out that they have little power to alter the mode in which orders reach them. It is the habits of buyers which in most cases make overtime necessary.

There seems reason to hope nevertheless that the curtailment of overtime by the Factory Acts will indirectly put such pressure on the buyers that they will gradually alter their methods of purchase.

The Eight Hours Day. SIDNEY WEBB *and* HAROLD COX, B.A. *London, Walter Scott, 1891.*

We come now to the trades "where sudden press of orders arises from unforeseen events." Here our position is one of complete scepticism. The sudden press of orders arises only because overtime is permitted. If it were known beforehand that excessive hours of work were absolutely forbidden, then the general public and the shopkeepers would make their arrangements accordingly. If, for example, Jones knows that, owing to the operation of an Eight Hours' Act, a pair of trousers cannot possibly be made in less than three days he will take care to give three clear days' notice to his tailor. Or to take a still more homely illustration, the housewife who knows that she cannot buy bread on Sunday will take care to order a double supply on Saturday. In the same way, if the biscuit trade, the fancy box trade, and the artificial flower trade were subject to the

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same rigid law as the cotton trade, every one would soon accommodate himself or herself to the necessities of the case. Orders would be given longer in advance, and the work would be spread more equally over the whole year, to the great advantage of the workers.

In support of this contention we cannot do better than quote the opinion of Mr. Lakeman. This most energetic of factory inspectors has frequently stated, as the result of his long experience in watching almost every industry in the kingdom, that overtime is in most trades an utterly unnecessary evil. For a particular illustration we may further appeal to the opinion of the head of a large firm of tobacco manufacturers in Southwark. This gentleman informed one of the present writers in the course of conversation that he always refused to allow overtime. "Possibly," he said, "we lose a few orders in consequence, but we get a more regular and steady business, and we prefer it." Nor would even the few orders be lost if the rule applied to all competing firms. (Pages 161–163.)

The Women's Industrial News. London, March, 1901. Season Trades' Conference.

In regard to causes of irregularity, while some of these are evidently inherent and unavoidable, there appear to be others which might be removed. One of these is the practice—which unquestionably, to some extent, exists—of deliberately holding back the orders of customers until the busy period. There are reasons for which this practice comes cheaper to the employer, the chief of these being the very largely prevalent custom of not paying for overtime.

In regard to remedies . . . one Londoner suggested that the workers ought to combine to insist upon pay for overtime and to resist infringements of the Factory Act. Some evidence had come before the Committee which seemed to show that the restriction of hours by law had tended, by forcing customers to allow longer time for the fulfilment of their orders, and enabling employers to declare themselves unable to get work done in a hurry, to diminish overpressure. (Pages 220–221.)

History of Factory Legislation. B. L. HUTCHINS *and* AMY HARRISON. *Westminster, King, 1903.*

Tremenheere then took the opinion of certain of the merchants on this point, and found them much more favorable to the extension of the Factory Act. . . . A limitation of hours might, it was admitted, occasionally produce inconvenience, but this would by degrees adjust itself.

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Merchants would have to think of their orders a little beforehand. . . . One bleacher very candidly admitted that knowing the bleacher would undertake to bleach and finish one thousand pieces of cloth in five days he often, in cases of sudden orders, gave him only five days to do it in; but that, if the hours of the boys and women working were restricted so he would know the work could not be accomplished in that time, he should have to make his arrangements beforehand to give seven or ten days, or to send part of the order to another bleacher. It was pointed out that if a bleacher lost part of an order on one occasion it would be made up to him on another, and that very possibly the bleachers would enlarge their works and keep more hands ready. If legislation were alike for all, the outlay would do the trade no harm. Tremenheere arrived at the conclusion that a limitation of women's and boys' hours would cause the masters to enlarge their works and improve their machinery rather than chance losing an order. . . . In 1857 . . . the mere anticipation of some such measure had caused additions to be made both to buildings and machinery which would considerably augment the firms' power of getting speedily through an increased quantity. (Page 134.)

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Le Travail de Nuit dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *L'Interdiction du Travail de Nuit des Femmes dans l'Industrie française.* [*Prohibition of Night Work of Women in French Industry.*] M. P. PIC, *University of Lyon. Jena, Fischer, 1903.*

The question of evening overtime was made the subject of a thoroughgoing discussion in the general meeting of the French section (of the Association for Labor Legislation), and it was the conviction of the very large majority of those present that the suppression of evening overtime would not encounter insurmountable practical difficulties; that the prosperity of dressmaking and similar establishments would be in no degree compromised if all were subjected to an identical and invariable regulation permitting no exceptions, for the clientele would be compelled to moderate its demands and submit to a law socially important, before which individual caprice must give way. (Page 210.)

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Schriften der Gesellschaft für Soziale Reform, Heft 7–8. [*Publications of the Social Reform Society, Nos. 7–8.*] *Die Herabsetzung der Arbeitszeit für Frauen und die Erhöhung des Schutzalters für jugendliche*

Arbeiter in Fabriken. [*The Reduction of Women's Working Hours and the Raising of the Legal Working Age for Young Factory Employees.*] Dr. AUGUST PIEPER *and* HÉLÈNE SIMON. *Jena, Fischer, 1903.* GERMANY

In Germany . . . since 1893, there are employers who, after the enactment of legal restrictions upon overtime gave it up altogether and have given assurances that their businesses have remained prosperous. "Many employers (1894) put a stop to overtime, because it had absolutely no advantages." Moreover, the objections made to giving up overtime have been refuted by experience. Many of the German inspectors . . . have expressed their conviction that overtime in factories should be completely abolished and that industry would be able to adapt itself without detriment to such a regulation. (Page 119.)

V. UNIFORMITY OF RESTRICTION

A. *Allowance of Overtime Dangerous to Health*

All the dangers of long working hours to the health of workingwomen are increased, and the need of limiting such hours emphasized, by the system of overtime, when evening work is required after the regular day's work. The special dangers to health from overtime are:

(1) THE EXCESSIVE LENGTH OF HOURS

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British Sessional Papers. Vol. XXVIII. 1844. Reports of Inspectors of Factories. Quarterly Report for Period ending 30th September, 1843.

I am equally well satisfied that persons are employed as adults, for very long hours, physically unfit for the work they are called upon to do, and often unwillingly on their part. In this remark I refer principally to females who have just completed the age of 18. I have seen many such employed for 13, 14, or 15 hours a day. . . . Some of these were employed in a room at a high temperature. What constitution can stand against such labour? Its effects may not immediately be seen on all, but the evidence of every medical man I have consulted pronounces it must result in the most serious consequences to them in after-life. (Page 8.)

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British Sessional Papers. Vol. XVII. 1893. Report of Chief Inspector of Factories and Workshops.

Much of the good done by the Factory Act is undone by allowing delicate women and girls to work from 8 A. M. to 10 P. M. for 2 months of the year. (Page 92.)

British Sessional Papers. Vol. XVII. 1897. Report of Chief Inspector of Factories and Workshops for the Year 1896.

Of the terrible injury resulting from the excessive hours which it is now so extremely difficult to control effectively in the South one example may suffice. I visited one hand laundry in London where a packer and sorter had been driven into a hospital with sores on her legs from long standing. . . . The girl eventually left the hospital on crutches, and at that time I found her successor on a fair way to losing her health also. In this case it has been possible to lessen the hours and improve the conditions to a certain extent. (Page 68.)

British Sessional Papers. Vol. XI. 1900. Report of Chief Inspector of Factories and Workshops for the Year 1898.

Early in 1898 Miss Squire made a full enquiry into the circumstances of employment in millinery workrooms attached to retail shops in South Wales. . . . She reported that workers regarded service in the shop after a day in the workroom as most exhausting and "more than any one ought to be allowed to do." She received numerous complaints from young women who gave evidence of being at the present time employed on Saturdays habitually in shop and workshop from 8 A. M. till 11 P. M. and very frequently until midnight and 12.30 A. M. Other persons complained that their friends had been so employed, and in two cases the girls were said to have returned to their homes in distant villages with health shattered, their condition being attributed by the doctor to overwork. (Page 180.)

Complaint is constantly made to me by employees, their parents and friends, of the exhausting and injurious effect of work carried on in factories and workshops without intermission from the end of dinner time until evening, that is either from 1 till 6 or 2 to 7. There is of course in these cases no breach of the Factory Act; the law allows a five-hours spell without a break, and this is not exceeded; often, indeed, the period of employment in the day is one hour short of the legal limit, and yet this five hours continuous work is a strain which I am convinced does tell

seriously (especially where the work is done standing) upon the physical powers of girls and young women. Their energy begins to flag about the middle of the afternoon, and work drags on with ever decreasing speed and efficiency until 6 or 7 o'clock sets them free, outdoor things are put on, and the girls trudge home with half an hour's walk to the tea which they are too exhausted then to relish. In some factories the making and taking of a cup of tea during the five hours' spell of an afternoon is allowed while work goes on, and the brief change of attitude is appreciated no less than the refreshment, but where neatness and order are considered this picnic is naturally not permitted. That it is possible with good management to allow a break of fifteen minutes without interfering with work or discipline has been proved, and managers who have tried it have told me that the increased quantity and quality of the work done in the closing hours of the day have more than repaid the time expended in partaking of refreshment. (Page 181.)

British Sessional Papers. Vol. VI. 1901. Report from the Select Committee of the House of Lords on Early Closing of Shops.

Witness, Sir William S. Church, President of the Royal College of Physicians:

2309. . . . There is one form of ailment which is aggravated by work such as shop assistants have to do. Those come rather under the observation of surgeons and physicians who practice more especially in diseases of women. But there is another great group which fall under the observation of the ordinary physician, and of which we see a very great deal in our London hospitals, and that is anæmic condition, which is produced partly by long hours of work, and still more so by the confinement that this employment entails. They do not get sufficient opportunity for being in the fresh air and in the sunlight, and the evil is, of course, greatly aggravated by late hours at night. . . . (Page 108.)

2319. . . . The longer the hours the greater the detriment. (Page 109.)

British Sessional Papers. Vol. XII. 1903. Report of Chief Inspector of Factories and Workshops for 1902.

Great discontent still exists among the laundry hands at the long hours which are legal. Quite recently I visited a laundry at 9.30 P. M., and found three young persons just leaving work, having been at it from 8 A. M. with 1½ hours for meals, and there were a number of women left to go on

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for another hour. I know the weekly total of hours is the same for laundries as for ordinary factories, but it is the abnormally long working day that is most trying to the workers. (Page 29.)

British Sessional Papers. Vol. X. 1904. Report of the Chief Inspector of Factories and Workshops.

"A point of some importance which was mentioned to me by the medical attendant at one factory (cigar) was that the number of cases under treatment for sickness varied *pari passu* with the amount of overtime work," i. e. over ten hours in one day. (Page 286.)

British Sessional Papers. Vol. X. 1907. Report of Chief Inspector of Factories and Workshops. Appendix II. Report on Tobacco, Cigar and Cigarette Industry.

The question of the health of the workers has been the main object of our enquiry, and we have therefore given our attention chiefly to this point. It is impossible to consider the industry an unhealthy one. With the exception of one or two processes there has been little or no evidence to prove that the manufacture of tobacco is in itself injurious to health. . . . In six of the largest factories visited, a very complete system of preliminary medical examination was found to be carried out by the doctors specially appointed by the firms. . . . We have gained a great deal of information from these doctors, whose experience is almost unique. Our attention was drawn to a very interesting and important point by two of the doctors; their experience (which in one case has been tabulated) had led them to form the opinion that overtime has a very marked bearing on the normal health of the workers. They had noted an increase during and just after periods of overtime work of from one third to one half in the number of workers coming to them for treatment; the matters complained of were not anything special, but simply an increase in the usual form of ailment, such as indigestion, anæmia, heavy colds (in winter), gastric disorders in summer. When one considers that overtime here means simply employment up to the normal legal period, that is, ten and ten and a half hours a day, and does not mean overtime as permitted in a large number of industries (in the case of women over eighteen) and which extends to twelve hours in the day, the result is all the more striking, and one feels that a similar record in one of the industries in which overtime is allowed would produce more noticeable statistics of the results of overfatigue. The conclusion seems to us clear that eight and a half to nine

hours' work a day cannot be exceeded by women and girls without overstrain and fatigue resulting in a lower standard of health. (Pages 253–254.) GREAT BRITAIN

Report of the Royal Commission on a Dispute Respecting Hours of Employment. The Bell Telephone Company of Canada, Ltd., and Operators at Toronto, Ont. The Department of Labour. Ottawa, Canada, 1907. CANADA

Mr. Dunstan:

To the girl working a good deal of overtime it (the wage) was all right but the overtime was most objectionable from the standpoint of her health. (Pages 29–30.)

Documents Parlementaires. Chambre des Députés, 10e Juin, 1890. Annexe 649. [*Parliamentary Documents of the French Chamber of Deputies, June 10, 1890. Annex 649.*] *Rapport sur le travail des enfants, des filles mineures et des femmes dans les établissements industriels.* [*Report on the Labor of Children, Young Girls and Women in Industrial Establishments.*] Senator RICHARD WADDINGTON. FRANCE

In sewing rooms, florists, dressmaking establishments, etc., the evening hours are continually added on to the working day; the working girls are quite unable to foresee the occasions when late overtime will be required of them, and they dare not refuse to stay for fear of immediate dismissal. It is not necessary to insist upon the grave injury to health suffered by women whose working day is thus prolonged to fifteen, sixteen, even eighteen hours; it is self-evident, not to speak of the disorganization of family life which results from this compulsory employment of the daughter, the wife, or the mother. (Page 1087.)

Documents Parlementaires. Sénat, 22e Juin, 1891. Annexe 138. [*Parliamentary Documents of the French Senate, June 22, 1891. Annex 138.*] *Rapport fait sur le travail des enfants, des filles mineures, et des femmes dans les établissements industriels.* [*Report on the Labour of Children, Young Girls, and Women in Industrial Establishments.*] M. TOLAIN.

As to the evening overtime its special characteristic is, as the inspector of the department of the Seine pointed out, that it is imposed upon women who have already been working all day. It differs, therefore, from regular night work, in that it is carried on by workers who have already performed

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a day's full task, and not by a fresh set who have been able to arrange systematically for their regular night hours by taking at least some rest by day and by making arrangements for their expected night of work. It is, therefore, upon women already fatigued that this extra burden is laid by the prolongation of the day's labor and this overtime may be in all, sixteen and seventeen hours' continuous labor—sometimes even more. (Page 205.)

BELGIUM

Royaume de Belgique. Rapport présenté à M. le Ministre de l'Industrie et du Travail. [*Report to the Belgian Minister of Commerce and Labor.*] *Le Travail de Nuit des Ouvrières de l'Industrie dans les Pays Étrangers.* [*Night Work of Women in Industry in Foreign Countries.*] MAURICE ANSIAUX, *Brussels, 1898.*

Evening work is not prohibited in Austria in small establishments. It will be of very great interest to inquire into the use made of this liberty. But it is disheartening to find that the development attained by authorized evening work is very great.

It is especially at Vienna that abuses are very numerous, and sometimes very grave.

Here, as elsewhere, it is a matter of additional or overtime work succeeding and superimposed upon the normal activity of the working day and prolonged to a late hour of the night: to midnight, 1 or 2 o'clock, and even later in some cases.

M. von Klein recognized that the lot of working women subject to this overwork is very unhappy. (Page 178.)

According to an official inquiry made in March and April, 1896, "the abuse varied in gravity according to trades. It must be recognized that in the majority of cases (the 'inquiry extended to fifty-eight distinct trades') the evil was of wide extent. All the testimony given during the course of the inquiry had a monotonous and saddening similarity. Almost always, the evening work—during the season—continued until 1 or 2 o'clock in the morning. The next day it was necessary to be at work at an early hour, under penalty of a serious deduction from wages." (Pages 180–181.)

GERMANY

Le Travail de Nuit dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Interdiction du Travail de Nuit des*

Femmes en Allemagne. [*Prohibition of Night Work of Women in Germany.*] Dr. MAX HIRSCH. *Jena, Fischer, 1903.* GERMANY

Especially is the complaint made that the overtime and night work of women bring on abdominal troubles, jaundice, pulmonary affections developing into inflammation of the lungs, and weaknesses of the eyes; with reference to these latter effects it is stated that female workers in textile mills very soon have their sight affected. (Page 29.)

Report of the Minnesota Bureau of Labor, Industries and Commerce. 1907–1908. UNITED STATES

Repeatedly has there been brought to the attention of this office the common practice of women working overtime.

At first it would seem that this was a question that was entirely optional with the worker, but as a matter of fact when the machines are ready for operation the employee who is not at her post must forfeit her position and make way for some one who will be willing to work as occasion requires.

Physicians, nurses, anxious mothers and ailing girls have appealed, but until there is a law that positively forbids the employment of women more than a specified time such establishments as must run overtime to fill the "rush orders" will work at night. . . . The long period of standing on their feet, the shortened time for meals, all combine to militate strongly against, not only her own health, but the health of those who shall come after her.

This particularly applies when we realize that the work that is done by women in so many departments of industry is "piece" work, where the nervous strain is at its highest tension.

It is therefore urged that Minnesota follow the good example of her sister States and place a time limit upon the number of hours when a woman may be employed. (Pages 243–244.)

(2) Evening Work in Addition to Day Work

A second danger to the health of working women from overtime is the excessive exertion needed to keep up evening work after and in addition to the fatigue of the day's work.

GERMANY

Archiv für Unfallheilkunde, Gewerbehygiene und Gewerbekrankheiten. Bd. I. Über den Gesundheitsschutz der Gewerblichen Arbeiter. [*Protection of the Workingman's Health.*] Dr. SCHAEFER. *Stuttgart, Enke, 1896.*

. . . In many cases ordinary working hours are extended by the system of overtime.

The results are disturbances of nutrition, premature decrease of efficiency, increase in the numbers of accidents, lowering of organic resistance to sickness and dangers of occupation in general; last, but not least, arrested physical and mental development in the offspring of our working population. (Page 204.)

Das Verbot der Nachtarbeit. Bericht erstattet an dem internationalen Kongress für gesetzlichen Arbeiterschutz in Paris, 1900. (*Schmoller's Jahrbuch, 25*[3-4].) [*Prohibition of Night Work. Report presented to the International Congress for Labor Legislation at Paris, 1900.* (*Schmoller's Yearbook, 25*[3-4].)] Dr. MAX HIRSCH, *Germany. Leipzig, 1901.*

When estimating the danger to health, however, not only night work itself must be considered, but the entire working time within the 24 hours and in one week. Even a short working time at night after a long day, or even after a normal working day, must be regarded as harmful. Here the generally recognized evil of overtime complicates the question of night work. Prof. Dr. Erismann of Zurich rightly stigmatizes this recurring "overtime" lasting into the hours of the night as a cruel exploitation of the worker and as a lamentable evasion of factory laws. (Pages 1263–1264.)

AUSTRIA

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Le Travail de Nuit des Femmes dans l'Industrie en Autriche.* [*Night Work of Women in Industry in Austria.*] ILSE VON ARLT. *Jena, Fischer, 1903.*

What we have just said (regarding evils of night work) is equally applicable to establishments less important than factories, with this added circumstance, that the fatigue arising from the day's work is increased by late overtime, making the task still more arduous.

AUSTRIA

Here, after a day's work already too long, when, after 12 or 14 hours of toil, "night work" must be accomplished in addition, the body becomes incapable of enduring the more intensive demands which are unremittingly made upon it. This overtime is the most destructive form of night work, and it is found in all those establishments that are not classed as factories. (Page 82.)

UNITED STATES

Report of Ohio Inspector of Workshops and Factories. 1890.

. . . If there can be raised any objection to the employment of women in factories, etc., it certainly should be their employment for unreasonable hours, and especially after night. The employment of women in factories implies that the great majority are compelled to remain standing more or less of the time while engaged at their daily avocation. It is a well established fact that for a woman to remain standing for any length of time, and especially for such practice to extend from day to day, will eventually result to her physical detriment. So apparent has this fact been established that Ohio has already placed a law on her statute books compelling that all employers of women furnish comfortable seats for their use, but it is absolutely impossible for most factory employees to receive much relief from this law, being, through necessity caused from the nature of their work, compelled to remain standing a greater portion of the time; and when they have been so employed for a period of ten hours, is it not barbarous that they should be compelled to work still longer hours, and sometimes far into the night? This department has received many pathetic appeals for relief from women employed in factories, who, through fear of being discharged from their positions, have been compelled to work long and irregular hours. (Pages 37–38.)

(3) Injury from Gas and Bad Air

The air of workrooms in which evening work is carried on is usually bad, vitiated by the presence of workers during the whole day, and by gas required at night.

GREAT BRITAIN

British Sessional Papers. Vol. XV. 1831–32. Report from the Select Committee on the "Bill to Regulate the Labour of Children in the Mills and Factories of the United Kingdom."

Sir George Leman Tuthill, F.R.S., physician to the Westminster Hospital and Bethlem Hospital:

GREAT BRITAIN

11314. You have already given your opinion as to the labour pursued during the night being probably more prejudicial than that undergone in the daytime; do you conceive that the having to work by artificial lights during the night may also tend to render labour more insalubrious, and also prejudicial to the eyes, as the operatives now being to allege?—Working during the night involves the necessity of using artificial light; and artificial light contributes to render unfit for respiration the air of the factory in which the light is used. Where artificial light is used to any extent, there must be a considerable quantity of carbonic gas mixing with the air of the apartment, which is prejudicial to health. (Page 580.)

Joseph Henry Green, Esq., F.R.S., a surgeon of St. Thomas' Hospital and Professor of Surgery at King's College:

11392. What effect has the long continued burning of artificial lights upon the purity of the atmosphere?—It removes the oxygen, and renders it chemically unfit for respiration. (Page 588.)

Charles Aston Key, Esq., surgeon at Guy's Hospital:

11416. Would not the artificial lights by which the labour must be pursued have a prejudicial influence upon the health by destroying to a certain degree the salubrity of the atmosphere?—Undoubtedly they must tend to deteriorate the quantity of the air, and render it unfit for the purposes of respiration.

11417. Some of the operatives have alleged that the gas lights have a tendency to injure the sight when they have to labour by them for so long a period; do you consider that that might be a result produced by labour under those circumstances?—Yes; I conceive that that is a very natural consequence. (Page 591.)

James Guthrie, Esq., F. R. S., Vice-President of Royal College of Surgeons, surgeon to Westminster Hospital and to Westminster Eye Hospital:

11479. In addition to other effects it might be likely to produce, does not this labour, when pursued by night, and consequently by gas or other artificial lights, tend, as the operatives allege it does, to injure sight?—Yes. (Page 595.)

British Sessional Papers. Vol. XII. 1886. Reports from Select Committee on Shop Hours Regulation Bill.

Witness, A. Redgrave, Chief Inspector of Factories:

24. Is it not the case that, although many of the shops are very well ventilated, and there is no objection upon that score, there are a large number of shops in which the atmosphere is no better than that in a

GREAT BRITAIN

factory? . . . At night, unquestionably in large drapers' shops, with a very large quantity of gas burning, the air is vitiated and bad. (Page 3.)

British Sessional Papers. Vol. XVIII. 1889. Report of Inspectors of Factories.

It must always be borne in mind that it is not only the length of the hours worked which is productive of so much harm, but the fact that especially in the winter time so large a proportion of these hours is passed in an atmosphere vitiated by gas and other impurities which have continued to accumulate during the day, which atmosphere the workers inhale at a time when the body is fatigued by a full day's work. (Page 96.)

British Sessional Papers. Vol. XVII. 1893. Report of Chief Inspector of Factories and Workshops.

. . . Our experience as factory inspectors goes more to the question of physical evil, and I have seen many a girl toiling away in a workroom, where the gas has been burning for 5 hours, upon whose face it did not want the eye of a doctor to discover the traces of the irremediable mischief which was going on. (Page 92.)

British Sessional Papers. Vol. VI. 1901. Report from the Select Committee of the House of Lords on Early Closing of Shops.

Witness, Secretary Scottish Shopkeepers' Association:

1034. . . . Then Dr. Cowan Lees is not an officer of our Union, but his practice is in a large and populous shopkeeping district of Glasgow, and knowing that he was peculiarly situated as regards experience we wrote to him, and this is his reply: " . . . I may state that I am of opinion that the long hours and confinement in the vitiated atmosphere of the great majority of shops, especially during the evening and night hours, are decidedly injurious to the health of shop assistants. During the long hours after dark shops are brilliantly lit . . . and it is in this that perhaps the greatest damage is done. If it were possible to lessen the evening hours, which I believe could be done without loss to the employers, a great blessing would be secured for the shop assistants." (Pages 75–76.)

UNITED STATES

Report of the New York Department of Labor. 1911.

In my previous reports, the question of artificial lighting in its relation to air vitiation has been fully discussed. Its effects upon the

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eyes of the workers, if too dim, or too glaring, are to cause eye strain, nervous disorders, dimness of vision and the loss of eyesight, which latter is the greatest calamity that can befall anyone.

It has been impossible to undertake an intensive investigation into the subject, but as a result of general injuries among the workers, I find there are a number who suffer from the effects of faulty lighting. I have observed many workers employed with unshaded gas and electric light directly on a level with the eyes, and from my own experience with such means of lighting, I am fully convinced of the harmfulness of such illumination. (Page 73.)

(4) Lack of Sleep

The lack of sleep, due both to the inadequate resting time allowed between working days when evening work is required, and to the impossibility of getting sleep after an exhausting and excessively long working day, causes serious injury to the health of workingwomen.

FRANCE

Rapports présentés à M. le Ministre de Commerce, de l'Industrie, des Postes et des Télégraphes par les Inspecteurs du Travail. [*Reports presented to the (French) Minister of Commerce, Labor, etc., etc., by the Factory Inspectors.*] *La Question de l'Interdiction du Travail de Nuit.* [*The Question of Prohibiting Night Work.*] *Paris, 1900.*

Late hours of work, as well as actual night work, are destructive to the health of girls and women. We have had occasion more than once to observe the injurious effect of evening overtime. When night hours are added to those of the day's labor the result is overwork which directly saps the strength and promotes the craving for alcoholic stimulant. During an inquiry made in Marseilles a number of sewing girls complained that after a certain number of evenings with late overtime they found it impossible to sleep. Though overcome by fatigue, they lay awake until early morning, when it was nearly time to go to work again. In consequence, they did not have the seven hours of sleep imperatively necessary for an adult. Failing to have restful nights after the days' work, insomnia supervenes with all its terrors. Sleep has so vast an importance with regard to health that there is perhaps no function deserving of more serious

consideration. Everything that interferes with the hygiene of sleep is dangerous, because the equilibrium of the nervous system is imperilled. The overworked women who have been employed overtime in the evenings absolutely need the period of unemployment to re-establish their shattered health as best they may. (Pages 71–72.) FRANCE

La Revue de Paris. September–October, 1904. Le Travail de Nuit des Femmes. [*Night Work of Women.*] GEORGES ALFASSA.

Of what value can the sleep be that comes between 2 and 7 A. M. after an exhausting day and evening? Thus, aggravated by conditions more or less unhygienic, night work for women has always resulted in deprivation of sleep. (Page 369.)

A physician, Dr. Rochard, says on this subject: " . . . Work at night is pernicious in itself, and has serious objections even when the workers can rest by day. The loss of sleep causes one of the most painful forms of suffering that human beings can be called upon to endure; it becomes more distressing when it is accompanied by monotonous labor and a repetition of the same motions over and over. It is above all fatal to the health of women." (Page 369.)

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Le Travail de Nuit des Femmes dans l'Industrie en Autriche.* [*Night Work of Women in Industry in Austria.*] ILSE VON ARLT. *Jena, Fischer, 1903.* AUSTRIA

. . . The injury to the eyes caused by white goods . . . and the bent position in sewing . . . require specially a sufficient night's sleep, for it is only this that can counterbalance the stooped posture and eye weariness of the day, and combat the anæmia resulting from undernutrition. (Page 87.)

(5) IRREPARABLE OVERSTRAIN

The excessive strain of "rush" work makes such great demands upon the worker's strength at certain seasons or days of the week, that no relief is afforded by the shorter

hours succeeding, which are supposed to compensate for the strain. The health of workingwomen has been wrecked even by isolated instances of such excessive exertion.

GREAT BRITAIN

British Sessional Papers. Vol. XIX. 1873. Reports of Inspectors of Factories for the Half-year ending 30th April, 1873.

To my mind it seems very fallacious reasoning to attempt to justify overtime amongst females . . . on the ground that, taking the years through, the hours of work average less than sixty weekly. A girl is not a whit less likely to be injured physically and morally by working fourteen hours a day in May and June because she has not to work more than seven hours in September and October. (Page 43.)

British Sessional Papers. Vol. XIV. 1898. Report of the Chief Inspector of Factories and Workshops.

Sixty hours' actual work in a normal week may be considered as a reasonable amount by the average laundry girl, but when one day in the week is a whole holiday, prescribed by the Factory Act, and she is still required to work sixty hours in the remaining five days, she apparently seems to feel that she is not being fairly dealt by, and that the law is taking away with one hand what it gave with the other. Several complaints have been received of sixty hours' employment in a laundry on the five consecutive days following a statutory holiday, as of something illegal, and a visit paid in response to one of these on a Saturday following a Monday Bank (holiday) found manageress, women, and girls tired out and murmuring that a holiday which had to be made up for as they had made it up was no holiday. (Page 107.)

GERMANY

Amtliche Mittheilungen aus den Jahres-Berichten der Gewerbe-Aufsichtsbeamten. XXI. 1896. [*Official Information from Reports of the (German) Factory Inspectors.*] *Berlin, Bruer, 1897.*

The complaints of laundrywomen in Beuel of bad conditions and overwork gave the inspector in Bonn opportunity to investigate the laundries. He found deplorable conditions. . . . The hours of work were varied and often permitted grave abuses of the strength of employees. In some establishments . . . the hours of work were prolonged from midnight until 6 or even 8 of the following evening, or from 12 to 20 hours broken

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only by short and irregular pauses. Even if this only occurred two or three times a week it could not fail to injure the strongest constitution. Unfortunately it is impossible at present to interfere, as this industry does not come under the factory laws. Cologne. (Page 264.)

Fourteenth International Congress of Hygiene and Demography. Berlin, September, 1907. Vol. II. Sec. IV. Die Ermüdung durch Berufsarbeit. [*Fatigue resulting from Occupation.*] Dr. EMIL ROTH. *Berlin, Hirschwald, 1908.*

My experience and observations do not permit me to feel any uncertainty in believing that the injury to health inflicted upon even fully capable workers by the special demands of a periodically heightened rush of work is never compensated for. Under this head we must consider the demands of all seasonal work, and those industries where piece-work with overtime is the rule during several months in the year, as also the special rush seasons in shops, before Christmas, etc., etc. We observe toward the end of such periods a marked increase in the amount of sickness, and with a frequent repetition of forced drafts upon strength the injurious results can no longer be repaired by longer pauses, or reduction of hours, or diminished demands upon the working capacity. Similarly in laundries the overstrain of the last part of the week is so great that it cannot possibly be balanced by the relatively easier work of the first part. (Page 610.)

AUSTRIA

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Le Travail de Nuit des Femmes dans l'Industrie en Autriche.* [*Night Work of Women in Industry in Austria.*] ILSE VON ARLT. *Jena, Fischer, 1903.*

. . . The suitable limits of working time vary with individuals but it is acknowledged that not only is a regularly long day of work injurious, but also that a single isolated instance of overstrain may be harmful to a woman all the rest of her life,—a fact that is of importance for workers in seasonal trades, and all the more so because the general ignorance of people as to hygiene for women gives no reason to anticipate any initiative for reform among the workers themselves. (Page 86.)

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Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part VII. Women Workers in Milwaukee Tanneries. IRENE OSGOOD, *Special Agent.*

During overtime work conditions are especially bad. A twelve-hour day with a light breakfast, a long walk, and a cold and insufficient lunch and supper, with intense work throughout the whole time, is not conducive to the physical well-being of a girl. Emergencies of this kind leave a permanent impress upon the health of women. (Page 1062.)

B. *Allowance of Overtime Dangerous to Morals*

(1) Loss of Family Life

Overtime work for women inevitably demoralizes all family life. When working hours are so long that the evening is invaded by labor the exhausted worker who does not reach home until late in the evening must unavoidably neglect all family duties, and lose all the elevating influence of family life.

GREAT BRITAIN

British Sessional Papers. Vol. XXIV. 1866. Reports of Inspectors of Factories for the Half-year ending 31st October, 1865.

We may be told, indeed, that to repeal this lost-time clause, and to substitute for it a strict adherence to factory hours, would be injuriously to affect the bleachers' and dyers' interests. But let us consider, too, the workers' interests, their powers of endurance, their loss of social comfort, the intellectual degradation of their families; and let us remember that these are considerations of a higher order than mere overwork, and of more enduring consequences. (Page 82.)

An Essay on the Nine Hours Movement. JOHN BEDFORD LENO. *London, Truelove, 1861.*

But overtoil means even more than this: it means disreputable homes. How can a man have that regard and that control over his household which it is desirable he should possess, if every hour of the daylight be spent in the workshop? His children grow up without his supervision, he has

neither the desire nor the time to instruct them; and hence those deplorable results which we too often witness. GREAT BRITAIN

. . . Or if we look at the question from an intellectual point of view. Do we not perceive that mental improvement is almost rendered an impossibility, for those who have idleness thrust upon them have neither the desire nor the motive for so improving themselves, while those who are overworked are unfitted for the display of the mental activity required for intellectual improvement. (Page 10.)

Problems of Poverty. JOHN A. HOBSON, M.A. *London, Methuen, 1891.*

One of the chief social dangers of the age is the effect of industrial work upon the motherhood of the race. So long as we refuse to insist as a nation, that along with the growth of national wealth there shall be secured those conditions of healthy home life requisite for the sound, physical, moral, and intellectual growth of the young, at whatever cost of interference with so-called private liberty of action, we are rendering ourselves as a nation deliberately responsible for the continuance of that creature whose appearance gives a loud lie to our claim of civilization,—the gutter child of our city streets. (Page 169.)

The Economic Journal. Vol. XIV. 1904. The Employment of Women in Paper Mills. B. L. HUTCHINS.

With regard to home life, the only employer seen who was of an age to remember conditions before the Act stated emphatically that legal regulation had been of greatest benefit to women workers. The old state of things in which women worked irregular hours, and in some cases all through the night, in relays, as men did, was demoralizing, and, as scarcely needs proving, fatal to any orderly home life. (Page 247.)

Report of the New Zealand Bureau of Industries. 1896. NEW ZEALAND

One very great drawback upon overtime labour, especially for girls, is that they have to work at night, and this is for many reasons undesirable. Parents complain that proper supervision of their children's conduct is impossible, and there is little doubt that night work of any kind for women is open to grave objection. (Page iii.)

Rapports présentés à M. le Ministre de Commerce, de l'Industrie, des Postes et des Télégraphes, par les Inspecteurs du Travail. [*Reports presented to the (French) Minister of Commerce, Labor, etc., etc. by the Factory* FRANCE

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Inspectors.] *La Question de l'Interdiction du Travail de Nuit.* [*The Question of Prohibiting Night Work.*] *Paris, Imprimerie Nationale, 1900.*

From the point of view of wholesome organization of family life the evening overtime endangers or destroys the morals of young girls so that this overtime is almost worse than regular night work . . . she must practically renounce her family. (Pages 84–85.)

L'Interdiction du Travail de Nuit des Femmes dans l'Industrie Française. [*The Prohibition of Night Work for Women in French Industry.*] A. CHAZAL. *Paris, Pedone, 1902.*

A labor inspector deplores the physical and moral effects of overtime evening work: "The amount of work required during 12 hours is indeed for girls and women an effort which they can frequently renew only at the price of their health. . . . From the point of view of the family, overtime work in the evening is detrimental; first, for young girls who escape thus the oversight of parents and who are exposed to the dangers of the street; secondly, to women and to mothers whose presence at home is so necessary.

"Overtime work at the mill does not permit them to care for their husbands, whose work almost always ends by 7 P. M., nor for their children, who are left to themselves and do not have even the indispensable material care, consequently their intellectual and moral needs are entirely neglected. The result of evening overtime work on the woman without regard to age is physical decline, even when it does not bring moral decline." (Pages 99–100.)

La Revue de Paris. September–October, 1904. Le Travail de Nuit des Femmes. [*Night Work for Women.*] GEORGES ALFASSA.

Late evening work is as dangerous as night work for the younger women. Late hours in the shop remove the girl from the protection of her parents. (Page 372.)

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Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Interdiction du Travail de Nuit des Femmes en Allemagne.* [*Prohibition of Night Work of Women in Germany.*] Dr. MAX HIRSCH. *Jena, Fischer, 1903.*

But if . . . the family cannot be united in the evening, then the full measure of evil is suffered; then as a rule everything within the family

is set adrift. It may be objected that overtime work can be authorized for only forty days. When during forty evenings, or even less, during the year, the woman, prolonging her absence beyond the usual working day, must slight her home duties, fail to insure the comfort of her husband and the physical and moral well-being of her children, such a practice well may, it even necessarily must, cause an irreparable injury, even to sapping and destroying the family life. (Page 34.) GERMANY

Proceedings of the First International Convention on Industrial Diseases. Milan, 1906. Frenastenia e delinquenza in rapporto a taluni ordinamenti del lavoro. [*Imbecility and Criminality in Relation to Certain Forms of Labor.*] Prof. CRISAFULLI. ITALY

When both parents, because of their need to work, pass the entire day away from home, the children, with few exceptions, grow up in a state of moral abandonment, and it is very rare that, in their moments of leisure, the parents can dedicate themselves to their education, owing to the fact that the heavy incessant toil in factory or workroom reduces them to a state of physical and mental exhaustion. (Page 147.)

Evidence submitted to the Massachusetts Legislature in Favor of the Enactment of a Ten-hour Law. Lawrence. 1870. UNITED STATES

Comparative merits . . . of the ten-hour system over the present (i. e., 11 hours).

2d. Heads of families are less crowded in the discharge of family duties—hence less irritated and passionate in directing the affairs of their households. The passionate treatment of wearied children by overworked parents, it is to be feared, has much to do in rendering home influences in some cases a curse instead of a blessing, yea, in driving both parents and children into habits of dissipation. E. A. BUCK. (Pages 19–20.)

Congressional Record. Vol. XXI. Part X. Pages 9300–9301. August 28, 1890. Remarks of Mr. McKinley upon the Eight-hour Bill.

The tendency of the times the world over is for shorter hours for labor; shorter hours in the interest of health, shorter hours in the interest of humanity, shorter hours in the interest of the home and the family. . . . Cardinal Manning in a recent article spoke noble words on the general subject when he said:

"But if the domestic life of the people be vital above all; if the peace,

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the purity of homes, the education of children, the duties of wives and mothers, the duties of husbands and of fathers, be written in the natural law of mankind, and if these things are sacred far beyond anything that can be sold in the market, then I say if the hours of labor resulting from the unregulated sale of a man's strength and skill shall lead to the destruction of domestic life, to the neglect of children, to turning wives and mothers into living machines, and of fathers and husbands into, what shall I say, creatures of burden? I will not say any other word—who rise up before the sun, and come back when it is set, wearied and able only to take food, and lie down and rest, the domestic life of man exists no longer and we dare not go on in this path." (Pages 8–9.)

(2) Danger of the Streets at Night

Overtime work subjects working women to the dangers of the streets at night. When work is continued until late night hours, the return home is fraught with physical and moral peril.

FRANCE

Documents Parlementaires. Chambre des Députés, 10e Juin, 1890. Annexe 649. [*Parliamentary Documents of the (French) Chamber of Deputies, June 10, 1890. Annex 649.*] *Rapport fait sur le travail des enfants, des filles mineures et des femmes dans les établissements industriels.* [*Report on the Labor of Children, Young Girls, and Women in Industrial Establishments.*] Senator Richard Waddington.

In dressmaking establishments, etc. the work is often prolonged to a late hour; sometimes it lasts all night. The women, dismissed at midnight or later, are exposed to inconveniences, often to danger, in regaining their often distant homes. (Page 1087.)

Rapports présentés à M. le Ministre du Commerce de l'Industrie, des Postes et des Télégraphes par les Inspecteurs du Travail dans l'Industrie. [*Reports of the (French) Factory Inspectors to the Minister of Labor, etc.*] *La Question de l'Interdiction du Travail de Nuit.* [*The Question of the Prohibition of Nightwork.*] M. Despeaux, *Inspector. Paris, 1900.*

For young girls, nightwork means the destruction of family influence, the promiscuity of the workplace, the deserted street, and at last prostitution. (Page 11.)

L'Ouvrière au XXe Siècle. Questions Pratiques de Législation Ouvrière. Vol. III. [*Practical Questions of Labor Legislation.*] J. BENZACAR. *Paris, 1902.* **FRANCE**

Work at night should be completely prohibited; not only does it exhaust women, but it exposes them, upon leaving the place of employment, to encounters that are dangerous both to safety and to morality. (Page 174.)

La Revue de Paris. Sept.–Oct., 1904. Le Travail de Nuit des Femmes. [*Night Work for Women.*] GEORGES ALFASSA.

In going home late at night they (workingwomen) are often insulted, and told that no decent woman is abroad at such an hour. On reaching their homes, they go to bed without food, and the next day their work recommences at the usual hour. Only the most considerate employers give them some moments of grace in the morning. (Page 369.)

British Sessional Papers. Vol. XXXIV. 1893. Royal Commission on Labour. Group C. Appendix CXXIX. Summary of Evidence of Mr. C. B. BOWLING (*Her Majesty's Inspector of Factories*). **GREAT BRITAIN**

I have discussed this matter (overtime) with numbers of all classes concerned. . . . They admit the evils, and these can be spoken to by all my colleagues, and I think in all large towns by the police, who have seen some of the results of turning a number of girls out into the streets at times of the night when there are comparatively few respectable people about. (Page 725.)

Journal of the Royal Statistical Society. Vol. LV. 1892. Female Labour in New South Wales. Abstract of "New South Wales: Census and Industrial Returns Act of 1891." London, Stamford, 1892. **AUSTRALIA**

Millinery is a much more attractive trade; the work is lighter, and the hours of labour (usually 9 A. M. to 6 P. M., and 1 P. M. on Saturdays) appear to be strictly observed. This last point is a serious consideration with parents, who prefer to apprentice their girls to this trade, knowing they will not be compelled to return home alone at almost any time of night. (Page 490.)

Report of the New Zealand Department of Labour. 1897. **NEW ZEALAND**

That girls and women should be compelled by overtime work to return to their homes late at night is most undesirable, not only from the tempta-

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tions and annoyances to which they are thereby subjected, but also for the home itself left too long neglected or unvisited. (Page iii.)

CANADA

Toronto University Studies in Political Science. First Series. No. 3. The Conditions of Female Labour. JEAN THOMPSON SCOTT, *Toronto, 1892.*

Another objection to the custom of long hours is that girls have often to find their way home alone at late hours, along lonely streets. (Page 15.)

GERMANY

Die Jahresberichte der k. Bayerischen Fabriken- und Gewerbe-Inspektoren für das Jahr 1901. [*Report of the Royal Bavarian Factory Inspectors for 1901.*] *Munich, Ackermann, 1902.*

The overlong evening working hours, resulting from the exceptions permitted by the law as overtime react harmfully upon the health of the women. Beside that, young women, returning late at night to their homes are exposed to insult and danger. (Page 8.)

UNITED STATES

Report of New York State Factory Inspectors. 1887.

It is not in accord with the fitness of things that females should be required to labor through the long hours of the night, or to such a late hour that they will be likely to suffer insult or bodily harm while returning to their homes. (Page 28.)

Report of the Nebraska Bureau of Labor and Industrial Statistics. 1907–1908.

. . . 10 o'clock at night is too late an hour to keep female workers away from home. In the cities, it means that such workers will get home not earlier than 10:30 to 11, because a majority of them live far from the business centre. Temptation to "suspend the rules" is always offered in cities to tired and discouraged workers, men and women, and the latter must also face the wiles and insults of loafers and mashers when out alone late at night. Attacks on young girls returning from work late at night are not infrequent; and since this is so, the state ought to protect them to the limit of its unquestioned power. (Page 33.)

C. *Allowance of Overtime Injurious to Output*

(1) Evening Work Results in Inferior Output

The system of working overtime is not only disastrous to health, but economically indefensible. After a very short period of evening work, output declines in amount and quality, while the efficiency of the workers is permanently injured by the overexertion required.

The most enlightened employers therefore have found that overtime does not pay; that it entails higher expenses than regular work, and results in progressively inferior output.

British Sessional Papers. Vol. XX. 1878. Reports of Inspectors of Factories. GREAT BRITAIN

The same person informed me that she at times doubted the value of working even the overtime allowed under the Act. The women at the close of the 12 hours, which period constitutes the usual day's work, were tired and exhausted and hardly did enough after that to pay for the gas consumed. (Page 14.)

British Sessional Papers. Vol. XXI. 1894. Report of Chief Inspector of Factories and Workshops.

The arguments against overtime seem to me to be:

1. That the work done during overtime is not equal, in amount or quality, to that done in regular hours. (Page 17.)

British Sessional Papers. Vol. X. 1901. Report of Chief Inspector of Factories.

I hope and believe that employers are at least beginning to recognize that employment of their hands overtime is a short-sighted policy and really bad economy. Some, I know, think so. There is also a waning inclination, I believe, on the part of the employed to grasp at the chance of making extra wages by overtime. If so, it is, I think, a healthy sign

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on both sides; health and full efficiency while at work being better than extra wages and long hours, better also in its results to the employer. (Page 158.)

The Eight Hours Day. Report on a Year's Work with a Forty-eight Hours Week in the Salford Iron Works, Manchester. (Mather and Platt, Ltd.) WILLIAM MATHER, M.P. *Manchester, Guardian Printing Works, 1894.*

I attribute the full maintenance of our production through the trial year solely to the unimpaired and cheerful energy on the part of every man and boy throughout the day. . . .

The total abolition of overtime, excepting in the rarest cases, is essential to the success of the shorter hours, if my conclusions as to the cause of increased production be correct.

This custom is a delusion on the part of workpeople and employers alike.

The extra wages are obtained by the men at too great a cost. The extra work is not worth to the employers the price they pay for it.

The double-shift system, which the Trade Unions have readily approved, has, on the other hand, many advantages in cases of exceptional pressure.

Employment is afforded thereby to more men, and the work they do is not paid for at an abnormal rate. . . .

But of this I am assured, that the most economical production is obtained by employing men only so long as they are at their best. When this stage is passed, there is no true economy in their continued work. (Pages 25–26.)

The Women's Industrial News. London, March, 1902. Women Polishers. (An enquiry made by the Technical Training Committee.) GRACE OAKSHOTT.

The much discussed question of the effect of legislation on women's position is of too much importance and interest ever to be neglected in an enquiry. Overtime in polishing plays such a small part in any case, women are scarcely affected by the law, but employers in discussing the desirability of protection are unanimous in their opinion that overtime is bad economy and that night work on moral, humane, and expedient grounds is to be condemned. (Page 292.)

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Report of the 72nd Meeting of the British Association for the Advancement of Science. 1902. London, Murray, 1903. Women's Labor: Second Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labor.

. . . The Factory Acts, after being bitterly opposed by the manufacturers, taught them a valuable practical lesson of the bad economy of excessive work. Mr. Baker has recorded a case of a Birmingham firm of button-makers who in 1866 became so dissatisfied with the conditions and mode of life of their workpeople that they voluntarily applied the provisions of the Factory Act for textiles (1844) to their own factory and found its advantage. . . . The tendency is evidently in the direction of a still further shortening of hours in some quarters. "There may be a limit to which hours can be profitably reduced, but we haven't found it yet" was one remark. . . . The development of industrial efficiency in women may itself be due to the regulations of the Acts. If the conditions of women's work have been humanized, and the strain of it diminished, industry itself may have been made more attractive, and drawn a larger number of recruits from good homes and healthy families than would otherwise have been the case. (Pages 296–297.)

Report of the 73rd Meeting of the British Association for the Advancement of Science. 1903. London, Murray, 1904. Women's Labor: Third Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labor.

. . . There is a general consensus of opinion that overtime is wasteful and expensive, entailing higher wages and fixed expenses for inferior work, and hence its diminution tends to efficiency. Very few, indeed, seriously desire to increase the length of the week's work, and many by their action have shown that it is best kept below the legal maximum. (Page 339.)

Women's Work and Wages. EDWARD CADBURY, M. CÉCILE MATHESON, *and* GEORGE SHANN. *London, T. Fisher Unwin, 1906.*

It is a matter of general experience that long hours deteriorate the quality of the work, and where power machines are used, the power is too valuable to be provided for slack or tired workers. (Page 91.)

CANADA

Report of the Royal Commission on a Dispute Respecting Hours of Employment, between the Bell Telephone Company of Canada, Ltd., and Operators at Toronto, Ont. The Department of Labour, Ottawa, Canada, 1907.

To pay the present high rate per hour for much overtime is most uneconomical, and results are not secured if there is any foundation for the idea that the service suffers when operators become tired. Service may not be materially depreciated at the end of the day when operators have been working under ordinary pressure, but it certainly must suffer when operators work overtime after being subjected to a heavy strain for the preceding 5 hours. (Signed) K. J. Dunstan. (Page 13.)

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Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1900. [*Reports of the Factory Inspectors in the Kingdom of Württemberg for 1900.*] *Stuttgart, Lindemann, 1901.*

As regards overtime many employers agree that the output of the women is only large for the first few days of overtime and that after that it falls back again, so that one sees plainly the ill effects of overstrain. (Page 135.)

Jahresberichte der Gewerbe-Aufsichtsbeamten und Bergbehörden für das Jahr 1904. Bd. I. Preussen. [*Reports of the (German) Factory and Mine Inspectors for 1904. Vol. I. Prussia.*] *Berlin, Decker, 1905.*

The majority of employers are becoming more and more convinced that, when overtime is worked regularly, the output does not increase in proportion to the lengthened hours of work and additional wages. On the contrary, it tends to decrease gradually so that finally overtime becomes too expensive to be worth while. (Page I[241].)

Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1905. [*Reports of the Factory Inspectors in the Kingdom of Württemberg, 1905.*] *Stuttgart, Lindemann, 1906.*

Employers agree that overtime work is, essentially, irrational, because as a rule wages for overtime are higher, while the productivity of the worker retrogrades with longer hours. (Page 53.)

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and*

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legal regulation. Preface by ÉTIENNE BAUER.] *Interdiction du Travail de Nuit des Femmes en Allemagne.* [*Prohibition of Night Work for Women in Industry in Germany.*] Dr. MAX HIRSCH. *Jena, Fischer, 1903.*

The report for the district of Cologne says, "No appreciable economic damage would result from the absolute prohibition of overtime work, for it is not the custom, at least here, to pay female workers higher wages for overtime than for regular work; and furthermore, it is recognized that the working capacity of female laborers falls to a very low level, after a labor period of eleven hours." These facts agree with the fact very frequently, and many a time officially established, that among men also the reduction of time by one or even two hours does not lessen the output. Where therefore is the advantage of overtime work, especially of that imposed on women, even if we consider only the interests of the employer? (Page 40.)

Gesammelte Abhandlungen. Bd. III. [*Complete Works. Vol. III.*] *Die Volkswirthschaftliche Bedeutung der Verkürzung des Industriellen Arbeitstages.* [*The Economic Significance of a Shorter Working Day.*] ERNST ABBÉ. *Paper read at the meeting of the Political Society at Jena in 1901. Jena, Fischer, 1906.*

The more clearsighted of our overseers had often said that, when there was great pressure of work and overtime was necessary—perhaps rising from 9 to 10 hours daily, the results were only satisfactory for a short time—perhaps 14 days, not longer. After that a corresponding rate of output was not obtainable even though there was a 25 per cent increase in the rate of wages. The men got listless and surly and things did not go well.

I had doubted this, and made an experiment to test it. . . . The men were anxious to please me, and had promised to work overtime . . . being glad of the extra income before Christmas. . . . After one week the extra output began to fall, and by the third and fourth week it had practically fallen to nothing.

It is therefore impossible, even with good will and self-stimulation to increase output over and above the regular day's work, except for a short time.

I am glad to see that this is corroborated by the factory inspector of Brandenburg in 1900. In his report we find the testimony of a factory owner, who had found that it was only worth while to work overtime when

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work pressed, for about 14 days. After that the working capacity flagged. Fourteen days was our limit also, as we found.

From all this I estimate the importance of good will and initiative as follows: Workmen are incapable of maintaining increased productivity during a lengthened working day, beyond a certain short time; and likewise, the individual's ill will alone does not cause a lessened output under shorter hours. (Page 220.)

The English examples of work under trades unionism have shown that even when the men felt an interest in doing less work in a given time, from the viewpoint of making more work for the unemployed, their efficiency and output under reduced hours were nevertheless the same. I therefore regard it as settled, that no motive is necessary, no will power, no driving of self interest is needed, to bring about this adjustment of rapidity of work to the shortened working hours, but that it is automatic and would occur even if the workers were discontented. (Page 221.)

Fourteenth International Congress of Hygiene and Demography. Berlin, 1907. Vol. II, Sec. IV. Ermüdung durch Berufsarbeit. [*Fatigue resulting from occupation.*] Dr. EMIL ROTH. *Berlin, Hirschwald, 1908.*

It must be remembered that the output of overtime, when the latter is of frequent occurrence, is always, according to my observations, from 25 per cent to 50 per cent below the average. (Page 610.)

SWITZERLAND

Berichte der eidg. Fabrik- und Bergwerkinspektoren über ihre Amtstätigkeit in den Jahren 1898–1899. [*Reports of the (Swiss) Factory and Mine Inspectors for 1898–1899.*] *Aarau, Sauerländer, 1900.*

The upholders of a shorter maximum working day all energetically oppose the frequent and widespread legal exemptions for overtime, and in this campaign they are often supported by employers who have come to regard overtime as unprofitable and who therefore do not use it. (Page 57.)

It is impossible for women and girls to maintain uniform production throughout all their work when they are kept busy 13 hours daily for any considerable period of time. Hence from the standpoint of output alone overtime could be done away with. But health considerations condemn overtime even more strongly, and these reasons have prevailed in some of the cantons in discouraging the practice of permitting exemptions. (Page 59.)

Le Travail de Nuit des Femmes dans l'Industrie: Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Jena, Fischer, 1903.* FRANCE

At present indeed, overtime work, at night or otherwise, serves partly to fill orders that have become more abundant but serves also quite as much to fulfill the lively desire on the part of promoters to reduce net cost by large output. But yet the rapid decline of price renders illusory, in many cases, the gain which the manufacturer derives from the night work of women. (Page xxxi.)

Débats et Documents Parlementaires. Chambre des Députés, 23e Mars, 1881. [*Parliamentary Debates and Documents (French) Chamber of Deputies, March 23, 1881.*] *Suite de la discussion des propositions de loi concernant la durée des heures de travail dans les usines et les manufactures.* [*Discussion of the Sections of the Law relating to the Length of Hours of Work in Work Shops and Factories.*]

Senator Waddington:

The workman who works fewer hours in the day will produce more per hour, yet, even so, he will, of course, in a considerably shorter day not produce as much as under a 12-hour day.

Nevertheless this loss has compensations. In many manufactures, slack seasons or no work at all, at times, is the rule, and a shop or factory which at some season works 12, 13 or 14 hours, at other times of the year has only 7, 8 or 9 hours' work.

It seems to me that the restriction proposed would have the effect of equalizing the hours of labor. There is nothing worse for the worker than to be obliged, at times, to work under abnormal pressure and put forth exhausting efforts to keep up with overwork, and then, two or three months after, to be subjected to a relative loss of work. . . . We can perfectly well arrive at a juster and better division of labor, better for every one, and that without any of those dangers to production which our opponents fear . . . the same predictions of ruin have been made when the labor of children has been restricted, but they have not come true. (Page 613.)

Rapports sur l'Application pendant l'Année 1899 des Lois (1892–1893) réglementant le Travail; par les Inspecteurs Divisionnaires du Travail. [*Reports on the Working of the (French) Factory Laws of 1892 and*

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1893, in the year 1899. By the French Factory Inspectors.] *Paris, 1900.*

I insist upon it that those employers who overwork their employees do not understand their own best interests. Can good work really be done by a young girl, who in case of rush, works fifteen hours a day? The best dressmakers understand this. (Page 64.)

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Women and the Trades. ELIZABETH BEARDSLEY BUTLER. *The Pittsburgh Survey. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1909.*

Manufacturers complain that overtime is a loss to them. They say that their employees do poorer work at night, and that the cost in wasted material, in light and heating, is more than the profit gained by a lengthened day; but that they are forced to work overtime by customers who will not send in orders ahead. Night work, they say, is a means of holding their trade rather than increasing their profits. Perhaps a universal legal prohibition would prove effective in overcoming the dilatoriness of customers in these seasonal trades, as well as in the trades where work pressure is irregular. Unquestionably, much overtime has been eliminated in states that have stringent laws; much has been voluntarily avoided by manufacturers who have come to realize that night hours are in the long run a financial loss. (Pages 353–354.)

(2) OUTPUT IMPAIRED ON DAY SUCCEEDING EVENING WORK

Not only does evening work result in inferior output, but it injures the output of the next day as well. After evening work, the workers are apt to come late the following day. They are often obliged to do over again in the morning what was done the night before, and their efficiency is so much impaired by overexertion that the days following evening work show a steadily inferior output.

GREAT BRITAIN

British Sessional Papers. Vol. XXIX–XXX. 1876. Factories and Workshops Acts Commission.

Witness, A Manufacturer. Vol. XXX.

10,947. . . . I think there is very little advantage in overtime, people

are worn out at night and do not work with the same vigour in the morning. (Page 535.)

British Sessional Papers. Vol. XXIII. 1877. Reports of Inspectors of Factories.

. . . There was a brisk demand for bricks, that they wanted to increase their production, and determined to work half an hour overtime 3 nights a week. After trying it some little time they found the number of bricks turned off decreased, that on mornings succeeding the days on which they worked half an hour after the usual time for ceasing work the men invariably came late, and worked less time and less assiduously than when they worked regularly, that they returned to regular hours. (Page 15.)

British Sessional Papers. Vol. XXI. 1894. Report of the Chief Inspector of Factories and Workshops.

Some employers, too, hold the opinion that in proportion as the workpeople suffer in health their work suffers in execution, and that in addition to this consideration has to be reckoned that of an extra expenditure in gas, which considerably weakens an already doubtful advantage. (Page 11.)

It is not likely that work done during these . . . hours of overtime, or on days following overtime, will equal either in quantity or quality that done when regular hours only are worked. (Page 15.)

In connection with overtime I think that very often the occupiers and managers of works object to it while they take advantage of the privilege. They naturally recognize that after a spurt comes reaction and that late hours tell against good work the next day. (Page 301.)

British Sessional Papers. Vol. XII. 1902. Report of Chief Inspector of Factories.

I think employers are beginning to look askance at overtime because it has to be paid for and sometimes at enhanced rates, resulting often in poorer work and less output the following days, and damage to the power of the workpeople. (Page 34.)

GREAT BRITAIN

British Association for the Advancement of Science. 73rd Meeting. 1903. Women's Labor: Third Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labor. London, Murray, 1904.

Very many employers say that overtime on one evening has the effect of tiring the women so as to spoil their next day's work; and there are many instances where a shortened or more regular week has resulted in a better output per worker. (Page 339.)

Women in the Printing Trades. A Sociological Study. Edited by J. RAMSEY MACDONALD. *London, King, 1904.*

It is evident that protection is viewed favorably by many employers, on the specific ground that it prevents systematic overtime. On the whole they are of the opinion that after overtime the next day's work suffers. (Page 82.)

B. used to work from 8 A. M. to 8 P. M. regularly, including Saturdays. . . . She disliked overtime, was tired out at the end of a day's work, and thought the other women were too, and she had often noticed how badly the work was done after eight or nine hours at it. Later on, as a forewoman, she noticed that the girls after overtime always loafed about the next day and did not work well. (Page 84.)

Another forewoman gave it as her deliberate opinion that when overtime is worked the piece workers do not make more, as a rule, for they get so tired that if they stay late one night, they work less the next day.

This is the unanimous view held by the forewomen, and it comes with considerable force from them, as it is they who have to arrange to get work done somehow within a certain time. They are the people who have to put on the pressure, and are in such a position as to see how any particular system of getting work done answers. (Page 87.)

The Economic Journal, Vol. XIV. 1904. The Employment of Women in Paper Mills. B. L. HUTCHINS.

The relatively short hours now customary are generally felt to make for efficient work. . . . In envelope making overtime may be worked thirty times per annum; and in a large envelope and account book works the foreman, whilst regretting that the girls should not be free to earn more extra money in this way, almost in the same breath stated that overtime was of little use from his point of view, as, if the girls stayed late one day, they were sure to come late the next. (Pages 246–247.)

Rapports sur l'Application pendant l'Année 1899 des Lois (1892–1893) réglementant le Travail; par les Inspecteurs Divisionnaires du Travail. [*Reports on the Working of the (French) Factory Laws of 1892 and 1893, in the year 1899. By the French Factory Inspectors.*] *Paris, 1900.* FRANCE

The later work lasts into the night, the more fatigued is the working woman, and as a result her work is poorly done, so that she is often obliged to do over in the morning what she had done the night before.

We repeat, therefore, the recommendations that we make every year: that a good organization of work with plenty of workers would be more profitable to the employers than overtime. M. Lagard, Marseilles. (Page xxxix.)

First International Conference of the Consumers' Leagues. Geneva, 1908. La Veillée: Abus et Responsabilités. [*Overtime: Abuses and Responsibilities.*] Mme. A. PAUL JUILLERAT, *French Factory Inspector. Fribourg, 1909.*

Overtime in all trades is worked at certain times of the year, but nowhere is it longer and more burdensome than in the clothing trades. (Page 48.) . . . In general, it is a loss to the employers; over-hours are almost always paid at higher rates; and the cost of them is enhanced by higher running expenses,—heat, light, etc. The fatigue from the day's work already performed makes the workers slower, and less careful in performing the extra tasks, and the work of the next day, taken up after insufficient rest, will drag still more and be still more imperfect. This, true even of the first 2 or 3 days of overwork, will become more and more true as the sewing women become more and more fatigued and, finally, exhausted. (Page 49.)

Report of the Nebraska Bureau of Labor and Industrial Statistics. 1907–1908. UNITED STATES

Of his experience . . . one manufacturer . . . says:

"When the business first came under my control, the men were working a nominal nine-hour day. But the real day was much longer. Recourse was had to overtime on the slightest provocation, and during the months of October and November overtime was the daily rule. In those months we have to get ready our goods for Christmas consumption, and the men used to be at work night after night till 8 or 9 o'clock. I have known them to leave the factory as late as 11 o'clock. When I com-

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plained of the system I was told that it was absolutely necessary; that the work could not be gotten through otherwise. However, I knew that it was bad for myself as well as for the men. A man who has done a reasonable day's work is not fit to give good work at night, and if he makes the attempt his work next morning suffers. So I put my foot down and stopped the practice almost entirely." (Page 189.)

D. *Uniformity of Restriction Essential for Regular Distribution of Employment*

(1) Prohibition of Overtime Promotes Better Organization of Industry

Wherever the employment of women has been prohibited for more than ten hours in one day, the requirement of dangerously long and irregular hours in the season trades is shown to be unnecessary. In place of alternating periods of intense overwork with periods of idleness, employers have found it possible to avoid such irregularities by foresight and management.

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British Sessional Papers. Vol. XVII. 1893. Report of Chief Inspector of Factories and Workshops.

As far as this district is concerned, the only demand for this overtime comes from an inconsiderable minority of manufacturers. . . . Although there are more than 4000 who could claim to make it (overtime) not more than 200 . . . apparently do so. I am persuaded that in a majority of instances in which overtime has been made by these 200 employers, it has been brought about either by the greed, tyranny, or incompetence of the managers or employers. I believe that much of the apparent necessity for working overtime is simply the result of want of forethought and organization on the part of the employers and their managers. . . . I came across a very large firm employing several hundred workpeople on work of an exceptionally important and public nature. It has been the custom in the works at the end of each month to keep all hands, young and old, at work for two days and nights. . . . They said their arrangements could not possibly be interfered with without causing serious public incon-

venience. . . . I answered that I would allow them two months to rearrange their system of working. . . . Before the two months were over I met the manager of the works, who said that my visit had been the best thing that had happened to them for years, that the strain of working under the old system had been almost unbearable as much to the managers as to the workpeople, that since my visit they had gone carefully into the whole matter, had laid the facts before their customers and had so rearranged the system of working that they could commence their undertakings early in the month, and that there was now no further necessity for the great strain at the end. If such a change as this could be brought about in a case of such apparently exceptional difficulty, it is fair to assume that most of the seasons of pressure which beset certain trades can be provided for by forethought and arrangement, but I am afraid that such forethought and arrangement will never be exercised while the mischievous expedient of overtime is made so easy. (Pages 89–90.)

How little actual demand there is for overtime on the part of protected hands, I think the return of this district will show. Out of nearly 9000 occupiers of factories and workshops, only about 200 apparently avail themselves of the permission to work overtime. (Page 91.)

British Sessional Papers. Vol. XXXIV. Appendix CXXIX. 1893. Royal Commission on Labour. Group C. Summary of Evidence of Mr. C. B. BOWLING, *Her Majesty's Inspector of Factories.*

. . . I am persuaded that in the majority of instances in which overtime has been made by these 200 employers (out of 4000 in the district who could claim it), it has been brought about either by the greed, tyranny, or incompetence of the managers or employers.

I believe a large proportion of it results from want of forethought and organization; a good deal from an insatiable greediness and striving to steal a march on their neighbours, which prompts many manufacturers never to refuse an order, however unprepared they may be to fulfill it. . . .

Of course the principal argument in support of this allowance of overtime to the trades named in the schedule, is that they are season trades, subject to recurring pressure at certain times.

To a more or less degree this may be urged with regard to the vast bulk of manufacturing industries of the country, and if under a law framed for the protection of young people from an undue strain on their mental and physical powers, you are going to sanction any overtime at all, I confess I cannot see where, without great injustice, you can draw the line. (Page 724.)

GREAT BRITAIN

British Sessional Papers. Vol. XIX. 1895. Report of the Chief Inspector of Factories and Workshops.

. . . Where organization and economy of management exist, the necessity for overtime does not exist; and that workrooms conducted under the apparent necessity for overtime can prosper under its withdrawal is shown by the fact that overtime has entirely ceased, under the control of a new manager, in workrooms in which under other management it had been excessive, and that the development of business rather than its diminution had been the result.

Complaints I have received from women employed in book-binding and kindred trades show, that in many instances where overtime is worked, its necessity has been due to grave mismanagement. Women and girls are kept without work for several hours, sometimes for the greater part of the day, they are then worked at full pressure during the remaining hours, and to the limit of overtime exception.

Various employers of labour have shown it to be possible to satisfy the demands of a thoughtless public and at the same time to guard the health of their work-people, which should remove the seeming conflict between the gratification of some few hundreds of inconsiderate people on the one hand, and on the other hand the health of several thousands of women and girls. (Page 12.)

British Sessional Papers. Vol. XII. 1903. Report of Chief Inspector of Factories and Workshops.

There is a growing disposition on the part of a number of employers to relinquish the habit of overtime as not "worth the candle." . . . It is significant that where one occupier in a given trade avails himself of the permission, there are several others, apparently engaged in identical work, who never work overtime from year's end to year's end. There may sometimes be exceptional circumstances to account for this, but I am inclined to believe that it is more often a question of management and methodizing work. (Page 29.)

British Sessional Papers. Vol. X. 1905. Report of Chief Inspector of Factories and Workshops.

I am glad to be able to report, however, that many employers are beginning to aim at better economic conditions for those they employ. They recognize, and rightly, that it is better if possible to spread their

orders over a longer period for execution and to induce their clients to fall in with this idea, than to have a tremendous rush for a short time and then be forced to turn away many of their better trained and more highly skilled workers at short notice. (Page 232.)

The Eight-Hours Day. SIDNEY WEBB *and* HAROLD COX, B.A. *London, Walter Scott, 1891.*

"Press of work arising at recurring seasons of the year" does not necessarily involve the permission of overtime. Such press can also generally be met, either by taking more people into employment when the pressure comes or by getting stock ready beforehand. Either of these ways is preferable to overtime working. Moreover, as a matter of fact, there is a great deal of superstition about the necessity for overtime working at certain seasons. No better illustration of this could be found than that of Mr. Beaufoy, related in the Appendix. An important part of Mr. Beaufoy's business is the manufacture of British wines, and, as everyone knows, British wines are consumed more freely at Christmas than at any other time of the year. Consequently, here appears a clear case for a season of overtime. And in fact when Mr. Beaufoy succeeded to the business there was no limit to the amount of overtime worked during the months of October and November. But Mr. Beaufoy on general grounds thought the system was bad, and determined to put it down. He has put it down absolutely and completely, and his business has benefited by the alteration. (Page 160.)

The Economic Journal. Vol. XIV. London, 1904. The Employment of Women in Paper Mills. B. L. HUTCHINS.

The restriction of overtime is chiefly felt in the processes of finishing the manufactured article, and may give a certain stimulus to the development of machinery, as appears indirectly from the statement of a manufacturer to the Commission, that overtime was required because he had only one pair of rollers. "We ought to have two." (Report, page 309.) In a large envelope mill a great deal of machinery has been introduced to save woman's labour; the reason assigned by the employer was that there is locally a deficiency of labour of this class, and a scarcity of women and girls. It was, however, stated later on by a foreman in the same mill, that the restriction of overtime had previously been found very inconvenient, and more machines having been introduced, any sudden pressure of business could now be successfully dealt with. . . . Yet the demand for

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women's work is keen and still increasing in the same mill. (Pages 246–247.)

The Economic Journal. Vol. XVIII. London, 1908. Gaps in our Factory Legislation. B. L. HUTCHINS.

Another highly desirable reform in regard to hours of work would be the abolition of overtime.

Overtime has also been made illegal for young persons in all trades, and also for women in textile, and in some non-textile, industries. Exemptions are still permitted in industries in which the nature of the employment is supposed to require elasticity, as, for instance, the making of wearing apparel, Christmas gifts, etc., etc. The workers in these employments are thus liable to be kept for very long speeds of work at certain seasons. Considering how long the daily hours under the Factory Act still are, it appears utterly unreasonable to require overtime as well. A master once said to me: "In nine hours the girls have done as much work as is in them to do." The permission of overtime is simply a premium on irregularity and bad organization. Permission to make up "lost time" and work overtime used to be granted in the textile industry, but it has gradually been recognized as a source of weakness, the exceptions have been shut off one by one, and the "normal day" has become more and more the standard. The trend is unmistakably to the prohibition of overtime, and the sooner the better, if we value the health of working girls and women. (Pages 224–225.)

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Jahresberichte der Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1901. [*Reports of the Factory Inspectors in the Kingdom of Württemberg, 1901.*] *Stuttgart, Lindemann, 1902.*

It is our opinion that, in all trades where overtime has become the rule at definite seasons of the year, ways and means should have been discovered by this time for eliminating it, either by doing work ahead in the dull season or by taking on additional hands in the busy season. (Page 11.)

Drucksachen des Kaiserlichen Statistischen Amts, Abth. für Arbeiter Statistik, Erhebungen Nr. 3, Teil I. 1903. [*Publications of the German Imperial Office of Statistics, Department of Labor Statistics, Inquiry No. 3, Part I. 1903.*] *Über die Arbeitszeit der Gehilfen und Lehrlinge*

in Handelsgewerbe und Kaufmännischen Betrieben. [*On the Hours of Shop Assistants and Apprentices.*] (*Investigation made in 1901.*) *Berlin, 1904.* GERMANY

The blame for many bad conditions must be ascribed to the absence of adequate legal restrictions on length of working time. So long as working hours are not limited, the employer does not meet extra work by bringing in extra help, but by overworking his staff by overtime . . . for the work must be done. (Page 34.)

It is often hard to define "overtime." The line between "working time" and "overtime" is not easily drawn unless "working time" is specifically limited by law. . . . The testimony shows that many business firms keep their employees busy until near midnight or even 1 A. M. Such overtime is often due to inadequate accommodation or to poor management, and disappears when these are improved. From Düsseldorf the reports stated that this excessive overtime, often persisting for months and running until late in the night, was complained of by all who were affected by it as the greatest hardship they had to endure. (Page 41.)

The chief complaint of employees as to late overtime is not entirely of the overwork itself, but of the fact that it is almost always avoidable. The causes of late work are actually poor arrangements or insufficient personnel. (Page 43.)

Rapports sur l'Application pendant l'Année 1899 des Lois (1892–1893) réglementant le Travail; par les Inspecteurs Divisionnaires du Travail. [*Reports on the Working of the (French) Factory Laws of 1892 and 1893, in the Year 1899. By the French Factory Inspectors.*] *Paris, 1900.* FRANCE

Would the suppression of overtime be difficult of execution and of a nature to disorganize the industries that now benefit by it? The facility with which certain establishments have voluntarily abolished it must dissipate all fears on this subject.

According to the report of M. Laporte, an inspector in Paris, most of the great furriers' establishments have stopped evening overtime, and they have arranged to have their employees come (in the rush season) an hour or two earlier in the morning.

The 11th and 12th hours are paid at night-work rates, and all work stops at 9 P. M. They find this arrangement satisfactory. (Page xl.)

BELGIUM

Royaume de Belgique. Rapport présenté à M. le Ministre de l'Industrie et du Travail. [*Report made to the Belgian Minister of Commerce and Labor.*] *Travail de Nuit des Ouvrières de l'Industrie dans les Pays Étrangers.* [*Night Work for Women in Industry in Foreign Countries.*] MAURICE ANSIAUX. *Brussels, 1898.*

Nevertheless, where the law limiting the frequency and extent of evening work is enforced, has it not at least caused considerable inconvenience? Is it not a source of incessant embarrassment in the execution of orders?

I have asked most competent persons these questions: the very interesting observations which they have made may be summarized in the following manner:

Under the influence of regulation, a more wholesome organization of work has come about. (Page 60.)

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Bulletin of the United States Bureau of Labor. No. 80. January, 1909. Woman and Child Wage-earners in Great Britain. VICTOR S. CLARK, Ph.D.

Factory administration is now more intelligent than heretofore, elements of cost are more closely watched, future markets are more confidently and accurately estimated, all of which makes it more economical to anticipate the stress season by preparing in advance for its demands than to allow work to accumulate and introduce confusion into the factory organization. This effect of the factory laws first began to be felt strongly after the Act of 1867 was passed. (Page 52.)

(2) PROHIBITION OF OVERTIME PROMOTES REGULARITY OF EMPLOYMENT

Wherever the employment of women has been prohibited for more than ten hours in one day, a more equal distribution of work throughout the year has followed. Regular employment replaces alternation of overwork and non-employment.

GREAT BRITAIN

Hansard's Parliamentary Debates. Vol. 92. 1847.

Bishop of Oxford:

. . . But the question was not, what was the portion of time deducted

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in the course of a single day, but what was the amount of prohibition from labour for the year round? He considered it to be only a prohibition against uncertain labour, and that taking the period of the last 10 years, it would be found though at some intervals men were idle, and at others they were overworked, that upon the average the work actually performed was not more than 10 hours a day. What was the result? It showed that there existed a great desire on the part of the manufacturers to employ large bodies of men extra hours at uncertain periods, to meet sudden demands, instead of being willing to share the market with others by employing men, for limited hours, thereby keeping up a continued stroke of work, and a continued average demand of labour. (Pages 937–938.)

British Sessional Papers. Vol. XV. 1870. Reports of Inspectors of Factories for the Half-year ending October 31, 1869.

Irregularity is bad for all parties; for the adult and married females, because they rise late and waste their time, and consequently have to work such late hours that they have no time to attend to their domestic duties in the evenings, much less to mental improvement, and also because under irregular hours they make less time and earn less wages per week than under fixed hours. (Page 217.)

British Sessional Papers. Vols. XXIX-XXX. 1876. Factory and Workshops Acts Commission. Vol. XXIX. Report. Appendix E. Report of Conference of Members of Women's Trade Unions on the Factory and Workshops Acts, 1875.

. . . The permission granted to season trades for the extension of the hours to fourteen per day, during certain periods of the year, should be withdrawn, with the view of equalizing the work throughout the year. . . .

Bookbinders complained that the trade was most unnecessarily considered by the law a season trade. . . . The existence of the modification made employers careless of due economy in time. (Page 193.)

British Sessional Papers. Vol. XXI. 1894. Report of the Chief Inspector of Factories and Workshops.

Why, then, allow overtime? The result of overtime is essentially injurious; there is a great push for time, people work long hours, often too long hours; then all is over for a time, the workpeople have made money

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and spent it, over-production is encouraged, and the rest of the year there is nothing, comparatively speaking, to do. (Page 299.)

British Sessional Papers. Vol. XII. 1902. Report of the Chief Inspector of Factories and Workshops.

It is often said that the rigidly fixed hours for work and meals in factories tend to make of the worker a machine, taking no actual personal interest in her work, while actually the effect is to help her, if the work does not occupy too great a part of the day, to be a person of some vigour interested in the work, but not entirely to the exclusion of other things, for which she can count on regular periods of leisure. (Page 178.)

English Factory Legislation. ERNST VON PLENER. *London, Chapman and Hall, 1873.*

By establishing a uniform and restricted working day, the Legislature exerted a most beneficial influence over the whole working class; the compulsory fixed time for commencing and leaving off work acted as a salutary check upon idleness as well as against excessive zeal, both which are alike injurious to morals and health. Fortunately both working men and masters alike are generally beginning to appreciate the advantages which regularity in the working system and in the mode of living, resulting from a judicious adjustment of the working hours, confers on all concerned, and thus it has come to pass that factory legislation, which on its first introduction was ridiculed as a monstrosity and prima facie, an abortive experiment, and which, moreover, was attacked and set at nought as an infringement on personal and industrial liberty, is today recognized in England as one of the soundest foundations of social reform and one of the most beneficial institutions of the State. (Pages 114–115.)

The Case for the Factory Acts. Edited by Mrs. SIDNEY WEBB. *London, Richard, 1901.*

The direct and constant result of enforcing standard conditions of employment is, . . . to raise the capacity of the workers. The prevention of excessive or irregular hours of work, the requirement of healthy conditions, and the insistence on decency in the factory or workshop—the direct results of factory legislation—represent exactly what is required to extricate the mass of working women from the slough of inefficiency in which they are unfortunately sunk. Hence, so far from regulation being any detriment to the persons regulated, it is, as all experience proves, a positive good. (Page 210.)

GREAT BRITAIN

British Association for the Advancement of Science. 72nd Meeting. 1902. Women's Labour: Second Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labour. London, Murray, 1903.

It is an important but very difficult problem to decide what hours would now be worked in the factories if there were no Acts. The following instances go to show that the hours would be longer; the cases above given where the women stop, but their work is carried on; the attempt of the women to put in extra work at meal times, the frequent cases of overtime worked by men in various parts of the factories; . . . the longer hours said to be worked by non-regulated home workers. . . . Employers and workers often admit that overtime, when allowed is not economical, and that 56½ hours is as long as women can work efficiently. Employees are very anxious to get off in the evening. . . . Without the Acts it seems certain that less uniformity would have been obtained, and that in many cases excessive hours would now be worked; and it is not easy to instance any occupation where the hours would probably have been shorter. . . . There is no direct evidence as to the effect on women's industrial or social efficiency, but there is general agreement that longer hours would be harmful and that the existing restrictions are beneficial. . . . Their effects on the comfort, health, and regularity of the lives of the workers have been great and beneficial. (Pages 293–295.)

British Association for the Advancement of Science. 73rd Meeting. 1903. Women's Labour: Third Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labour. London, Murray, 1904.

Employees, so far as their opinions have been gathered, are unanimous in approving the restriction to the maximum allowed. . . . The Acts have had considerable effect in spreading work more uniformly through the week, month, or year, where there is occasional pressure. . . .

There is some evidence that the regularization of hours has promoted the efficiency of women as productive agents. (Pages 340–341.)

Women's Work and Wages. EDWARD CADBURY, M. CÉCILE MATHESON, *and* GEORGE SHANN. *London, T. Fisher Unwin, 1906.*

On the whole, however, employers are beginning to recognize that overtime "does not pay." "Loss of overtime is not necessarily a loss of work,

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but a redistribution (and an economic one, too) of the times at which work is done and does not therefore mean a loss of income, but a steadying and regulation of income." (Page 38.)

GERMANY

Jahresberichte des Gewerbe-Aufsichtsbeamten im Königreich Württemberg für das Jahr 1902. [*Reports of the Factory Inspectors in the Kingdom of Württemberg for 1903.*] *Stuttgart, Lindemann, 1904.*

But it is urgently necessary that the abuses (of overtime) which have become common should be prevented and that the habit of some employers of working overtime to the utmost legal limits, should be stopped by the gradual restriction and ultimate prohibition of all overtime. . . . These abuses are repeatedly spoken of in the reports, . . . employers compelling their women to work at times, with feverish intensity for 13 hours, while perhaps a little later there is no work or scarcely any. (Page 194.)

Handwörterbuch der Staatswissenschaft. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Political Science in Göttingen and* EDG. LOENING, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

A rigid limitation of the daily hours of work is often advocated, to be only relaxed under circumstances of extraordinary urgency, with the idea that thus the extremes in the lives of workers, the evil alternation between forced production and crises might be obviated. (Page 1204.)

FRANCE

Rapports présentés à M. le Ministre du Commerce, de l'Industrie, des Postes et des Télégraphes par les Inspecteurs du Travail. [*Reports of the (French) Factory Inspectors to the Minister of Labor, etc.*] *La Question de l'Interdiction du Travail de Nuit.* [*The Question of the Prohibition of Nightwork.*] M. LEGARD, *Inspector. Paris, 1900.*

The working class demands two things; regularity in the distribution of working time, and a living wage. . . . Night work means superactivity at certain seasons, followed by periods of unemployment. (Page 62.)

UNITED STATES

Report of the Illinois Factory Inspectors. 1893.

A valuable result of the new law already to some extent obtained, is the greater uniformity of work and rest insured to girls and women. Formerly

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the custom prevailed of working overtime in many trades during a part of the year and then closing the factory outright, or working three or four very long days a week. This irregularity is one of the most cruelly demoralizing experiences of the working girl's life, injurious alike to health and to every habit of thrift and persevering effort. (Pages 18–19.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part VII. Women Workers in Milwaukee Tanneries. IRENE OSGOOD, *Special Agent.*

These illustrations are sufficient to indicate the importance of considering irregularity of employment, overtime, and undertime, in any study of wages. It affects the wages, habits, and morals of employees more than any other factor in the industry. Certainty of an occupation, and regularity of work are practically essential to the welfare and happiness of those who earn their living day by day. (Page 1060.)

Bulletin of the United States Bureau of Labor. No. 80. January, 1909. Woman and Child Wage-Earners in Great Britain. VICTOR S. CLARK, Ph.D.

Though in many factories the later laws have not reduced hours of work, they have exercised an important influence in making these hours more regular. Irregularity is due principally to two causes, both of which are in great part remediable. The first is the bad working habits of the operatives themselves. In the old days workmen would lay off the first part of the week and then try to make up wages by excessive hours just before pay day. This is still an evil where manufacturing is carried on in the homes. The second cause is the seasonal demand for goods in some industries, which presses manufacturers for heavy deliveries at certain times of the year. They used to meet this by putting on extra employees, sending work to outworkers, and by overtime. These were uneconomic expedients, and under the influence of the factory regulations a better distribution of work throughout the year has in many trades already been accomplished. Of course when factories are working fewer than the maximum number of hours allowed by law, they may employ women and children up to that maximum, in case of emergency, without restriction. This is done in many instances. Factory accommodations are more adequate than formerly, so that extra hands can be taken on when needed. This causes some irregularity of employment for these temporary employees; or rather it might be said that they are given an opportunity for

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employment that would not exist if the regular hands worked longer hours. (Page 52.)

The great effect of this act (1867) stipulating a normal day was to lessen irregularity rather than to lessen hours worked per week, for even before 1867 the hours of work in a week often would not exceed 60. The need for alteration was not so much due to the number of hours as to the irregularity of work. At times of pressure employers worked their employees any number of hours they pleased, and the irregular habits of the work people themselves often compelled employers to work long hours to make up for lost time. (Page 53.)

. . . There are some material and moral benefits to be traced directly to the factory laws. They have made the hours of work more regular, relieving workers of the tyranny of their own bad habits and of inefficient industrial administration, whereby formerly they experienced alternations of idleness and excessive labor, injurious alike to their health and morals. (Page 72.)

(3) Effect on Wages

The additional wages of overtime work are often urged as reasons for allowing such work after the regular hours of labor. But such wages, even where they are obtained, are earned at too dear a cost to the workers. Extra living expenses cut down the slight extra income, while the injuries to health received in overtime work more than outweigh the small pecuniary balance. Often, too, after overtime is established, the longer hours become the rule, and are paid no higher than the original shorter day.

GREAT BRITAIN

British Sessional Papers. Vol. X. 1840. First Report from Select Committee on the Act for the Regulation of Mills and Factories.

Witness, L. Horner, Inspector of Factories:

1616. You are aware that the persons working in factories have for a succession of years petitioned Parliament for a reduction of the hours of labour in factories to 10; are you also aware that in all the petitions they have ever sent they have never expressed any opinion whatever as to what the wages would be, but they have constantly complained of the hardship they had to endure by being worked longer than their physical powers afforded them means of doing compatibly with their health, and

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that they have been willing to make the experiment of limiting it to 10 instead of 12, provided an Act was passed for that purpose regardless of the consequences that might befall them in the rate of wages?—I am strongly impressed with the belief that the workers who have come forward in that way, have done so under a conviction that there would be no reduction in wages eventually, although it might take place at first, but that they would get in a short time as much for 10 hours' labour as they at present get for 12 hours' labour. (Page 121.)

British Sessional Papers. Vol. XX. 1878. Reports of the Inspectors of Factories and Workshops.

The women at the close of the twelve hours, which period constitutes the usual day's work, were tired and exhausted, and hardly did enough after that to pay for the gas consumed. Book sewers and folders are all paid by piece work, and if overtime were continued for a few weeks together their earnings would soon fall to about the same amount as when they worked the regular hours. (Page 14.)

FRANCE

Documents Parlementaires. Chambre des Députés, 10 Juin, 1890. Annexe 649. Rapport sur le travail des enfants, des filles mineures et des femmes dans les établissements industriels, par M. R. WADDINGTON. [*Parliamentary Documents, French Chamber of Deputies, June 10, 1890. Annex 649. Report on the labor of Children, Young Girls, and Women in Industrial Establishments.*] Senator RICHARD WADDINGTON.

Supper and carfare (after overtime work) often exhaust the additional pay. Fatigue and sickness resulting from overwork compel absence and corresponding loss of wages. A better organization of work would remedy this and make over hours unnecessary without harm to business. (Page 1087.)

Documents Parlementaires. Sénat, 22 Juin, 1891. Annexe 138. Rapport sur le travail des enfants, des filles mineures, et des femmes dans les établissements industriels. [*Parliamentary Documents of the French Senate, June 22, 1891. Annex 138. Report on the labor of Children, Young Girls and Women in Industrial Establishments.*] M. TOLAIN.

The abuses of such a system of overtime are flagrant, and the women subjected to them complain bitterly. If, even, this burden of over-fatigue

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brought some improvement in general welfare But it does not, for the increased incidental expenses completely wipe out the increased payment of wages for overtime. And, if the employee is late in arriving at her working place the next morning as a result of exhaustion the evening before, she loses a part of her wages by fine. (Page 205.)

Rapports sur l'Application pendant l'Année 1899 des Lois (1892–1893) réglementant le Travail; par les Inspecteurs Divisionnaires du Travail. [*Reports on the Working of the (French) Factory Laws of 1892 and 1893 in the year 1899. By the French Factory Inspectors.*] *Paris, 1900.*

Overtime necessitates extra expenses for the worker who has to submit to it; it is more taxing to the human system and is in actual practice rarely paid for at a higher rate than regular work. (Page 368.)

Whatever arrangement of work might finally be agreed upon, we are certain that evening overtime should be stopped. (Page 428.)

Ministère du Commerce, de l'Industrie, des Postes et des Télégraphes. Office du Travail. [*French Labor Department.*] *Législation Ouvrière et Sociale en Australie et Nouvelle Zélande.* [*Social and Labor Legislation in Australia and New Zealand.*] Dr. M. ALBERT METIN. *Paris, 1901.*

The experience of England has shown that, if overtime is agreed to by some, it is soon imposed upon others. Those who decline it are, in one way or another, forced out of their jobs.

As a matter of fact the employer tends to regard the day with overtime as the normal day; he inclines toward a return to the former scale of wages but without reducing the length of working time. Thus the too frequent practice of overtime tends in the end to a reduction of wages. The conclusion is self-evident that adult workers should submit to a regulation of working time in their own interest. (Page 88.)

First International Conference of Consumers' Leagues at Geneva, 1908. La Veillée: Abus et Responsabilités. [*Overtime: Abuses and Responsibilities.*] Mme. A. PAUL JUILLERAT, *French Factory Inspector. Fribourg, 1909.*

After the excessive rush of the "season" there is another evil, which is partly the result of the first and is no less real a hardship, this is the

unemployment of the dull season. . . . (Page 61.) There are workers who are willing to work overtime for the extra gain in wages, but how many of them are able to lay by for the dull season? Very few. The extreme fatigue they endure often reduces their vitality to such a point that, weak and anæmic, they are obliged to expend all the little surplus gain for medical treatment and care. (Page 62.) FRANCE

Royaume de Belgique. Rapport presénté à M. le Ministre de l'Industrie et du Travail. [*Report to the Belgian Minister of Commerce and Labor.*] *Travail de Nuit des Ouvrières de l'Industrie dans les Pays Étrangers.* [*Night work of Women in Industry in Foreign Countries.*] MAURICE ANSIAUX. *Brussels, 1898.* BELGIUM

The unlimited prolongation of labor throughout the day and the night is humanly impossible; or if it is done anyhow, it must be paid for dearly and cruelly.

A woman whose health is ruined and whose nervous system is broken down by prolonged and frequent evening work is no longer able to furnish during a given period of time work as good or as abundant as in the past. This is perhaps the explanation of the fact that I have more than once heard stated and confirmed, that the level of total wages has not fallen appreciably on account of the prohibition of night work. (Pages 146–147.)

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Le Travail de Nuit des Femmes dans l'Industrie en Autriche.* [*Night Work of Women in Austrian Industry.*] ILSE VON ARLT. *Jena, Fischer, 1903.* AUSTRIA

The woman who passes all her evenings at outside work can hardly prepare dinner, accomplish the minor daily labors of her housework, and devote part of her time to her children. (Page 101.)

If there is indeed ground for supposing that the industrial activity of married women rarely brings in certain cases more than sufficient to pay for the management of the house and the care of the children, it is certainly beyond dispute that the majority of the wages obtained by overtime hours will not, in any manner, compensate for the neglect of domestic duties. . . . It is necessary, moreover, for mothers to take account of the fact that they are without doubt able to place their children in safe places during the day, but not in the evening. (Page 102.)

UNITED STATES

Report of the United States Industrial Commission on the Relations and Conditions of Capital and Labor Employed in Manufactures and General Business. Vol. VII. 1900.

Mr. Samuel Gompers, President American Federation of Labor:

I am opposed to overtime work except in a case of absolute necessity,—for the safety of life and the preservation of property from destruction. Overtime is nothing more than the lengthening of the day's work. It becomes habitual, and when it becomes the habit of the employers the rule is that the wages paid for overtime, including those of the day's work, do not exceed the wages which have been paid for the regular day's work; that is, after a while it happens that overtime—overwork—becomes the rule and is no longer overwork. . . . Overtime makes the workman slovenly, deadens his senses, makes him careless of himself and fellows. (Pages 613–614.)

Report of the Wisconsin Bureau of Labor and Industrial Statistics. 1907–1908. Part VII. Women Workers in Milwaukee Tanneries. IRENE OSGOOD, *Special Agent.*

The bad effect of overtime work on wages intensified by the piece-rate system, can be illustrated by the records of the girls.

TABLE III.—HOURS, WAGES, AND RATE PER HOUR BASED ON PIECE WORK WAGES FOR THE GIRLS.—SHOWING THE EFFECT OF OVERTIME ON EARNINGS.

Date, 1906	A			B			C		
	Hours Worked	*Wages Earned (2 Weeks)*	*Rate per Hour*	*Hours Worked*	*Wages Earned (2 Weeks)*	*Rate per Hour*	*Hours Worked*	*Wages Earned (2 Weeks)*	*Rate per Hour*
January 15 .	120	$22.50	$.187	120	$24.14	$.20	120	$18.65	$.155
January 31 .	129	18.50	.14	60	6.05	.10	133	19.33	.145
March 31. . .	132	20.67	.157	140	19.63	.14	134	14.65	.107
May 15	133	17.02	.128	133	11.79	.08	130	18.25	.14

The earnings of A, as shown in Table III, under the piece rate system, ranged from 12.8 to 18.7 cents per hour; B ranged from 8.4 to 20 cents per hour; while C's hourly earnings ranged from 10.7 to 15.5 cents. In each case the highest wages per hour were received on those days when

fewer hours were spent at work. Similar variations exist in the earnings of many others. But when the attention of one of the girls who had worked in the tannery for more than four years was called to this apparent anomaly in her own earnings, she was unable to explain it. Her mother said: "I have often noticed that the longer she works the less she gets." After some further thought the girl finally concluded that her exceptionally low earnings were probably occasioned by work upon a class of skins for which a lower rate was received. Of course it might be possible that she worked with less vim or intensity on those particular days. Or it might easily have been due to the effect of overtime as expressed by a London forewoman: "when overtime is worked the piece workers do not make more, as a rule, for they get so tired that if they stay late one night they work less the next day." There is ample evidence to show that when overtime is worked for several weeks under the piece rate system, earnings inevitably tend to fall to about the same amount received for regular hours of labor. In the long run, therefore, overtime work brings them no extra reward under the piece rate system. It brings them instead lowered forces of vital energy. (Pages 1058–1059.) UNITED STATES

(4) Effect of Requiring Extra Pay for Overtime

In those communities which require by law extra high pay for overtime the system tends to be automatically abolished. When employers are not able to keep their employees for evening work without a substantial outlay in wages, they have found it possible to reduce overtime extensively by better organization and foresight.

Report of the Queensland Chief Inspector of Factories and Shops for the Period from 1st Jan. to 30th Sept., 1901. Brisbane, 1902. AUSTRALIA

Objection has been made by certain occupiers to the provision insisting upon a minimum payment of 6d. per hour for overtime, but I am strongly of opinion that there is no more just or effective provision in the section for limiting the amount of overtime worked by those more or less helpless employees. It is unfortunate that, in making this provision for the payment for overtime, provision was not also specifically made in the interests of piece workers. This is quite obviously an oversight, but, nevertheless, full advantage is being taken of it, and the unfortunate

AUSTRALIA

effect of it is that, while a young employee paid by weekly wages who is working overtime receives a minimum of 6d. per hour, another one employed by piece work on perhaps very similar work receives the ordinary rate of pay. A reference to the table showing the amount of overtime worked will at once reveal part of the effect of this provision in the reduced amount of overtime worked by boys (who are mostly time workers) compared to that worked by females. (Page 7.)

Report of the Queensland Chief Inspector of Factories and Shops for 1902. Brisbane, 1903.

Overtime must not be worked by these employees more than two nights in succession, and must be paid for at the rate of time and a half, the minimum payment being at the rate of 6d. per hour. This makes the employment of young labour, as a rule, unremunerative, and consequently it is not availed of except in pressing cases. These provisions may press heavily on some occupiers for whose work young labour is ordinarily quite suitable, and other hands cannot be engaged to work the overtime required, but when all occupiers are treated alike the hardship is a small one. (Page 8.)

Report of the Victoria Chief Inspector of Factories, Work-Rooms and Shops for 1907.

Although the hours of labour for males over 16 years of age are not limited, still in the majority of trades in which the wages are fixed by Wages Boards, the wage provided is for a week of 48 hours, and overtime rates have to be paid for any time worked in excess of that number. This has had the effect of making 48 hours the recognized weekly hours for a week's work where the Determinations of Wages Boards apply, but it has also affected numbers of workers that are employed far from cities or towns, and has proved beneficial to those who do not come under the Factories Acts at all. For instance, within the last year or two the saw-millers, whose works are carried on chiefly in shires, now recognize the 48 hours limit, and I am informed on good authority that at least one manager of a large saw-mill has stated that he has found by experience that by conceding the 48 hours he has suffered no loss, though he has made no reduction in wages. (Page 67.)

My experience is that suspensions to be allowed to work overtime are not availed of unless it is imperative. The stringent conditions as to payment for more than 48 hours' work are effective in minimizing overtime,

as also does the fact that it is recognized that the fatigue which results from long hours of night work prevents the ordinary amount of work being done next day. (Page 68.) AUSTRALIA

Report of the New Zealand Department of Labour. 1908. Wellington MaKay, 1908. NEW ZEALAND

There has been comparatively little overtime worked in shops during the year. The fact that a permit is necessary and that such overtime has to be paid for at time and a half has had the effect of reducing the overtime very considerably. (Page xx.)

Sweated Industry and the Minimum Wage. CLEMENTINA BLACK. *London, Duckworth, 1907.* GREAT BRITAIN

Long hours, which are in effect one form of low wages, have been checked by the Factory Acts, but not yet ended. (Page 29.)

It must be remembered that, in the case of workers paid by the day, as is usual in dressmaking establishments, and in some departments of laundry work, there is frequently no extra payment made for overtime. I have indeed heard a West-end working woman declare that overtime would cease if the law made payment for it compulsory; and although that assertion was much too sweeping, the experience of strong trade unions shows that when employers are compelled to pay at a higher rate for overtime, that necessity for overtime of which so much is heard whenever the Factory Acts are under discussion, does diminish in a very remarkable manner. (Pages 32–33.)

La Femme dans l'Industrie. (*Woman in Industry.*) R. GONNARD. *Paris, Colin, 1906.* FRANCE

The inspector of labor of Lyons says:

"It has come about that this decrease of the legal maximum limit of hours of labor (ten hours a day), which went into effect the 28th of March, 1902, obliging the employer to pay a higher wage for overtime hours, has urged the manufacturers to replace their former equipment by machines of great producing power. In short, for the manufacturers in question, the regulation has become a powerful stimulus, which has driven them to do away with methods of manufacture already somewhat superannuated." (Page 78.)

E. *Uniformity Essential for Purposes of Enforcement*

In order to establish enforceable restrictions upon working hours of women, the law must fix a maximum working day. Without a fixed limit of hours, beyond which employment is prohibited, regulation is practically nullified. Exemptions of special trades from the restriction of hours not only subject the workers in such industries to injurious overwork, but go far to destroy the whole intent of the law. The difficulties of inspection become insuperable.

GREAT BRITAIN

British Sessional Papers. Vol. IX. 1841. Report from the Select Committee on the Act for the Regulation of Mills and Factories.

Your Committee . . . wish to impress upon the House, in the language of one of their witnesses, that "wherever there is the power of making up lost time, it ought to be guarded by every possible check; it is so easy to evade, and so difficult to detect any evasion, that every possible check that can be devised to prevent dishonest working ought to be introduced.

The 4th Section "provides for time unavoidably lost in cases of accident," and gives permission that, whenever anything shall happen to the machinery of the mill, whereby not less than three hours labour at any one time shall be lost, such time may be worked up under certain restrictions. It was urged before your Committee, that, experience having proved the facility and frequency of abuse of this power, it ought to be taken away by any amended Bill. "It is a Section," says one Inspector, "which I believe has been productive of the grossest violations of the law, without the possibility of our checking it." Any accident, however minute, to any part of the mill-gear, has been held sufficient to justify the making up of lost time at some other more convenient period. . . . He is asked whether "it would not be rather oppressive upon the workpeople, if no possible accident, under any circumstances, should be allowed to be worked up?" He replied, "I conceive hardship may arise in particular cases, but I think the balance is decidedly in favour of there being no possibility of working up lost time." (Page 2.)

Another witness, an operative, is asked, "Have you any information as to the feelings of the working people in regard to the clause which permits working to make up lost time?—That is the source of grievance to a

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vast number, both of children and adults; I have heard them frequently say when lost time is allowed to be worked up, that they would rather lose their wages for the time that was lost than make it up. . . . They have expressed themselves strongly on that point, that they would rather lose their wages than work the time up. (Page 3.)

Your Committee, referring to the evidence of the witnesses examined on the subject of making up lost time arising from accidents to the machinery, etc., are of the opinion that great abuses have arisen under the 4th Section of the Act, and would urge upon the House that effectual means should be taken to put a stop to this evil. (Page 4.)

British Sessional Papers. Vol. XXII. 1842. Reports of Inspectors of Factories for the Half-year ending June 30, 1842.

Night-work no one fears, because it entails so many disadvantages; but it is a small excess which we have most to complain of, as it does not involve the necessity of two sets of overlookers and managers and there is consequently none of the difficulty of night-working attendant upon it; and it is all clear gain to the party practising it. (Page 9.)

British Sessional Papers. Vol. XIX. 1873. Reports of Inspectors of Factories for Half-year ending 30th April, 1873.

The difficulty of acquiring evidence, too, of this overwork is very great, for the danger of loss of employment on the disclosure of facts is so deterrent of exact information by the oppressed workers that they will not appear before the magistrates to support the Sub-Inspector in his attempt to protect them, however urgently or indignantly that protection has been claimed. (Page 44.)

British Sessional Papers. Vol. XIX. 1890–91. Report of Inspector of Factories.

These modifications of the law (allowing overtime) were intended to meet *bona fide* cases of season pressure and short-notice orders, arising from unforeseen events, but beyond doubt under their cover much illegal working is carried on, the very flimsiest of pretences being made the excuse for continuing work after the prescribed finishing hour.

Whenever the Act comes up for amendment I venture to think that some of these modifications might, without causing any real hardship, be limited in their scope, if not altogether repealed. (Page 49.)

GREAT BRITAIN

British Sessional Papers. Vol. XXI. 1894. Report of the Chief Inspector of Factories and Workshops.

By dressmakers and milliners, . . . legal overtime is almost universally condemned. A dressmaker's assistant, whose legal working day had for a considerable period lasted from 8 A. M. to 10 P. M. said to me in the presence of her fellow workers, "the overtime exception just spoils the Factory Act." . . . The popularly supposed compensation of extra overtime seldom exists, and the young apprentice, improver, or assistant who spends 14 hours a day in workrooms, often ill-ventilated and overcrowded, finds it difficult to understand that her day has been allotted to her, not by a law-breaking employer, but in accordance with the provisions of a protecting Act. (Page 11.)

British Sessional Papers. Vol. XIX. 1896. Report of the Chief Inspector of Factories and Workshops.

I most cordially approve of the extensions of the Act in the various directions in which these have been made; but I fear that the regulations as to the hours of work permissible in laundries will be of little avail to avoid overtime so long as the somewhat senseless power is accorded of daily altering the period of employment. In connection with this it is only necessary for anyone having the most rudimentary acquaintance with factory life to reflect how absolutely useless the Factory Acts would have been during the many years of their existence if the hours in factories and workshops had been regulated on this principle. It is only to be hoped that their power may be rescinded at the earliest opportunity. (Page 18.)

British Sessional Papers. Vol. XVII. 1897. Report of the Chief Inspector of Factories and Workshops.

Twelve months' work among the laundries in London and the neighbourhood, in districts devoted to this industry, has afforded special opportunities for observing the working of section 22, 1895. (Overtime.)

The result cannot be said to be satisfactory. Employers complain that they cannot understand the provisions governing laundries, and as to the workers themselves, the ironers, washers, machine girls, packers, and sorters, constant intercourse with them has produced a painful impression of the disappointment they have experienced with regard to what the Act has done for them. (Pages 67–68.)

A year's experience of the working of the sections applicable to laundries

GREAT BRITAIN

has proved the value, importance, and benefit of those which apply to a laundry as if it were a factory or workshop, e. g. sanitation and safety, but as anticipated, the extreme elasticity of the rules regarding employment has not only made evasion easy, but has given legal sanction to employment for an excessive period on certain days if other days of the same week are correspondingly short. (Page 68.)

In general, so far as periods of employment, specified meal times, and all matters affecting hours of work are concerned, in any industry of which I have experience, the treatment of branches of work as separate factories or workshops, except with rigid enforcement of the guarded conditions laid down in the order of the Secretary of State, would constitute a serious innovation on the regulation of hours by the Factory Acts which has been so successful in the past, and which is still a model for other industrial countries. Even now reformers in France, after experience of a looser system of control of such exceptions are striving for the abolition of the shift system which has there often made limitation of hours for protected persons a matter of theory rather than a reality. (Page 70.)

British Sessional Papers. Vol. XIV. 1898. Report of the Chief Inspector of Factories and Workshops.

Nothing has been more striking than the difficulties surrounding the law affecting laundries. The immensely long hours, the absence of any conditions as to mealtimes other than that there shall be at least half an hour in every five hours' spell, and the extraordinary manner in which overtime is at present worked, combine to make the inspection of laundries more difficult and more ineffectual than in any trade I have had under my notice. (Page 107.)

British Sessional Papers. Vol. XI. 1900. Report of the Chief Inspector of Factories and Workshops for the Year 1898.

To visit laundries is but disheartening work in most cases. The law is so elastic that it is almost impossible to see that its provisions as to hours are carried out. No adherence to the stated period on the abstract can be insisted on, as a substituted period can be worked on any day. Over and over again one hears complaints of long hours and late hours in laundries, and in nine cases out of ten nothing can be done as the legal limit has not been infringed. A woman *may* work from 8 in the morning till 11.30 at night for three nights a week, and for 30 days in the year,

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provided she is given an hour and a half for meals during that time. The law allows her to stand at a washtub for 14 hours in one day, or to stand in the heated ironing-room pressing heavy irons for that period. It is small wonder that accidents in laundries are not uncommon under such circumstances. In steam laundries, where machinery is being more and more used, it is disquieting to hear of the frequent accidents of the tops of fingers smashed in the rollers of the collar machines, and the more terrible accidents caused by the calenders, where a moment's inattention may result in the loss of all the fingers of one hand. . . .

The want of a definite short day in laundries is a frequent cause of complaint. (Pages 178–179.)

British Sessional Papers. Vol. X. 1901. Report of the Chief Inspector of Factories and Workshops.

The existence of an exemption (in the fish-curing trade) has rendered the administration difficult and uncertain in result. It is noteworthy that in this trade, in which overtime is permissible to women on sixty occasions in the year, I have never found overtime notices in use in any workshop. The occupiers do not find them necessary. Starting with an exemption for one process, that of "gutting, salting, and packing," the industry would seem to have shaken itself gradually free from control, until now we find fish that have been in salt for several weeks dealt with as perishable articles. Given plenty of time and unsuitable surroundings, every article of food is to some extent perishable, and when a herring has been kept in salt for some weeks there is no reason for working on it at night except the reason that the day will bring other work, and in this seems to lie the cause of much of the late and irregular hours of the fish-curing trade. (Pages 388–389.)

British Sessional Papers. Vol. XII. 1903. Report of the Chief Inspector of Factories and Workshops.

After six years' experience of the effect of the present regulations, it is impossible not to feel greatly depressed by the result; the elasticity of the law has tended to encourage rather than check these unsettled hours. (Page 174.)

The innumerable loopholes and subterfuges which it affords to a sharp and unscrupulous employer places his more stupid or more scrupulous competitor at an unfair disadvantage, which is preventable, and therefore

should be prevented. The broad, clear limitations, easily understood and capable of being exactly and thoroughly enforced, which apply to other industries under the Act, impose the same obligations and provide the same protection for all alike. This is impossible where regulations cannot be properly enforced and can be continually evaded with success. (Page 174.) GREAT BRITAIN

Women's Work. A. Amy Bulley *and* Margaret Whitley. *London, Methuen, 1894.*

Evidence given before the Labour Commission, and furnished on many occasions in the annual report of the Chief Inspector of Factories by Her Majesty's factory inspectors, proves conclusively that in the first place overtime is injurious; in the second that it is often totally unnecessary; and, in the third place, that it is impossible to keep an effective check on the period during which work is performed. (Page 160.)

The Case for the Factory Acts. Edited by Mrs. Sidney Webb. *London, Richard, 1901.*

To accede to the demand for greater elasticity is to suppose a higher code of morals on the part both of employers and of employed than experience justifies, and it would also render necessary a far more elaborate and irritating system of inspection than at present exists. The efficiency of modern factory industry depends very greatly upon automatic working —upon its standardization of conditions; and the existing factory law with its inelastic provisions is, in reality, a great aid in maintaining those conditions of efficiency. (Page 93.)

The fact that exceptions lead always to illegalities—that a permission to work till ten at night leads constantly to work till one or two in the morning—appears frequently. (Page 153.)

Rapports sur l'Application pendant l'Année 1899 des Lois (1892–1893), réglementant le Travail; par les Inspecteurs Divisionnaires du Travail. [Reports on the Working of the (French) Factory Laws of 1892 and 1893, in the year 1899. By the French Factory Inspectors.] Paris, 1900. FRANCE

Inspectors are not armed to resist the excessive, even though legal demands of employers, who, with their repeated claims for exemptions which they call temporary, succeed actually in freeing themselves permanently from the obligations of the law, with the result that they bring about and perpetuate that condition of partial unemployment of which workers rightly complain. (Page 32.)

FRANCE

Demands for exemption have increased steadily since 1895, and, with rare exceptions, they have not been of that emergency nature which was contemplated by the law. (Page 32.)

. . . The privilege given to employers to infringe temporarily the prohibition of night work continues to be essentially delusive, and perpetuates abuses which it is almost impossible to reach or to repress. (Page 112.)

It is almost impossible for employers in those industries which permit work to go on until 11 P. M. not to break the law, for it is always in times of rush work, that the necessity for overtime arises, yet the workers have been at work since early morning. Evening overtime agrees ill with the prohibition of more than 12 hours work, for, as I have said, overtime is always an emergency and the women who have already worked their full day do the overtime. Others are not to be found. (Pages 147 and 148.)

Supervision is extremely difficult, not to say impossible, for, if the inspector goes after 9 P. M. the door is not opened. It has, indeed, only been by strategy that inspectors have succeeded in proving violations of the law, and strategy is not compatible with the dignity of an inspecting body. (Page 148.)

"In general, the personnel retained for overtime are the experienced women. . . . From the time when the law went into effect the inspectors have never known of a different set of workers being employed in the late evening hours; it is always the regular staff that is burdened with this supplementary time." (Page 195.)

Control of evening overtime is extremely difficult, not to say impossible; we must have some effective means of preventing fraud, or, what is more to the point, of making it impossible for the employers to commit fraud. (Page 268.)

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *L'Interdiction du Travail de Nuit des Femmes dans l'Industrie Française.* [*Prohibition of Night Work of Women in Industry in France.*] Prof. P. PIC, *University of Lyon. Jena, Fischer, 1903.*

It is absolutely certain that legal exemptions directly encourage fraud. M. Laporte, division inspector in Paris, has said so publicly, and no one has contradicted him. (Page 210.)

All the annual reports of the *Commission supérieure du travail* prove

that the system of evening hours stands condemned, both by reason of its serious sins against hygiene and morality and the premium it places upon fraud. It is eminently desirable that it should be made to disappear as soon as possible. (Page 211.) FRANCE

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Jena, Fischer, 1903.* SWITZERLAND

The following, written by Inspector Schuler sixteen years ago, is still of value: "The extraordinarily rapid weakening of resistance to a normal working day, the growing disapproval of opposition, and the absence of any ruinous results to production in spite of very grave apprehensions in this regard, justify our claim that to grant frequent exceptions for overtime is almost equivalent to nullifying the regulations of the duration of work." (Page xxxiii.)

Schriften der Gesellschaft für Soziale Reform, Heft 7–8. [*Publications of the Social Reform Society, Nos. 7 and 8.*] *Die Herabsetzung der Arbeitszeit für Frauen und die Erhöhung des Schutzalters für Jugendliche Arbeiter in Fabriken.* [*The Reduction of Women's Working Hours and the Raising of the Legal Working Age for Young Factory Employees.*] Dr. AUGUST PIEPER *and* HÉLÈNE SIMON. *Jena, Fischer, 1903.* GERMANY

Legal exemptions for overtime . . . increase the difficulties of inspection and offer not only opportunities, but temptations to disobedience to the laws, especially as the inspecting staff is never large enough, the fines for infraction are much too small, and the unorganized workers are usually ready partners in disregarding legal prohibitions. Thence arise unceasing complaints from factory inspectors in all countries, of illegal overtime carried on under cover of the exemptions permitted. (Pages 283–284.)

Legal recognition of overtime offers a dangerously easy method of evading the law. In many cases the benefits of a maximum working day are completely nullified by exemptions, and in all cases the already difficult task of inspection is rendered doubly difficult. "No laws, perhaps, are so often disregarded as labor laws, and every legal exemption enhances the difficulty of discovering infractions."

The English government held it to be not only more advisable, but also more profitable, to put a stop to all overtime "except in cases of national emergency." And the English inspectors oppose it uncondi-

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tionally on the basis of their past experience. One of them says: "Legal permission of overtime is in my opinion a public scandal." (Page 117.)

Labor Laws for Women in Germany. Dr. ALICE SALOMON. *Published by the Women's Industrial Council. London, 1907.*

Unfortunately, however, the law provides for a number of exceptions to the above rules respecting the hours of labor, exceptions which render adequate control difficult and greatly weaken the effect of the law. (Page 5.)

F. *Uniformity Essential to Justice to Employers*

Few employers are able to grant their employes reductions of hours, even if they are convinced of its advantages, while their competitors are under no such obligation. The uniform requirement of limited working hours, therefore, not only checks the unscrupulous employer, but makes it possible for the enlightened and humane employer to shorten the working day without fear of underbidding competitors.

(1) To Encourage the Best Employers

GREAT BRITAIN

British Association for the Advancement of Science. 73rd Meeting. 1903. Women's Labour: Third Report of the Committee . . . appointed to investigate the Economic Effect of Legislation Regulating Women's Labour. London, Murray, 1904.

So far as legislation has furthered the reduction of hours to the period of greatest output, it has promoted efficiency; and in many cases the Acts have only made generally compulsory what the firms with most capital and best management had already practised. (Page 339.)

GERMANY

Handwörterbuch der Staatswissenschaften. Bd. I. [*Compendium of Political Science. Vol. I.*] *Edited by* Drs. J. CONRAD, *Professor of Political Science in Halle;* L. ELSTER, *Ober Reg. Rath in Berlin;* W. LEXIS, *Professor of Law in Halle. Arbeitszeit.* [*Hours of Work.*] Dr. H. HERKNER, *Berlin. Jena, Fischer, 1909.*

As reduction of hours, under some circumstances, is entirely in the interests of intelligently managed enterprises, it has not been uncommon for employers to establish a shorter day of their own accord.

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It is doubtful whether the State would have arrived at the restriction of hours so soon, had it not been for the experiments of such enlightened men. Nevertheless, it would not do to leave the whole domain of hours entirely to the growing insight and good intentions of employers. They are not always enlightened, and furthermore there are many cases which need reduced hours, but where it is not to be expected that the employers would think so. (Page 1217.)

UNITED STATES

Report of the Massachusetts Bureau of Statistics of Labor. 1881.

As a further result, we have found that a large majority of the manufacturers would prefer ten hours to any greater number, "if only all would agree to it." Repeatedly has it occurred, when our agents have made known their errand, that almost the first words of the manufacturer would be, "It (ten hours) would be better for manufacturer and operative, if it could only be made universal"; and these words, always spoken so spontaneously as to show that they were the expression of a settled conviction, may be fairly taken to express the united wisdom of the manufacturers of textile fabrics in New York and New England. (Page 458.)

As one reason for this it was constantly said, that, if all worked but ten hours, then it would be the same for all, and so everybody would have just as fair a chance for success under ten as now under more hours. (Page 459.)

Bulletin of the United States Bureau of Labor, No. 80. January, 1909. Woman and Child Wage-earners in Great Britain. VICTOR S. CLARK, Ph.D.

Two distinctions need to be made at the outset—between the average and the abnormal day in all establishments, and between the average and the abnormal establishment. For instance, in a clothing factory, the average working hours throughout the year may be 54 a week; but during the spring and autumn these hours, unless regulated, may rise to 66 or 72 a week. Likewise, of several boot and shoe factories a majority, and those generally the largest and best establishments, may have a 54-hour week, while a number of small shops, ranking as factories under the law, may work their hands 60 hours a week. Furthermore, of a number of clothing factories, several may be able to keep very near the 54-hour weekly average throughout the year, while supplying the same trade and competing successfully with factories that work short hours some months in the year and excessively long hours the remaining months.

These time variations, as well as the wage variations described later,

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found in competing industries in the same vicinity, indicate a margin within which the condition of workers might be improved without increasing the maximum labor cost of production, so as to raise the market price of the articles manufactured. For it is not reasonable to suppose that mills which regularly work fewer hours at higher wages than establishments which compete with them are working at a loss. Indeed, they are generally making a satisfactory profit. If so, it follows that the other establishments are either making an excessive profit out of their employees or that they are operating under uneconomic conditions. If the entire productionof the articles in question could be centered in the best-organized mills, the articles could be sold at the same price, and the workers enjoy the advantage of shorter hours and higher wages. So far as legislation is able to hasten the uniform application of these superior conditions of production in any industry, by requiring the conditions observed in the best mills to be enforced in all, it is serving the workers without taxing the rest of the community, unless it be a few incompetent, over-grasping, or it may be merely unfortunate employers. English factory legislation—at least the modern acts—has followed the principle of bringing average conditions of employment up to the best conditions of employment in each industry. (Page 48.)

Convention of the National Women's Trade Union League. Chicago, September, 1908.

Miss Mary Anderson, of the Boot and Shoe Workers Union:

I heard a rumor the other day that one of the manufacturers I know is going back to the ten-hour day. It is a sad thing, and it is just that kind of a manufacturer that sets the pace for the manufacturer who wants to do the right thing by the worker. Some do it of their own accord—only a few, I will say—and some have done it through the force of organization. When a manufacturer like this goes back to the ten-hour day and a lower wage, he undersells the other manufacturer, and the consequence is he has the bulk of the work. And you see by that we are affected as well. It is really the competition which sets the pace. (Page 35.)

(2) To Check the Backward Employers

GREAT BRITAIN

British Sessional Papers. Vol. XX. 1834. Factories Inquiry. Queries addressed by the Central Board of Commissioners to Manufacturers.

H. Houldsworth and Sons (cotton spinning):—

A. 26.—It is our opinion that the moving power driving cotton ma-

chinery should be limited under all circumstances, to a stated time daily, and no lost time, from whatever cause, worked up; otherwise any legislative measure will be as inoperative as the present and previous Acts have been, and any other clause a new Act may contain will not only be ineffectual, but will greatly lessen the advantages which the promoters intend, by affording the avaricious opportunities of evasion, by working longer time and thereby obtaining an advantage over those who are anxious to conform to the law. A. 1. (Page 134.)

Robert Dick (cotton spinning):—

A. 26.—We are of opinion that all excess beyond the regular hours of work is not only avoidable, but should be put a stop to. D. 1. (Page 144.)

Daniel M'Laurin (woolen mill):—

A. 26.—I consider it quite avoidable in all spinning factories beyond the regular hours, and conceive it would be an advantage to the trade if none were permitted, as it gives unprincipled masters an undue advantage. A. 1. (Page 163.)

British Sessional Papers. Vol. XXVI. 1847–1848. Reports of Inspectors of Factories for the half-year ending April 30, 1848.

Justice requires that, when the law interferes with the productive power of capital, all who are in the restricted trade should be kept to one rule as to time; and it was upon the urgent representation of Mill-owners that such was notoriously not the case, that in the amended Bill of 1844, restrictions were proposed to check such fraudulent over-working . . . declaring that the hours of the work of children and young persons (and women, by sec. 32) in every factory shall be reckoned from the time when any child or young person shall first begin to work in the morning in such factory. (Page 7.)

British Sessional Papers. Vol. XXII. 1849. Reports of Inspectors of Factories. Appendix. Evidence of the Opinions of Persons employed in Factories, respecting the Ten Hours' Act, collected in September, October and November, 1848.

R. J. Saunders, Inspector:

Former reports from some of my colleagues and from myself, declare clearly the opinion, that nothing but one uniform set of hours for all the persons employed in the same mill, in each of the protected classes, can effectually guard such operatives from overwork. (Page 107.)

GREAT BRITAIN

The humane and sound Christian principles which have governed the conduct of many factory occupiers and operatives, have been comparatively valueless to them as a body or to the nation at large, in consequence of the prevalence of selfish, sordid and sensual interests, under no control, or only such regulations as have acted generally to the prejudice of all who desire to obey, whatever enactments may have been framed, because they are not impartially enforced on all. . . . Whatever enactments are laid down, should be as uniformly and efficiently enforced as is possible, on the 2 classes of employers and employed to whatever extent each may be affected by them; and also—so far as is possible, no provision should be enacted which cannot be impartially enforced, on all engaged in similar pursuits. (Pages 113–114.)

British Sessional Papers. Vol. XVI. 1867. Reports of Inspectors of Factories.

With respect to overtime, competition in commerce is successful often by decimal profits. If a man has 50,000 spindles, and each spindle revolves 4000 times a minute, and at each revolution wraps round the bobbin three and a half inches of thread, it is easy to see how valuable minutes become, and what moral energy it must sometimes require on the part of the manufacturer to resist the winding on of a few more yards. Thus the power given in the Bleaching and Dyeing Works Act to make up time said to be lost, from any cause whatever, offers an equally irresistible temptation to a bleacher with not a very susceptible conscience, to add to the profit of his day against the conscientious labour of a neighboring bleacher, who would deem it a degradation to be suspected of overwork. It also places the conscientious bleacher at a very great disadvantage with his neighbor in the same market, besides exciting acrimonious feelings between them, weakening also the law, and the power of its administrators. (Pages 56–57.)

British Sessional Papers. Vol. XIV. 1868–1869. Reports of Inspectors of Factories for half-year ending October 31, 1868.

Every manufacturer ought to feel perfectly satisfied that the restrictions upon the labour of his "hands" should be neither more nor less than those upon his competitors, and he ought to be cognizant of what his competitors are able to do and are doing. (Pages 15–16.)

Feeling that uniformity of working is essential to a just administration of the law, I have endeavored to obtain this uniformity for all establish-

ments in which the occupations are precisely the same in establishments whether under the Factory Acts or under the Workshops Acts. (Page 19.)

Report of the Birmingham and District Trades Council upon the Factories Act and the Workshops Bill.

We are of opinion—2nd, That any measure for the regulation of the labour in factories should apply to all equally irrespective of the number employed therein, whether it be a detached building, or part or parts of a dwelling house so occupied. 3rd, That all should be subject to the same system of inspection and penalties for non-compliance. (Page 313.)

British Sessional Papers. Vol. XXIX–XXX. 1876. Factories and Workshops Acts Commission.

Vol. XXIX. Report.

Mr. Redgrave states: "I believe that the difficulty in making (The Acts) uniform arises from the fact that the circumstances of the different trades vary very much,—but then all the main features of the restrictions could be made very fairly uniform without injury to the employers at all."

Similarly Mr. Baker urges, in reference to the present unequal condition of the law, that "we should, as far as we possibly can, equalize it all," and again to a question as to the reason for including all trades under the latest of the Factory Acts, he says, "the one great evil is that they work different hours." (Page 14.)

British Sessional Papers. Vol. XXI. 1894. Report of the Chief Inspector of Factories and Workshops.

I believe, therefore, that although a withdrawal of the overtime exception would meet with protest from employers who have developed its use from an exception into a principle, there are some who would welcome, and many who would be indifferent to such an amendment; that the large class of employers engaged in the textile and allied trades from whom permission to work overtime has been rigidly withheld, would greet as a measure of justice its withdrawal now from trades, logically no more entitled to the exception than their own; and that by the workers its abolition would be welcomed with feelings of the warmest gratitude. (Page 11.)

GREAT BRITAIN

British Sessional Papers. Vol. X. 1901. Report of the Chief Inspector of Factories and Workshops.

. . . A lack of loyal adherence to reasonable hours of employment by many laundry occupiers increases the difficulty for those who make the attempt in real earnestness. Many employers gladly welcome further regulation as a means of organizing and controlling their workers. "What is the use of my making the effort to so organize my work that the laundry shall close at 8 P. M. like other reasonable work-places do," said a disheartened employer; "all the neighboring laundries are open until nine, ten, or even eleven o'clock, and my women find it suits their irregular habits to go and work in these places after they leave my premises; they are then too tired out to arrive at my laundry till 9.30 or 10 next morning. If we all had to keep the same rules and close at the same time, the law would work fairly; as it is I must just scramble on with the others in the stupid expensive old way." (Page 385.)

A Shorter Working Day. R. A. HADFIELD, *of Hadfield's Steel Foundry Co., Sheffield, and* H. de B. GIBBINS, M.A. *London, Methuen, 1892.*

Again the writer is inclined to think that shorter hours would eventually tend to more uniform output, and to some extent, assist in modifying the serious fluctuations of business which are baneful alike to master and man. There is nothing that an employer peruses with more interest than his order sheets. Now, under the present system, too often there is extreme high pressure at one time, followed by a reversal which is exceedingly disastrous to all concerned. Trade suddenly expands, machinery is wanted in haste, telegrams fly to and fro, promises are made which often cannot be performed. If an order of importance is given probably penalties are specified. The manufacturer is in a state of feverish anxiety until the matter is cleared off his books. Overtime must be worked, and there is high pressure all round. If a uniform day existed, and overtime were made more difficult all employers in each particular branch being on the same footing would alike work under the same conditions, and would not have the same temptations as at present to outbid one another and work at such high pressure. (Pages 116–117.)

The Case for the Factory Acts. Edited by Mrs. SIDNEY WEBB. *London, Richard, 1901.*

Now and again an employer complains of some hard experience, and forgets that a departure from rigid rule would destroy the certainty which

he feels that the law is treating him exactly as it is his competitors. Such a feeling of security is essential to business enterprise. (Page 93.) GREAT BRITAIN

Massachusetts House Documents. No. 80. 1855. Report on Ten-Hour Petition. UNITED STATES

If the large manufacturing companies reduce their hours of labor, all the smaller corporations immediately follow their example. The reason for this is found in the fact that the most intelligent portion of the operatives invariably seek employment at such places as run their machinery the least number of hours; and as the intelligent operative is the most profitable to the company, hence the fact, if the smaller corporations wish to retain their good help, they *must* conform to the same rules adopted by the larger ones. (Page 4.)

Report of the United States Industrial Commission on the Relations and Conditions of Capital and Labor Employed in Manufactures and General Business. Vol. XIV. 1901.

Testimony of Mr. Thomas O'Donnell, Secretary of the Fall River Mule Spinners' Association, and of the National Spinners' Association:

It is what I might term sometimes the selfishness probably of some of our manufacturers that would keep the mills open at night. I do not think it is the press of orders, for this reason: In enlarging their plants, sometimes we have had an instance of it in this city where a manufacturer made an addition to his plant, and instead of supplying it with machinery for the various departments, he only supplied it with machinery for one department. The result was that, in order to get the necessary product to run that department, he had to run the other department nights. Now, when he built the addition, if he had equipped it with the requisite machinery, he would not have had to do that. This was one instance but during all the progress and history of the cotton industry in this city our manufacturers always have got along without working overtime to fill their orders up to 2 or 3 years ago, and the innovation in this matter by this man was the cause mostly. He was the cause of the other manufacturers wanting to do the same. If he had never done it, there would not have been any other manufacturer in the city of Fall River attempting it, and they said: "Stop him from doing it, and we will stop doing it." That shows that they were doing it for their own protection. (Pages 570–571.)

G. *Allowance of Overtime an Unnecessary Evil: Opinions of Officials*

The arguments in favor of allowing overtime in seasonal trades or in cases of supposed emergency have gradually yielded to the dictates of experience which show that uniformity of restriction is essential to the establishment of a fixed and regular number of working hours. The officials who have most closely observed the working of laws limiting hours of labor express their conviction that overtime, once considered a necessity, is an unmitigated evil and should be abolished.

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British Sessional Papers. Vol. XIV. 1868–1869. Reports of Inspectors of Factories.

. . . Practical experience teaches us that fixed and regular hours of labour are beneficial, not only to the workman, but to the employer also. And not only in the case of time labour, but the same rule will equally apply where piece-work is the custom. (Page 313.)

British Sessional Papers. Vol. XIX. 1873. Reports of Inspectors of Factories for the half-year ending 31st October, 1872.

(In regard to milliners and dressmakers) I strongly deprecate the granting of "fourteen-hour permissions," which only unsettle the trade, and are quite unnecessary. Such hours are very injurious to the girls employed. (Page 134.)

British Sessional Papers. Vol. XVIII. 1889. Report of the Chief Inspector of Factories and Workshops.

I have been struck by the frequently expressed opinion of employers as well as of the employed that overtime is injurious alike to the best interests of both. I share this view strongly myself, and as far as my district is concerned am convinced that the amount of overtime sanctioned under the Act is in excess of the necessities of the case and even of the desire of those who have the best claim for consideration on the question of overtime. (Page 96.)

British Sessional Papers. Vol. XX. 1890. Report of the Chief Inspector of Factories and Workshops. GREAT BRITAIN

Doubtless public opinion has to be gradually educated and good reasons existed for the framing of the "overtime clauses," but I earnestly trust that the day is not far distant when these clauses (except for perishable food) will cease to exist. . . . I fear that few persons realize what working overtime means and I fear that the very liberal concessions made too often lead to abuse. (Page 28.)

British Sessional Papers. Vol. XXXIV. 1893. Report of Royal Commission on Labour. Group C. Appendix CXXIX. Summary of evidence of Mr. C. R. Bowling (*Inspector of Factories*).

Finally, from my point of view then, I arrive at this position: The large amount of overtime sanctioned by the Act is not called for by any imperative necessity; that the law in thus extending its sanction to overtime is offering a premium in many cases to the greedy, incompetent, or tyrannical employers of labour; that the evils resulting from the employment of young persons and women, especially in the case of female young persons, are admitted by all, and are so manifold and serious that unless it can be uncontestibly shown that by withholding the privilege of making this overtime the loss to the country would be so great that it would justify the infliction of some suffering on the few; the whole question should at once be taken into consideration. (Page 725.)

British Sessional Papers. Vol. XVII. 1893. Report of Chief Inspector of Factories and Workshops.

I am convinced that there is no necessity for this overtime; the season trade work or the press of orders would be executed just the same if overtime were illegal (as it is in textile and many of the non-textile trades); the work would only be spread over a longer period or mean the employment of more hands. (Page 92.)

British Sessional Papers. Vol. XXI. 1894. Report of Chief Inspector of Factories and Workshops.

It is not necessary, for in a large proportion of cases in so called season trades, advantage is simply taken of the concession by certain firms to monopolize a larger share of work than they are warranted by their plant in undertaking, or by customers in unnecessarily delaying their orders

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knowing that overtime will come to their rescue. It is not desirable, for in many cases (that of milliners and dressmakers especially) the long hours are most prejudicial to the health of the employees. (Pages 299–300.)

I consider the present state of the law with regard to overtime as nothing short of a public scandal. (Page 300.)

For my part I have always wished to see this special (allowing overtime) exception revoked, excepting of course as regards perishable articles. In the first place it seems to me rather unfair to allow it to some trades and not to others, and the very ones that use it most, i. e. tailors, dressmakers, etc., and letterpress printers, are those I would take it away from first, as I believe work to be carried on under worse conditions in these trades than in any others, and especially so in the very large towns. (Page 308.)

British Sessional Papers. Vol. XIX. 1895. Report of Chief Inspector of Factories and Workshops.

Except in the case of perishable articles of food, I fail to see why so much distinction should be drawn between one class of employment and another. Every business and every handicraft is subject to fluctuation, and every trade is occasionally liable to calls of exceptional pressure. Yet the favour is granted to those handicrafts whose employees labour in the worst type of workshops and under the most unfavorable hygienic conditions. . . . I am convinced if overtime were forbidden that the average business would suffer no loss, and what loss there might be, would fall upon the most unscrupulous and unconscionable employer. (Page 194.)

British Sessional Papers. Vol. XIX. 1896. Report of Chief Inspector of Factories and Workshops.

In visiting workshops my attention has as formerly been much drawn to it, and I can only repeat again that I consider overtime an evil. Further experience has shown me that even when extra work means extra pay, overtime is felt to be a hardship by most workers, and I am confident that much good will result from the reduction of the occasions on which overtime may be worked and also from the prohibition of it for young persons. (Page 117.)

"Overtime is by hypothesis an exception, but the employers by a recurring demand for it turn it into a rule." This opinion, based as it is on carefully compiled statistics brings surely a strong reinforcement of the opinion held here by H. M. Inspectors of Factories, that overtime (apart

from the treatment of perishable articles) is an unnecessary evil. (Page 117.) GREAT BRITAIN

British Sessional Papers. Vol. XVII. 1897. Report of Chief Inspector of Factories and Workshops.

Overtime was materially curtailed by the 1895 Act, but the change seems to have caused little real inconvenience. . . . Mr. Calder writes: The change in the overtime regulations which reduced the maximum number of occasions in any twelve months from 48 to 30 has had a more than proportionate effect upon the (overtime) returns in the district from workshops. Overtime in the latter is practically confined to the retail wearing apparel trade and in a number of instances, the practice formerly was to select a day in the middle of the week for the half holiday, and work till 10 o'clock P. M. on 48 Saturdays in each year. Such systematic employment after the ordinary period is now impossible. The limitation as well of overtime working to "women" has not affected the above industry greatly. (Pages 39 and 40.)

(I am) much impressed by the comparative rarity of complaints as to hours in the larger laundries in the northern textile districts as compared with the South of England, and a fresh illustration appears to be herein afforded of the widespread benefits of a rigid restriction as to periods of employment. The hours of laundry workers in many Yorkshire and Lancashire towns are, as a rule, practically assimilated to those in the textile factories. The women generally will not work the longer hours; managers inform me that they could not work up to the 60 hours' limit if they wished because better conditions could be obtained by the workers in the mills. I except from this statement such large towns as Leeds and Manchester where not only the size of the town but also the immense variety of the industries and their conditions prevents the influence of the textile regulations from being effective. In these towns instances may be found of irregularities and excessive hours that fairly match the instances in London and neighborhood or in large seaside resorts. As all the alleged practical difficulties in the way of organizing work in laundries within a prescribed period are the same in the textile as in the non-textile districts we get in this way a gauge of force of the argument against a regular daily instead of the present weekly limit. It thus appears that whatever reason may be put forward against the daily limit, there is at least no cogent reason based on the nature of the work carried on in laundries.

All the evidence as to the successful working of laundries within rational daily limits in the North of England demonstrates that the

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possible maximum 14 hour day of the existing regulations is as unnecessary in the interests of the public and of the employers as a body, as it is contrary to the interests of the workers. (Page 68.)

British Sessional Papers. Vol. XI. 1900. Report of Chief Inspector of Factories and Workshops for the year 1899.

The prohibition of overtime for young persons imposed by section 14 of the Factory Act 1895 has in my opinion proved to be the most beneficial clause of that Act. It has moreover been carried out without any serious interference with trade and without causing much difficulty to the Inspectors. The further restriction in the same clause of the overtime employment of women by reducing the number of times on which it may be worked in any twelve months from 48 to 30 was also a step in the right direction. If overtime were abolished altogether, except for preserving perishable articles, the season trades would soon accommodate themselves to doing without overtime in the same way that the cotton, woollen, linen and silk manufacturing trades have done, for they also are season trades. (Page 140.)

British Sessional Papers. Vol. X. 1901. Report of Chief Inspector of Factories and Workshops.

I do not retract my former confession of faith that overtime for protected persons is contrary to the spirit of the Factory Acts, injurious to the workers, and could with advantage be abolished except for perishable articles. . . . As the textile trades can do without it so could other and less important trades. It unfortunately happens that amongst those trades in which overtime is allowed are some of the most sedentary and unhealthy, such as the making of wearing apparel, letter press printing and bookbinding. (Pages 157–158.)

The opinion of the inspectors is almost universally in favor of the total abolition of overwork as now practiced and understood. It is notorious that the great weight of opinion among employers is thrown into the same scale, their only stipulation being that the incidence of the law should be equal. (Page 338.)

Factory Act Legislation. The Cobden Prize Essay for 1891. VICTORINE JEANS. *London, T. Fisher Unwin, 1892.*

A resumé of the work in London during the previous 10 years shows that the fears as to the effects of the Acts on the "season trades" were

unfounded. "You have come to ruin us," said a large manufacturer of artificial flowers to the inspector of 1867. A year afterward he acknowledged that the Factory Act was a positive blessing, that he got as much work out of his hands in 10½ hours as in 12 or 14, and that he effected a saving of £30 on his gas-bill besides. Another declared in 1876 that he "considered the alteration a great improvement both to the men and to himself, there was a saving of gas, and a clear gain of time due to the fact that the workwomen were not so subject to fits, the result of over-exhaustion." (Pages 76–77.)

The Case for the Factory Acts. Edited by Mrs. SIDNEY WEBB. *London, Richard, 1901.*

No one who studies the actual working of the Factory Code can doubt that it will be perfected just in the measure in which all these differences are abolished and an equal adequacy of protection extended to all the places and all the persons who work. The ideal is that the regulations of all places in which manufacturing work for gain is carried on should approximate as closely as possible to those which obtain in the most completely guarded places, namely, the textile factories . . . the textile factory is cursed by no such overtime exception as elsewhere undermines the value of the hours' limitation.

The overtime exception is doomed. Unless some unforeseen change in our industrial conditions revolutionizes the present order of things, the total abolition of overtime for women must follow on that for young persons, which was virtually accomplished by Mr. Asquith in 1895. . . . The case for abolition was as clearly proved as the complete consensus of opinion on the subject of those who work under the exception and those who have to enforce it could prove anything. The opinions of H. M. Inspectors of Factories and the opinions of the organized women workers were all but unanimous against allowing any overtime. These opinions, the expression of which dates back to the Royal Commission of 1875, are based on arguments which carry with them conviction on many grounds. Over and over again the view is stated that with better organization of the business the need for overtime disappears. Cases are quoted to prove that many large dressmaking and millinery firms never avail themselves of this exception, and the great object lesson of the textile trade is given. In all textile factories, and in a great many non-textile factories, to which no exception has been granted, organization and management quite easily cope with the recurring season pressure, and the trade automatically adapts itself to the law's requirements. In other non-textile factories

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and workshops, to which the overtime exception has been extended, demands no more urgent are met by the deliberate overtaxing of the workers' health and strength. (Pages 153–156.)

In 1878, when this industry (fruit-preserving (jam-making) factories) was first brought under inspection, the employers protested against any regulation of the hours of labor, or even of sanitation, during the jam-making season, on the plea that the fruit had to be dealt with as it was delivered. The House of Commons, instead of insisting that the employers should exert their brains so as to cope with difficulties inherent in their particular trade, weakly accepted their plea, and exempted them from the Common Rules enforced on other industries. What has been the result? The majority of British jam factories at the beginning of the twentieth century present, during the summer months, scenes of overwork, overcrowding, dirt and disorder, hardly to be equalled by the cotton mills at the beginning of the nineteenth century. Women and young girls are kept continuously at work week-days and Sundays alike; often as much as a hundred hours in the seven days; and sometimes for twenty or even thirty hours at a stretch. (Pages 51–52.)

. . . As if on purpose to complete the proof that these shortcomings are not inevitable in the business, and are merely the result of a disastrous exemption from regulation, we have the fact that, here and there, in different parts of the kingdom, a few firms stand out as preferring the "upward way"; scientifically organizing their supplies, providing cold storage, working their operatives only normal hours, and seeing to it that the work-places are clean and healthy. If the "downward way" were barred by law, as it is in cotton-spinning, all jam-making firms would long ago have been forced into the same course. (Page 53.)

CANADA

Report of Inspectors of Factories for the Province of Ontario, Canada. 1896.

I consider the "overtime" system should be discouraged in all trades, even when extra work means extra pay, and there are some factories which have worked overtime without paying extra.

Overtime is felt to be a hardship among most workers, and it is next to impossible to define the number of hours worked per day when that number is being systematically exceeded. It is responsible for some of the idleness or only partial employment of a small number. It fosters a spirit of discontent in those who do not get the work. Irregularity of employment is its inevitable result, and I am confident that much good would result from the reduction of occasions in which overtime may be worked, and also from the prohibition of it for young persons. (Page 22.)

Report of Inspectors of Factories for the Province of Ontario, Canada. 1899. CANADA

I have been struck with the frequently expressed opinion of employers, as well as of employees, that overtime is injurious alike to the best interests of both. I share this view very strongly myself, and am convinced that the amount of overtime sanctioned under the Act is in excess of the necessities, and even of the desire of those who have the best claim for consideration on this question of overtime. (Pages 24–25.)

New South Wales Legislative Assembly. 1903. Report of the Working of the Factories and Shops Act. AUSTRALIA

Every year's work shows more plainly the urgent necessity for amending the Factories and Workshops Act of 1896, in the direction of giving more definiteness to the provisions governing the length of the day's work and the strict guarding of overtime. (Page 11.)

Jahresbericht der Grossherzöglich Badischen Fabrikinspektion für das Jahr 1904. [*Reports of the Factory Inspectors of Baden, 1904.*] *Carlsruhe, Thiergarten, 1905.* GERMANY

Within the last year the employers proposed to an organization of workers that . . . the workmen should be legally permitted to work voluntarily beyond the legal hours. . . . The workers voted unanimously against the proposition and expressed themselves as fixedly opposed to "voluntary" overtime.

They preferred keeping what they had won. Permission for "voluntary" overtime would render all labor legislation illusory. For, as opposed to the power of employers, "voluntary overtime" would be an empty phrase, and if the employers wanted overtime work, such a contract would not be worth the paper it was written on. (Page 47.)

Berichte über die Fabrikinspektion, 1882–1883. [*Reports of the* (*Swiss*) *Factory Inspectors for 1882–1883.*] *Aarau, Sauerländer, 1884.* SWITZERLAND

Overtime work is no longer so often regarded as a desirable thing as it used to be. I have a long list of statements by factory owners to the effect that active, industrious workers, out of consideration for their health, are unwilling to work overtime except in the most urgent emergencies . . . and that after 2 hours' overtime the employees are sleepy and indifferent. One employer, who with a specially lucrative rush order,

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divided half of the profit with his workers in order to induce them to work overtime, found that most of them dropped out after four weeks.

In an important industrial center a number of factory managers expressed the opinion that overtime work "not only was a physical injury to the workers, but also destroyed pleasant relations between them and the employers, who were believed to profit unfairly by overtime." (Pages 22–23.)

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Report of New York State Factory Inspector. 1889.

In some cases the privilege of working overtime has been asked by the employees themselves, for the stated reason that the extra money earned would purchase some necessary of life which the money earned during regular working hours would not permit. However laudable this purpose may be, I cannot agree with the practice of crowding two days' work into one, for aside from its demoralizing effects, both mentally and physically, it is contrary to the principle which is gaining strength in the minds of many people, that the hours of labor should be still further reduced to at least less than ten per day. (Page 68.)

Report of the New Jersey Inspector of Factories and Workshops. 1892.

The protection to all women and young persons, both male and female, under eighteen, which this law (55-hour law) affords is unquestionably approved by public sentiment. . . . If, as is undoubtedly the case, it is necessary to operate some establishments for a longer time than fifty-five hours a week, or for other periods of time than those mentioned in the act, it certainly is not necessary that persons under eighteen years of age and females above that age should be employed in such operations, except within the periods limited thereby. (Page 13.)

VI. THE REASONABLENESS OF THE CLASSIFICATIONS IN THE ACTS

The fact that the Oregon Act of 1907 was confined in its application to mechanical establishments, factories, and laundries, was held not to be an arbitrary discrimination against the persons engaged in those employments. The

experience of industrial communities shows clearly the special need of limiting the hours of labor of women in factories and workshops, and in many states and countries the prohibition of longer working hours is limited to such establishments.

The specific inclusion of other occupations is not an arbitrary discrimination against those occupations such as the telephone or telegraph service, millinery or dressmaking establishments, or restaurants, enumerated in the Ohio Act of 1911; or mercantile establishments, hotels, restaurants, telegraph or telephone service, or common carriers enumerated, among other places of employment, in the Illinois Act of 1911. The special dangers of long hours in these establishments, as they are conducted, present strong reasons for providing a legal limitation of the hours of work in these businesses.

A. Laundries

(1) Present Character of the Business

Dangerous Trades. Thomas Oliver, *Medical Expert on Dangerous Trades Committee of the Home Office. Chapter XLVII. Laundry Workers. London, Murray, 1902.* GREAT BRITAIN

It is perhaps difficult to realize that the radical change which has everywhere transformed industrial conditions has already affected this occupation (laundry work) also. . . . When the first washing machine and ironing roller were applied to this occupation, alteration in the conditions became as much a foregone conclusion as it did in the case of the textile or the clothing manufactures, when the spinning frame, the power loom, or the sewing machine appeared.

Meanwhile, few industries afford at the present time a more interesting study. From a simple home occupation it is steadily being transformed by the application of power-driven machinery and by the division of labor into a highly organized factory industry, in which complicated labor-saving contrivances of all kinds play a prominent part. (Pages 661–662.)

The manufacture of laundry machinery, to which much energy and capital is devoted, is every year increasing. New and ingenious inven-

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tions and improvements constantly appear, many of which come from America, whence a considerable amount of this machinery is imported. (Page 665.)

This work is not the light and often pleasant occupation of sewing or folding. It is not done sitting down. From morning to night these young girls are constantly standing; they are generally tending machines, the majority of which are specially heated, and they work in an atmosphere in which steam, which is nearly always present, makes the high temperature far more oppressive than would be the case if the air were not thus artificially saturated to an excessive degree with moisture. Steam rises from the calenders and various machines. It is given off also by the damp clothes, which in many laundries, even large ones, hang drying or airing overhead or on "horses" in the room. The conditions in this respect are often at least as trying as in any spinning-mill, and the hours during which the girls are exposed to them very much longer. (Page 670.)

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Colorado. Third Biennial Report of the Bureau of Labor Statistics, 1891–1892. Part II. Female Wage-Earners.

In some laundries the hours of employment during the rush frequently extend to eleven and twelve hours per day, although no extra compensation is paid to female employees, with but few exceptions. . . . While machinery to a large extent relieves her (the female laundry worker) of much work, the full strength of her physical endurance is taxed by a tedious attention to the duties assigned her. (Page 28.)

Report on Condition of Woman and Child Wage-Earners in the United States. Vol. XII. Senate Document No. 645. 61st Congress. 2nd Session. 1911.

Three hundred and fifteen laundries were visited in Chicago, New York, Brooklyn, and Philadelphia. These laundries employed a total of 6417 persons, 5142 or 80.1 per cent of whom were women. (Pages 9–10.)

HOURS OF WORK IN LAUNDRIES

Inquiry in regard to the hours of labor in laundries was made in all the laundries visited, and a detailed study of the hours of labor was made in a number of representative laundries in Chicago. A comparison of the working hours in all of the laundries visited with those in the Chicago laundries, where special inquiry was made, shows that practically the

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same conditions as to hours of work prevail in all of them with but few exceptions. While the weekly hours of work are in but few cases long when compared with other industries, the practice of extending the working hours on one or two days of the week is not uncommon, days of 12, 13, or even 14 hours being reported elsewhere as well as in Chicago. (Page 15.)

Thirty-seven per cent of the girls reported working longer hours than those given as normal by the managers of the laundries in which such girls were employed. Moreover, women not employed in such laundries at the time of the interview, but formerly at work there, told the agents of the Bureau that there were one or two days nearly every week in the year, prior to the validation of the Illinois 10-hour law, when the girls had to work more than 10 and sometimes as many as 14 hours a day to get out the rush orders. (Pages 16–17.)

CHARACTER OF THE WORK IN POWER LAUNDRIES, BY OCCUPATIONS

In the motor laundries the nature of the work performed by the women requires explanation before the importance of good laundry conditions can be appreciated. The principal occupations for women are, in the order of the work, listing, marking, sorting, hand washing, shaking, mangling, folding, starching, machine ironing, hand ironing, finishing, mending, and wrapping.

The operation of washing machines is now almost entirely confined to men. . . .

Before the pieces are ready for the ironing process, however, they must be straightened out from the tangled mass in which they leave the extractor. They are sent to the mangle floor and are shaken up in an empty wheel for the purpose, or are taken up by girls who are called shakers, who pick up the pieces one by one, snap or shake them violently, lay them down in neat piles or fold and lay them on horses which are passed to the operators of the mangle, who stand on an elevated platform for the feeding work. The younger girls are usually employed as shakers and can do the work only when standing. The work involves a steady use of the arms and more or less stooping and reaching, so that many girls acquire a constant motion of the body as well as of the arms. The muscles are under constant strain continued throughout the day in rooms where the temperature is high and the air full of moisture.

The mangle is a huge piece of machinery consisting of a number of hollow iron cylinders which revolve. Steam pipes or electric wires lead into the central or larger cylinder and it is heated to the required temperature. The smaller rolls which are placed on all sides of the upper part of

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the central cylinder are wrapped with many folds of felt material. These also are revolved by the motor and heating power, and form the touching surface through which the goods pass. The work is fed in at one side of the machine and after getting the many ironings which a course through a mangle insures, comes out at the other side steaming, but perfectly smooth and ready to be folded and packed. The feeders on the mangle stand at their work, which does not require much skill, and after once learned is not, save for the constant standing, fatiguing.

The mangles are sometimes guarded by a large roll, which is placed upon the carrier apron immediately in front of the heated roll and keeps the fingers from coming in contact with the heat, or from being crushed by the heavy cylinder rolls. This is a most effective guard. Another guard consisting of a frame with strings stretching across is sometimes used. Sometimes, unfortunately, no guard is used. (Pages 19–20.)

The process of starching is always done by women. In some laundries it is still entirely a hand process, but in others it has been much improved by the introduction of machinery. Though the bulk of the work can now be done by this improved method, a measure of handwork remains. In hand starching the girls stand at tables with the starch mixture in basins before them. Each article is stretched out and the starch rubbed into it. Thus, in addition to the standing, the movements of the arms and the necessary strain on the muscles are fatiguing, and the continued exertion tends to exhaust the worker. If starching is done in the ironing rooms, as is frequently the case, the effects of the heat and the work are especially severe during the summer months. One forewoman in a large laundry said that before the starching was done in a separate room the girls employed at this occupation suffered from the heat, were forced to apply cold and wet cloths to their heads, and sometimes fainted. Where space is ample a separate room is provided and the heat is less intense. (Page 21.)

The heaviest machines used for ironing shirts are called body ironers, but might be described as small mangles. The main part of the machine consists of two iron cylinders, one of which is heated from the inside by gas, the other covered with a thick pad of felt and cotton cloth. These pads are much thicker than those on the machines for ironing collars. The rolls on each machine stand apart until the body of the garment has been adjusted by passing it over the end of one roll instead of putting it in laterally as in the case of the large mangle. Then the operator presses a lever with her foot. This swings one roll into contact with the other and gives the pressure. The lever is held down by the foot, and this requires the weight of the body, while the hands direct the work.

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The ordinary process of machine ironing requires the constant use of the lever, which is operated by the same foot continually. In case certain reverse movements are necessary a second lever operated by the other foot is used. The occupation of ironing is without doubt excessively fatiguing labor. The women can not sit while doing the work. The machines are so arranged that the operators can stand upright at their work, but many women are accustomed to sway the body with every motion of the hands or feet. In some laundries the women have wooden boxes to stand on, so that in using the foot lever they step down upon it instead of having to step up on the lever and then force it down with the weight of the body. This is decidedly easier and not so trying on the feet. The women who use these levers usually wear old soft shoes or no shoes at all while at work. There is a great difference in the weight required to operate the different machines in use. The latest, most improved machines with the reversible levers are much easier to run than the older and heavier machines. One employer, in explaining to the agent of the bureau the difference in the weight required to operate the different machines in use, stated that the old machines "would tear a woman to pieces in a few years if constantly used." He was replacing the old machines with new and improved ones at the time, but in other laundries a very large number of the old machines are still used. As long as they do their work a laundryman hesitates to go to the expense of replacing them with new and expensive ones.

The machines radiate an excessive heat, and this combination of heat and tiresome movements of arms and body works great discomfort to the operator. In addition to the muscular strain the women must be constantly on guard to prevent getting their fingers caught between the rolls. An accident was witnessed where the girl was talking to another behind her and carelessly caught her fingers between the cylinders of the body ironer, forgetting in her fright that her foot was on the lever which produced the pressure. Her fingers were held long enough to be severely burned. (Pages 22–24.)

(2) Bad Effect on Health

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British Sessional Papers. Vol. X. 1901. Report of the Chief Inspector of Factories and Workshops.

The whole work of a laundry is done standing, and the practice of so apportioning the legal "sixty hours a week" that on three or four days in

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the week the women have to work from 8 A. M. to 10 or 11 at night—a practice which could be, and where there is proper organization often is, rendered needless—has its natural result in the form of disease to which laundry workers are extremely liable. It is well known that they suffer much from varicose veins, and terrible ulcers on the legs; but the extraordinary extent to which they are so afflicted is, I think, not generally known. In many other trades standing is a necessary condition, and it is difficult to account for the far greater prevalence of this disease among laundry workers than among others of the same class engaged in ordinary factory occupations, except on the ground of the long and irregular hours. (Page 383.)

With a view to arriving, if possible, at some definite knowledge of the position of laundry workers as compared with other women of their class and situation, in regard to the question of health, I have this year devoted some time to inquiring into the subject in the districts under my charge and in neighbouring localities. . . . By the kindness of the superintendents of the two first infirmaries (Islesworth, and Wandsworth and Clapham) I have been able to examine the carefully kept records of the number, ages, occupations, and diseases of the patients. The following tables, compiled from these records, speak for themselves, and afford some indication of the kinds of disease to which laundry workers appear to be particularly liable. (Pages 383–384.)

TABLE A. ISLESWORTH INFIRMARY

(Includes Acton, Chiswick, Brentford—A typical laundry district)

	Number	*Suffering from Ulcers on the Legs*	*Proportion*	*Phthisis*	*Proportion*
1908					
Laundresses	58	9	1 in 6	6	1 in 10
Women, other than laundresses	179	7	1 in 25	7	1 in 25
1899					
Laundresses	79	13	1 in 6	9	1 in 9
Women, other than laundresses	218	7	1 in 31	11	1 in 20

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TABLE B. WANDSWORTH AND CLAPHAM INFIRMARY

(Includes Battersea—another laundry district)

	Number	*Ulcers on the Legs*	*Proportion*	*Rheumatism*	*Proportion*	*Bronchitis*	*Proportion*	*Phthisis*	*Proportion*
1899									
Laundresses	247	36	1 in 6	16	1 in 16	45	1 in 5	21	1 in 11
Women, other than laundresses.	1171	50	1 in 23	49	1 in 22	129	1 in 9	63	1 in 19
1900									
Laundresses	199	27	1 in 7	12	1 in 16	21	1 in 9	18	1 in 11
Women, other than laundresses.	1127	41	1 in 27	69	1 in 16	133	1 in 9	59	1 in 19

At the Fulham and Hammersmith Infirmary about the same proportions exist, but it was not so easy to collect accurate statistics. . . . The figures supplied by the records of the cases attended by the Kensington District Nursing Association show a large proportion of ulcerated legs and of forms of internal disease aggravated by standing for long hours. (Page 384.)

I was struck by the absence of any particular liability to skin disease . . . noticed . . . some years ago, but . . . since almost disappeared. The immensely increased use of machinery in the process of washing . . . may account for this difference.

The constant exposure to steam, standing on wet floors, the great heat in which the work is carried on, and the long hours at exhausting work, amply explains the tendency to pulmonary disease. The badly arranged floors in large wash-houses are a constant source of discomfort and probably of ill-health to the workers. . . . It is not uncommon to find that the yellow and foul water from a row of tanks or washing machines at one side of a wash-house flows all across the floor and over the feet of the workers before eventually reaching the drain. (Page 385.)

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Report on Condition of Woman and Child Wage-Earners in the United States. Vol. XII. Senate Document No. 645. 61st Congress. 2nd Session. 1911.

EFFECT OF LAUNDRY WORK UPON HEALTH FROM THE VIEWPOINT OF A PHYSICIAN OF EXPERIENCE WITH LAUNDRY WORKERS

In the bleaching processes to which household linen is subjected in the laundry, acrid and caustic chemicals are employed, such as chloride of

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lime, carbonate of soda, etc. If handled in a dry state these cause intense itching and eczematous eruptions of the skin. When vaporized after solution, or in gaseous form, they irritate the eyes and the whole respiratory tract, occasioning conjunctivitis and giving rise to catarrhal inflammation of the throat and bronchial tubes.

Hand ironers, using the old-fashioned flatirons, are peculiarly liable to synovitis of the extensor muscles of the right fore arm. This inflammation impairs the motility of the wrist and excites pains of a rheumatic character.

Paræsthesia of the finger tips is a common affliction of both hand ironers and hand starchers. Its symptoms are numbness, tingling, and formication in the fingers which often extend to the arms.

Many hand ironers bend over their work and press with their bodies, at a point just below the ensiform cartilage, upon the handle of the flatiron, as carpenters do sometimes against a bitstock. This is a most pernicious practice, and may occasion gastric ulcer and other diseases of the stomach.

The operators of body ironers frequently suffer from displacement of the left kidney (enteroptosis). The trouble is caused by constant use of the foot lever. Operators of these machines should wear abdominal supporters as a preventive measure.

A very prevalent deformity among washers and ironers is flatfoot, which results from their continual standing. It occasions pains resembling and sometimes mistaken for those of rheumatism.

Varicosities of the veins of the lower extremities are common in all occupations that necessitate a continual standing posture; hence washers, starchers, and ironers often have dilated veins which need the support of elastic stockings.

In many laundries the mangle cylinders are not provided with guards of any description. As an inevitable consequence of this negligence hands and fingers are burned or crushed.

Though not peculiar to them, chlorosis is perhaps the commonest ailment of laundresses. And although the data presented in this series of cases are not sufficiently full and definite to afford the basis for a positive differential diagnosis, the syndrome of symptoms (anemia, shortness of breath, debility, etc.) in many instances justifies a provisional and tentative conjecture in favor of the existence of this affection. The condition is due chiefly to unwholesome environment.

The relative rarity of tuberculosis among laundry workers deserves special study. For, though the comparative immunity to phthisis of employees in this industry is generally accepted as a fact, no investiga-

tion, so far as the writer is aware, has ever been undertaken with the view of verifying or correcting the opinion, or of ascertaining the cause of the exemption, if it really exists. (Pages 25–26.)

Making Both Ends Meet. The Income and Outlay of New York Working Girls. S. A. CLARKE *and* EDITH WYATT. *New York, Macmillan, 1911.*

Although the labor at the machines in the laundry washrooms is done by men, and all work in laundries consists largely of machine tending, still women's part in the industry can be performed only by unusually strong women. Its severity may be indicated by an account of the work a machine ironer in Illinois regularly performed before the passage of the Illinois Ten-Hour Law. Miss Radway used to iron five hundred shirt bosoms a day. Holding the loose part of the shirt up above her head to prevent the muslin from being caught in the iron, she pressed the bosom in a machine manipulated by three heavy treads—by bearing all of her weight on her right foot stamping down on a pedal to the right; then by bearing all her weight on her left foot, stamping down a pedal to the left; then by pressing down both pedals with a jump. To iron five hundred shirt bosoms required three thousand treads a day. (Pages 179–180.)

I found some steam laundries in which no work at all is done on Monday or Saturday, but in the busy season the place keeps running regularly on the other four days from seven in the morning till half past eleven and twelve at night. (Page 190.)

After standing ten or twelve hours, there are few whose feet or backs do not ache. The effect on the feet is perhaps the chief ground of complaint. Some merely wear rags about their feet, others put on old shoes or slippers, which they slit up in front and at the sides. The girls who press skirts by machine and those who do the body ironing have to press down on pedals in order to accomplish their tasks, and find this, as a rule, harder than standing still. (Page 192.)

The low wages and long hours of the great majority of the women workers, the gradual breaking and loss of the normal health of many lives through under-nourishment and physical strain, are, in my judgment, the most serious dangers in the laundries. The loss of a finger, the maiming of a hand, even the mutilation of the poor girl who lost the use of both of her hands—the occasional casualties for a few girls in the laundries—are, though so much more salient, far less grave than the exhaustion and underpayment of the many. (Pages 196–197.)

(3) Bad Effect on Safety

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British Sessional Papers. Vol. X. 1904. Report of the Chief Inspector of Factories and Workshops.

The comparative immunity from accidents in the laundries in the West Riding of Yorkshire may be possibly due in some measure to the moderate hours of employment. (Page 210.)

The incidents of accidents according to time of day is somewhat surprising, the most dangerous hours apparently being 11 A. M. to 12 noon and 4 to 6 P. M. . . . Probably 11 A. M. to 12 noon is more generally than any other time the last tiring hour of a five hours' spell; 4–6 P. M. covers the time when most generally the transition from daylight to artificial light takes place. (Page 211.)

Reference was also made (in the Thirteenth International Congress of Hygiene), although figures were not adduced, to the alleged increase in the number of accidents which occur late in the working day when the effect of intellectual and physical fatigue have made themselves apparent. (Page 298.)

(4) Bad Effect on Morals

British Sessional Papers. Vol. X. 1901. Report of the Chief Inspector of Factories and Workshops.

One of the most unsatisfactory results of the present system or lack of system of working hours in laundries is the unfortunate moral effect on the women and girls of this irregularity. The difficulty of securing steady regular work from employees and of insuring punctual attendance is complained of on all sides, and the more intelligent employers are beginning to see that this is the natural result of the irregularity in working hours, which is still too readily fostered by many who do not realize its mischievous effect. Women who are employed at arduous work till far into the night are not likely to be early risers nor given to punctual attendance in the mornings, and workers who on one or two days in the week are dismissed to idleness or to other occupations, while on the remaining days they are expected to work for abnormally long hours, are not rendered methodical, industrious, or dependable workers by such an unsatisfactory training. The self-control and good habits engendered by a regular and definite period of moderate daily employment, which affords an excellent training for the young worker in all organized industries, is

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sadly lacking, and, instead, one finds periods of violent over-work alternating with hours of exhaustion. The result is the establishment of a kind of "vicious circle"; bad habits among workers make compliance by their employers with any regulation as to hours very difficult. (Page 385.)

Dangerous Trades. THOMAS OLIVER, M.D., *Medical Expert on Dangerous Trades Committee of the Home Office. London, John Murray, 1902.*

The ten minutes or quarter-hour "lunch" of "beer" is common, and the "beer-man" who goes his rounds at 10 A. M. and 6 or 7 P. M. to all the laundries, delivering his cans of beer from the nearest public house, is an institution which is, I believe, unknown in any other trade. Imagine the amazement of the master of a mill or weaving factory if his employees were to stop in a body for a quarter of an hour twice a day between meals to drink beer! Yet in many laundries the beer is kept on the premises for the purpose, and it is certain that as long as time thus wasted (to put it on the lowest grounds) can be made up by each separate woman "working it out" at the end of the day, irregular dawdling and intemperate habits will be encouraged. On the other hand, a woman who is expected on Thursdays or Fridays to be in the laundry from 8 or 8.30 in the morning till 9 or 10 or 11 at night may claim with some show of reason that only by some kind of spur can she keep her over-tired body from flagging. (Page 672.)

British Sessional Papers. Vol. XII. 1903. Report of the Chief Inspector of Factories and Workshops.

The work of endeavouring to administer the regulation as to period of employment in (laundries) is extremely disheartening. When work is carried on in spurts, the shamefully long hours, straining endurance to the utmost, alternating with days of idleness, the worker cannot be expected to develop any qualities but those of the casual labourer. (Page 174.)

B. Mercantile Establishments

(1) HOURS OF LABOR IN ILLINOIS MERCANTILE ESTABLISHMENTS*

Official government investigations show that without a legal limitation of hours, the daily hours of labor in Chicago

* This section was part of the Brief in defense of the Illinois Act of 1911; hence the hours of labor in Illinois are quoted. They are typical of all large cities, as well as of Chicago.

mercantile establishments were in many cases so long as to be dangerous to the health of the girls and women employed therein.

(a) Before the ten-hour law was extended to include mercantile establishments, the day's work often exceeded ten hours.

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Report on Condition of Woman and Child Wage-Earners in the United States. Vol. V. Senate Document No. 645. 61st Congress. 2d Session. 1910.

All of the fifty-four women employes in Chicago mercantile establishments interviewed on the subject of overtime, reported their longest days as more than ten hours. Twenty-nine reported the longest day as more than twelve, and the average for the fifty-four was 12.8 hours, with a range of 11¼ to fifteen hours. The normal hours per week for the fifty-four women averaged approximately 53.8, and their normal earnings $7.51 a week. The average age was 26.7 years. Twenty-nine of fifty-four women reported overtime work during the year, exclusive of December, 1907, for 2.4 hours on an average of 3.7 days for each week during an average period of thirty-four weeks. (Page 209.)

The indications are strong enough to warrant the conclusion that overtime runs to dangerous limits in mercantile establishments in the absence of restrictive laws setting definitely a limit to the hours of labor per day and per week. (Page 215.)

Bulletin of the U. S. Bureau of Labor. No. 91. November, 1910. Working Hours of Wage-Earning Women in Chicago.

The hours of work here recorded are for women working in the neighborhood department and small retail dry-goods stores of Chicago. Such stores are located in districts several miles to the south, west, and north of the large department stores on State street. (Page 891.)

Basing the estimate on the number of women employed in the establishments covered by this report and the number of listed firms of similar character and size, there are approximately 10,000 saleswomen in the neighborhood department and retail dry-goods stores of Chicago. In other words, about two-fifths of Chicago's retail-store women work under conditions differing materially from the conditions surrounding the 15,000 women employed in the downtown department stores.

The normal hours of work per day and per week and the hours during the busy season in each of the eleven stores included in the investigation are shown in the following table:

HOURS OF LABOR OF WOMEN EMPLOYED IN NEIGHBORHOOD DEPARTMENT AND SMALL RETAIL DRY-GOODS STORES DURING NORMAL PERIODS AND DURING THE RUSH SEASON OF 1909, AS REPORTED BY EMPLOYERS. CHICAGO

Establishment Number	Number of Women Employed			Normal Hours for Women 16 Years and Over								Busy Season			
	16 Years and Over	Under 16 Years	Total	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total Hours per Week	Duration in Weeks	Number of Hours Second Week before Christmas	Number of Hours First Week before Christmas	Number of Hours Day before Christmas
1.....	138	(a)	138	(b)	10½	8½	8½	10½	8½	11½	*b*58⅔	2	68	77	13
2.....	75	4	79	(c)	11	9	9	11	9	*c*11	*c*60¾	*d*1⅔	*d*66	72	*d*12½
3.....	50	..	50	*e*4	11	9	9	11	9	12	*e*63	2	73	82	14
4.....	25	..	25	..	9	9	9	11	9	12	59	1	59	64	12½
5.....	6	..	6	(*f*)	12	11	11	12	8	*g*5	*f*60	2	62	62	*g*8
6.....	6	..	6	..	10	8	8	10	8	11	*b*55	10	*b*66	*b*66	*b*12
7.....	72	8	80	..	8⅔	10⅔	8⅔	10⅔	8⅔	11⅔	59	2	66	71½	13 1/16
8.....	170	6	176	..	8⅔	10⅔	8⅔	10⅔	8⅔	12	59⅓	2	66⅓	72	12⅔
9.....	25	..	25	..	8⅔	10⅔	8⅔	10⅔	8⅔	11⅔	59	2	65	72	12⅔
10.....	45	8	53	..	11	9	9	11	9	12	61	2	72	72	12
11.....	6	..	6	..	11	9	9	11	9	11	60	1	60	66	11
Total..	618	26	644	..	..	..	..	..	..	..	..	..	..	..	..

a A few married women and a few girls under 16 years of age work occasionally mornings and evenings.

b Girls have to work 4 hours every sixth Sunday.

c Employer stated 3 hours on Sunday and employes had to report only once a month. All employes gave 4 hours on Sunday and said they had to report every other Sunday. Also reported additional 1½ hours on Saturday night.

d Employes reported 2 full weeks, which increased the hours considerably; 14 hours were reported Christmas Eve.

e Girls work every other Sunday 4 hours.

f Girls work 4 hours on Sunday once a month.

g Day before Christmas was Friday and the Jewish Sabbath began at 5 P. M., so the store was closed.

h The employer stated that the women did not work certain nights and came late in the morning. The girls were not only seen working the nights when they were reported off, but were seen coming an hour earlier in the morning. This would make at least a 61-hour week.

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The total number of women 16 years of age and over employed in the eleven representative neighborhood stores covered by the investigation was 618, or approximately 6 per cent of the adult women employes in the neighborhood department and other retail stores of Chicago. (Pages 892–893.)

Of these 618, 100, or about 16 per cent, were personally interviewed on the subject of working hours during the level of business of 1909 and 1910 and during the rush periods of 1909. They are all women who have been working in stores at least since the early part of 1909, and could, therefore, give information for that year. Many of them are women of long experience in the business, who began working at the age of 14 or even younger.

The neighborhood department store may be called a modern department store on a small scale or a large old-fashioned general merchandise store. It supplies every want of the families in the neighborhood from groceries and furniture to evening dresses and tailor-made suits. (Page 893.)

The normal hours as given in the tabulation for the establishments are strictly true for four of the stores. For the other seven stores the hours as reported are only approximately correct, as the individual employes interviewed reported longer hours in almost every case. This is explained by the fact that on the nights when the stores remain open the doors are open until the last customer has gone, even though this may be some time after the nominal closing hour. Thus in one store that was supposed to close at 9.00 P. M. on Thursday night no one ever got away before 9.05 and many could not leave before 9.30 P. M. The Saturday night closing hour is very elastic. Some stores that are supposed to close at 10.00 P. M. are open any time from 10.30 P. M. to 11.00 P. M. and even later.

In the case of establishment No. 6, the manager reported the hours as given, saying the girls did not go to work until 9.00 A. M. and did not work on Tuesday, Wednesday, and Friday evenings. Later this store was visited on evenings when it was reported as closed, and not only was the store open, but the very girls who said they did not work on the evenings named were found selling goods. They were also seen going to work at 8.00 A. M. instead of 9.00 A. M. It was not possible to talk to the girls alone, for the manager followed the agent around whenever such an attempt was made. Thus, sixty-seven hours a week would be more truthful than fifty-five hours. The latter probably shows more nearly what could be done to shorten hours than what is done. (Page 895.)

(b) The longest hours prevailed during the Christmas rush precisely when the work was most severe and exhausting.

Bulletin of the U. S. Bureau of Labor. No. 91. November, 1910, Working Hours of Wage-Earning Women in Chicago. UNITED STATES

However, in spite of the strain of long hours on half of the days of the year, the greatest strain occurs during the stores' busy season in December. This lasts from one to two weeks before Christmas each year—in the largest number of stores two full weeks before Christmas Day. The only exception to this rule was the ten weeks reported by a cloak and suit store (establishment No. 6). Four of these ten weeks were before Christmas and six before Easter. During the holiday busy season the stores remain open every night in the week from 9.00 to 11.00 o'clock, depending on the customers. On Christmas Eve the closing hour was even later. The hours reported by the managers for these two weeks are very conservative statements of the case. They may have desired to close at the time they reported, but the doors were not closed or the lights turned out, and the saleswomen had to remain and serve customers until 9.30, 10.00, and 10.30 every evening the first week, and until 10.00, 10.30, 11.00, 11.30, 12.00, and even 1.00 o'clock every evening the week before Christmas. Some could leave earlier than others, for whenever business ceased in a department the girls were allowed to go. A study of the hours reported by individuals will give a fair idea of the strain of those two weeks. Thus, thirty-two out of the 100, or almost one-third of the individuals, reported eighty hours or more for the week before Christmas. Only one of the thirty-two had worked less than seventy-two and one-half hours the week before that. One saleswoman at a bargain table reported seventy-six and one-half hours the second week before Christmas and eighty-six and one-half hours the week before. The culmination of the strain ended Christmas Eve with a thirteen-hour day. None of these girls worked less than thirteen hours the day before Christmas and one reported working fourteen and three-fourths hours. Fifty-six more of these saleswomen, or eighty-eight out of the 100, worked more than seventy hours the week before Christmas, and only twenty-two of these had less than seventy hours the week before that. Out of the 100, twelve reported working only between sixty and seventy hours these two weeks. Of the 100, twenty girls worked fourteen hours or more the day before Christmas, thirty-nine more, or fifty-nine out of the 100, worked thirteen hours or more the day before Christmas. Only five worked less than twelve hours on this day, and two of these were in a store owned by Hebrews who closed

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at 5.00 o'clock on Friday, since Christmas happened to fall on Saturday in 1909. (Pages 896–897.)

Report on Condition of Woman and Child Wage-Earners in the United States. Vol. V. Chap. V. Wage-Earning Women in Chicago. Senate Document No. 645. 61st Congress. 2d Session. 1910.*

In addition to the regular hours of work, nearly all women are required to do "overtime work" in busy seasons, such as Christmas, before special sales in their departments, and when inventory is taken. A woman in charge of the section may have to remain frequently after the store is closed. . . . In 60 per cent of the cases, however, the "overtime work" is done within a period of from one to three weeks before Christmas. Some of the stores are open every night (except Sunday night) from ten days to two weeks before the holidays. In these stores the girls generally work at night for a week to prepare for the rush. In cases where the girls remain until 10.30 P. M., 11.00 P. M., or midnight, an effort is sometimes made to relieve the strain by allowing them to report from one-half hour to one and one-half hours late the next day. This does not always happen, however. Even in the stores that are closed to patrons after 5.30 P. M. the girls do overtime work at this season. (Page 110.)

Ibid. Chap. XI. Overtime and Nightwork of Wage-Earning Women.

Forty-six of the fifty-four women employes in Chicago mercantile establishments worked overtime in December, 1907, for an average of 11.2 days before Christmas; five of them received definite compensation, averaging $3.20 each for the 11.2 days; ten were paid a commission on all December sales as compensation for overtime; twelve were given supper or supper money only; and nineteen received nothing at all for the Christmas overtime work.

As has been said, nothing in this condition was illegal in Illinois at the time of this investigation. (Page 210.)

In general, it can be said that long hours for women are rarely found under more unfavorable conditions than in stores that keep open evenings during the holiday season and, to a less degree, in the stores keeping open Saturday nights. (Page 214.)

* Number of women included in investigation of department and other retail stores, 339.

Report of the Consumers' League of the City of New York for the Year 1908. UNITED STATES

The most important work of the Committee on Investigation has been its attempt to cope with the evil of excessive overtime work during the season preceding Christmas, when the daily strain put upon employes is greatest.

As the claim has often been made that evening opening was necessitated by the demand of busy working people who could not buy in the daytime, it was decided to make this year a more expanded investigation of the evening conditions. . . . Three hundred such investigations were made, and, as the weather was fine, it gave a full impression of the "demand."

Testimony was unanimous that on the first open evening there were no crowds in the stores, and that on the evening when the stores were crowded a very large proportion of persons were not buying. . . . When it is realized that this extra time in the evening follows the most congested time of the year's selling, and that the special sales begin on December 26th, allowing no let-up in the strain, it will be seen that the health of employes is unwarrantably jeopardized. (Page 30.)

(2) Nature of the Work: Comparison with Factory Work

The nature of the work in mercantile establishments is comparable to work in factories, and the strain of the employment is analogous to the strain of factory work. The long hours of standing behind the counter and the bad air common to most stores, are the worst physical hardships. The strain of machine work in factories is replaced in stores by the strain of constant intercourse with customers, together with the effort to keep up the amount of her sales, upon which the salesgirl's tenure of work usually depends.

The legal prohibition of excessive working hours is therefore as necessary for women employed in stores as for women employed in factories, and the benefits which have been secured for the former may reasonably be expected to accrue also from the prohibition of more than ten hours' work in one day in mercantile establishments.

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Report on Condition of Woman and Child Wage-Earners in the United States. Vol. V. Senate Document No. 645. 61st Congress. 2d Session. 1910.

A saleswoman is in constant contact with people, obliged to please not only the customer, but the buyer, the assistant buyer, and the floor-walkers. As a buyer, she must give closest attention to details as well as to the matter of general supervision. All these causes may have over-strained her nervous force, and at this point it is not uncommon to hear of nervous breakdowns. The case of Mrs. F. is an illustration: After eight years' experience as an energetic and pushing saleswoman she was promoted to the rank of buyer. She was unusually successful, but after a few years the intense strain proved too great, and at the age of about 33 years nervous prostration necessitated a three-years' rest. At the expiration of this period she returned to work, but was obliged to take a place among the rank and file as saleswoman. She is now earning a salary of $12.00 a week. (Page 43.)

The wage of a saleswoman is determined, primarily, by the amount of her sales, which are carefully watched by the buyer, and if the sales of one fall below those of her neighbor she is told that she must sell more goods or "we shall have to fill your place with some other clerk." The saleswoman is in this way constantly nerved to highest endeavor, for not only does failure to sell mean loss of promotion, but she must keep up to the standard to maintain her present rank and wage. (Page 44.)

The Illinois statutes contain a law requiring employers to provide seats for women employes. Many of the department store employers obey this law to the letter. They provide seats. But the seat does not help a woman much unless she is allowed to use it. Most of the women say that they are closely watched, and are reprimanded by the floorman of their section if they sit down, even though they are not busy. Occasionally one hears of a floorman who proved an exception to the rule. (Page 109.)

Ibid. Vol. IX. History of Women in Industry in the United States.

The hours of saleswomen, too, though they have been gradually shortened, have always been long, and it soon became evident that the constant standing, which had been required of men, was injurious to women. Other evils, too, appeared. The history of saleswomen, then, like the history of other classes of working women, early becomes a story of hard work, long hours, and low wages. (Page 236.)

It was suggested that the constant standing position was probably as injurious as the use of the sewing machine. (Page 238.)

Report of the Consumers' League of the City of New York for the Year 1895.

Consider what it means to be on one's feet from ten to fourteen hours a day, in a crowded space, shoved and pushed about, lifting heavy boxes at times, waiting on impatient customers and customers who wish to be helped to know their own minds, keeping accounts of sales and stocks, taking addresses—often given hurriedly and carelessly, fined in many instances if they were written down incorrectly, and all this for salaries ranging from three to eight dollars a week, and obliged to dress neatly and fairly well, and to pay out of it for one's meals, lodging, washing, clothing, and carfare. (Page 17.)

Report and Testimony Taken Before the Special (Reinhard) Committee of the Assembly Appointed to Investigate the Condition of Female Labor in the City of New York. January 16, 1896.

Witness, Dr. Mary Putnam Jacobi:

It seems to me that the gist of the matter lies in one question, and that is, "Does the condition of the employes in retail stores at the present moment approximate or become identical with that of employes in factories?" That is the whole question. Because the question of the necessity of factory inspectors, and the necessity of some control outside of the factories, to protect the interests of the factory operatives has been decided, after nearly a century by the unanimous opinion of people who have tried the experiment. This question first received attention in 1802 in England, and we know it is only by means of the factory legislation that has been enacted and carried on and reïnforced in England that the population of England has been arrested on the down-grade slope of deterioration that threatened the very existence of the English nation. We know that most of the most enlightened states in the United States have followed in the track of the English legislation.

The second point is that the physical health of the women and children is of immense importance—not merely to themselves and family, but to the community at large. It is a social matter, and if the health of thousands and millions of women and children are allowed to deteriorate, why the whole nation suffers. It is on these two principles, which are perfectly obvious, that the factory legislation has been initiated for operatives in factories, and it seems to me perfectly evident as soon as any one stops to

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consider that this same principle applies to the workers in retail stores. This development of the employment of women and children in stores is a very recent and modern thing.

We, therefore, ask you to report this bill, which extends to the mercantile establishments where women and children are employed the principles which have been decided and accepted in spite of the opposition of the employers in mills and factories, and which are now recognized as necessary for the welfare of the community. (Page 764.)

Women and the Trades. ELIZABETH B. BUTLER. *The Pittsburgh Survey. Russell Sage Foundation Publication. New York, Charities Publication Committee, 1909.*

The dead air that tires the casual shopper weighs unrelieved on brain and nerves of the salesgirl who must breathe it the day through. . . . Since adequate ventilation is as yet only half insisted upon in churches and courts and schools, we can perhaps be tolerant of the backwardness hitherto of stores in this respect. Yet we can scarcely continue to be so indefinitely. The stores have a direct economic advantage to be gained by fresh air. . . .

Health and efficiency in a measure go hand in hand. The kind of efficiency that results from a clear brain and physical buoyancy, the kind that even an untrained salesgirl may have, is sapped constantly by the breathing of vitiated air. It is sapped, too, by needless physical weariness, whether this results from counters built so close that the girls have not room to pass each other, and even when standing are cramped and uncomfortable, from the firm's neglect to provide seats, or from the tacit understanding, of all too frequent occurrence, that seats when provided are not for use. This tacit understanding at times finds expression in definite rules with penalties for non-observance. . . .

Girls untrained in the ways of their trade, at work often under conditions distinctly unhealthful, are expected to counterfeit attentiveness by constantly standing. At times during the day they are not waiting on customers. At times they have no stock to arrange and are obliged only to be at their places. That any should have always to stand seems obviously unnecessary. (Pages 299–300.)

Labor Laws and Their Enforcement with Special Reference to Massachusetts. Edited by SUSAN B. KINGSBURY. *New York, Longmans, Green and Co., 1911.*

Health conditions may show a higher average in stores than in factories, but cases of bad conditions in stores certainly exist and these might

perfectly well be made illegal by a simple extension of present laws. (Page 266.) UNITED STATES

Saleswomen in Mercantile Stores. Baltimore. 1909. ELIZABETH B. BUTLER. *Russell Sage Foundation Publication. New York, Charities Publication Committee, 1912.*

Mercantile establishments employ a large proportion of the women wage-earners of this country. Although the types of saleswomen vary from district to district, from city to city, yet the requirements for salesmanship in all cities are fundamentally the same. . . . The saleswoman in a small specialty house or in a neighborhood store is a cog in a small wheel, just as the saleswoman in a department store is a cog in a large wheel. In both cases, the duties of her occupation are for the most part the same.

This occupation, simple as it appears, involves prompt personal adjustments and quick understanding. It is upon the intelligence of the saleswoman, and upon her attitude to the customer, quite as much as upon the quality of the goods, that the number and value of sales depend. The mercantile house, however thorough in organization and however responsive to public demand, must in the last analysis rely upon its sales force for success, and the personal efficiency of the latter must keep pace with the impersonal efficiency of store organization. (Pages vii–viii.)

British Sessional Papers. Vol. XII. 1886. Report from Select Committee on Shop Hours Regulation Bill. GREAT BRITAIN

Mr. William Abbots, M.D., Member of the Royal College of Physicians, Member of the Royal College of Surgeons:

2016. Do you think a shop more monotonous than tending spindles and looms in textile factories, for instance?—In a shop there is this also to be considered, that the assistant has to deal with a great many people of different styles.

2020. Would it not, therefore, be less wearing in a shop than in tending a machine?—I do not think so.

2023. That is quite sufficient answer to my question, if it is your opinion that the labour in shops is really as exacting and trying as a corresponding length of time tending machines?—It is.

2039. I think you said just now that in shops the change which the assistants have makes the work not so monotonous as the work in an ordinary workshop, and, therefore, it is healthier?—I did not intend to put it quite in that way; I meant to imply more trying; that in a shop

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there is a greater strain upon the mind where you have to deal with different people; so many different phases of humanity in a given time; but in the workshop, presuming that a woman understands the duties of looking after a particular machine or department, it becomes so much a matter of routine or habit that there is not the same strain.

2040. Do you not think that the mental irritation that often arises between an assistant and a troublesome customer who is difficult to please is as injurious to health as the monotony of a workshop?—It would certainly not conduce to health.

2041. Would it conduce the other way?—Exactly. Where there are so many phases of humanity there is a continuous strain, supposing there is much business doing; and if there is not much business doing, there is standing the whole time, and that has the same effect physically.

2042. The point I want to bring out is this: Although the occupations are entirely different, there are certain irritating circumstances which are quite as injurious to health as the dull monotony of tending a machine?—Yes.

2043. In fact, you think that the work of shop assistants is, on the whole, as tiring as the work of tending machines?—I should think it is more so.

Mr. Whateley Cooke-Taylor, Inspector of Factories:

3875. With regard to the health of the people, do you think that the general health of those employed in workshops has certainly improved since the passing of the Factory and Workshops Acts?—I do.

3876. Have you yourself noticed a considerable improvement in their health?—I have.

3877. Do you think that the same result would follow if the hours in shops could be curtailed?—I think it would.

Mr. James Ball Lakeman, Inspector of Factories for the Metropolitan District:

858. And it would be a fair addition to the present legislation, would it not, that those who sell materials which have been made up should have the same advantages as those who make up the materials?—I think so, clearly.

British Sessional Papers. Vol. XII. 1895. Report of Select Committee on Shops (Early Closing) Bill.

Witness, Dr. Percy Kidd, M.D. of University of Oxford, Fellow of College of Physicians and Member of the College of Surgeons; attached to London Hospital and Brompton Hospital:

5322. . . . Then you would not like to say that you speak with any authority in particular as regards the shop assistants, would you, and that it is a class which has bad health?—It is a class which is very liable to these complaints, as far as my experience goes, especially this general debility, which is more frequent in them than in other classes. I will not say it is confined to shop assistants; it affects factory workers as well.

British Sessional Papers. Vol. VI. 1901. Report from Select Committee on Early Closing of Shops.

Sir William S. Church, Baronet, President of the Royal College of Physicians:

2288. I should like to call your attention to the fact that in the year 1886 there was a Committee of the House of Commons on the Shop Hours Regulation Bill. The committee made a unanimous report to the House that "In many places the hours of labour in shops ranged from eighty to eighty-five per week, and that in their opinion such hours as those were injurious to health and in many cases ruinous, especially in the case of women." Under those circumstances the then presidents of the Royal College of Physicians and of the Royal College of Surgeons issued a circular to the medical men of London, which was signed by Sir Andrew Clarke, Dr. Matthew Duncan, Mr. John Marshall, Sir James Paget, Dr. Playfair, Dr. Priestley, Sir Richard Quain, Sir William Savory, Sir Samuel Wilkes; and you will probably tell the committee that those gentlemen were at the very head of the medical profession?—Yes.

2289. And several of them were particularly conversant with the diseases of women, were they not?—That is so.

2290. In consequence of that circular more than 300 of the medical men of London signed a petition to Parliament. A petition of that kind, signed by 300 of the medical men of London, is, you will probably agree, a very remarkable and unusual document to be addressed to the House of Commons.

2294. All we are asking you is, that you should give the committee your views as to whether those hours of labour really are, in your opinion, as they were in the opinion of your predecessors, seriously injurious? If they were compulsory hours of labour, I think the State should interfere, in the same way as it does in the Factory Act.

Sir William MacCormac, President of the Royal College of Surgeons:

2471. You mention physical toil. It has sometimes been urged before us, "You ought to remember that the work is not very arduous." I gather that the evils which you speak of are due to the confined condi-

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tions: to the bad air, to the constant standing, etc., rather than to the arduous character of the physical labour? I should consider that standing for ten or eleven hours was exceedingly arduous labour.

2473. We are told sometimes, "You speak of these hours as unduly long, but you ought to remember that the work is not so very severe, that it involves no great strain upon the muscles" . . . but I imagine that you would tell us that that is not the question, that it is the conditions under which they are spending the day, rather than the amount of toil, which is important?—Quite so.

History of Factory Legislation. B. L. HUTCHINS and A. HARRISON. *London, P. S. King and Son, 1911.*

While conditions have without doubt greatly improved in better class shops, in many quarters the hours are still a terrible grievance, and fraught with the worst possible consequences to health. The excuse is sometimes made that the work is less hard than in manufacturing industry. This may be true to a certain extent, but it leaves out of account that the attitude of standing, if maintained for any length of time, is quite as fatiguing as, and probably more injurious than, movements that involve more muscular effort; also that, after all, nobody's day is more than twenty-four hours long, whatever work he may do, and the mere fact that any particular work done is less heavy and strenuous than some other kinds does not *ipso facto* give the worker any more hours for rest, relaxation, or recreation. (Page 222.)

(3) Bad Effect on Health

(a) General Injuries to Health

The fatigue which follows excessive working hours and long hours of standing in mercantile establishments, becomes chronic and results in general deterioration of health. While it may not result in immediate disease, it undermines the whole system by weakness and anæmia.

The highest medical authorities in Great Britain have borne witness to the dire menace to health, from conditions of employment in British mercantile establishments similar to those shown to exist in stores in the United States in general, and in Illinois in particular.

Bulletin of the U. S. Bureau of Labor. No. 91. November, 1910. Working Hours of Wage-Earning Women in Chicago. UNITED STATES

The saleswomen complain bitterly of the long hours of standing even when there is no rush season. Many when asked concerning their health, reported swollen and aching feet and frequently broken arches, painful menstruation, and other disorders. In a few of the stores stools are provided and the girls are advised to sit down when not busy. In other stores the only seats the girls had were boxes that they hunted up themselves. They were afraid to use even these when the managers or floormen were around. The most bitter complaints were of the added long hours of Saturday night, especially when they had to get up and work again Sunday morning.

Not only are the hours increased to meet the Christmas rush, but more help is employed. Even then, however, each employe is worked to the limit of endurance. Two girls reported a week's illness in bed as a result of the strain of the busy season, and nearly every girl reported excessive pains in the feet and extreme exhaustion.

. . . Not a girl reported any additional compensation for the long hours of the two weeks before Christmas. Those who received a commission made more from additional sales, but the rate of commission remained the same. (Pages 897–898.)

Report on Condition of Woman and Child Wage-Earners in the United States. Vol. V. Senate Document No. 645. 61st Congress. 2d Session. 1910.

The worst feature of this (Christmas) overtime is that it comes at the time of the year when the regular work is the most taxing and the women least able to endure longer hours. (Page 84.)

The chief hardship of this extra work arises from the necessity of standing throughout such a long day—eleven or twelve hours, and in extreme cases even fourteen hours. More than one woman reported spending all of Christmas Day in bed as a result. (Page 110.)

Report of the Massachusetts Bureau of Statistics of Labor. 1884.

We secured the personal history of these 1,032 of the whole 20,000 working girls of Boston, a number amply sufficient for the scientific purposes of the investigation. (Page 5.)

Long hours, and being obliged to stand all day, are very generally ad-

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vanced as the principal reasons for any lack or loss of health occasioned by the work of the girls. (Page 69.)

Report of the New Jersey Inspector of Factories and Workshops. 1884.

The law passed this year through the efforts of the State Trades Unions, compelling employers to provide seats for the use of their female employes, is one of the best on our statute books, and has been approved by men of all classes, especially by the medical fraternity, many eminent members of which have testified that it is destructive to the health of women to keep them standing for hours in mills or stores without an opportunity to rest. (Page 25.)

Report of the Chief of Massachusetts District Police for the year ending Dec. 31, 1885.

Many complaints have been made in the public press, and some agitation in other quarters, based upon the physical hardship of compelling women and girls employed many hours daily in manufacturing mechanical and mercantile establishments to remain standing at their respective occupations. It was shown by the testimony of medical men that serious results to the health were produced in such ways. (Page 34.)

Report of the Maine Bureau of Industrial and Labor Statistics. 1888.

Many saleswomen are so worn out, when their week's work is ended, that a good part of their Sundays is spent in bed, recuperating for the next week's demands. And one by one girls drop out and die, often from sheer overwork. This I know from observation and personal acquaintance. (Page 142.)

National Child Labor Committee. New York. Proceedings of the Third Annual Conference. Cincinnati, Ohio. 1907. Some of the Ultimate Physical Effects of Premature Toil. ALBERT H. FREIBERG, M.D., *Cincinnati, Ohio.*

Standing occupations naturally involve the feet and legs in greatest strain, and more especially the feet. In consequence we see developing, during the adolescent years, that condition known as weak and flat foot. This frequently occurs in the adult also from causes of similar nature, but only too frequently the result of conditions and weakening which must

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be attributed to the period of active growth. . . . Commonly the foot loses its strength and shape gradually, so that at this time but little notice is taken of it. Later . . . the feet only too frequently become so painful that long abstention from work is imperative, and it happens not rarely that an entire change of employment cannot be avoided; . . . for while medical science can do much for these unfortunates, they are often debarred from continuing in trades requiring constant standing. Frequently upon coming under medical care the condition is such that nothing short of a long stay in hospital will prove availing, and this means loss of income if not loss of independence for a greater or less period. I doubt whether it is generally realized how frequently such conditions are met as those to which I have just referred. (Page 23.)

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British Sessional Papers. Vol. XVII. 1892. Select Committee on Shop Hours Bill.

Paper handed in by the chairman. Petition in favour of the Early Closing Bill. 1888. (Presented by Sir John Lubbock.)

To the Honourable the Commons of the United Kingdom of Great Britain and Ireland, in Parliament assembled.

We, the undersigned medical men, having had our attention called to the very late hours to which shops are open, and being satisfied that such prolonged hours of labour are grievously injurious to the health especially in the case of women, pray your Honourable House to enact the Early Closing Bill, introduced by Sir John Lubbock. . . . And your petitioners will ever pray.

J. Matthews Duncan, 71 Brook street.
John Marshall, 16 Saville Row, W.
Wm. S. Savory, 66 Brook street, W.
Samuel Wilkes, 72 Grosvenor street.
James Paget, 1 Harewood Place.
Wm. O. Priestley, 17 Hertford street, Mayfair.
W. S. Playfair, 31 George street, Hanover Square.
Richard Quain, 67 Harley street.
Andrew Clark, 16 Cavendish Square, and 298 others. (Page 238.)

Petition in favour of the Early Closing Bill, 1888. To the Honourable Commons of the United Kingdom of Great Britain and Ireland, in Parliament assembled. The humble petition of the undersigned:

We, the undersigned matrons and nurses in Metropolitan hospitals, having had our attention called to the grievous injury which is sustained by women, and especially by girls, by reason of the long hours during

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which they are now compelled to stand in shops, humbly pray your Honourable House to pass the Early Closing Bill brought in by Sir John Lubbock.

And your petitioners will ever pray.

List of petitions in favour, and number of signatures from the following Metropolitan hospitals:

Charing Cross Hospital, 52 signatures; Kings College Hospital, 25 signatures; St. Mary Lebone Infirmary, 61 signatures; British Home for Incurables, 14 signatures; London Hospital, 93 signatures; Royal Free, 34 signatures; London Home Pathic Hospital, 6 signatures; Middlesex Hospital, 25 signatures; London Hospital, 26 signatures; German Hospital, London, 4 signatures. (Page 238.)

Mr. James Ball Lakeman, Inspector of Factories and Workshops:

732. Have you found that women and young persons suffer severely on account of long hours when the sanitary accommodation and other conditions are defective?—I cannot say that they suffer from want of sanitation because I have never, of course, gone into the question so minutely; but I know that, with regard to anæmia and varicose veins and dyspepsia, those are instances I myself have seen and given as the result of long hours of standing.

735. But even in the case of grown women, if they were kept standing, working under conditions such as you describe, for more than seventy-four hours a week, in your judgment, and from your experience as an inspector, would you not expect to find that their health would suffer?—Yes. I certainly think that a continuation of labour on the system now obtaining must be injurious to the health of the female, whatever her age may be.

Mr. Thomas Sutherst, Barrister, Early Closing Association:

1243. I think we have got sufficient now to show that on the ground of the health of those employed in shops there is absolutely no doubt that the hours are too long, and the conditions very unsatisfactory?—I should like to mention the number of the medical faculty who have given evidence corroborating that without reading it; there is Sir Risden Bennett, Dr. Norman Kerr, Dr. B. W. Richardson, Mr. Lawson Tait, Mr. J. H. Rutherford, Elswick Lodge, Newcastle-on-Tyne; Dr. Arthur W. Edis, London; Dr. Robert H. Lloyd, Medical Superintendent, Lambeth Infirmary; the late Sir Charles Bell, Dr. Peter Mark Roget, Mr. William Sharp, Junior, late surgeon to the Dispensary, Bradford, Yorkshire; Mr. Charles Turner Thacketh, Surgeon, late of Leeds; Mr. George James Guthrie, late Vice-President of the Royal College of Surgeons and Surgeon of Westminster Hospital; Dr. John Elliotson, late Physician to St. Thomas' Hospital and Medical Teacher in the London University;

Mr. Benjamin Travers, late Surgeon to St. Thomas' Hospital, Southwark, and Dr. James Blundell, late Lecturer on Physiology in the School of Guy's Hospital. These are typical and representative men.

1348. I may take it therefore that you think that the long hours and the bad conditions under which women have to labour are damaging for grown women, as well as for girls under 18?—Undoubtedly.

1351. And consequently we stand today in just as great need of some controlling of the hours that women work as we did at that time (1886)? —Quite. My only difficulty is as to the best means of doing it.

1352. You have also enlarged here upon the causes of the illnesses of women, the long hours at which they are kept at work, the standing, the bad air they have to breathe, the irregular meals with too little time to take them. May I take it that we may consider that your views upon the causes of the illnesses of women are the same today as they were then? —Exactly the same.

Mr. James Austin Stacey, Secretary of the Early Closing Association:

2427. As regards the question of health, would you wish to say anything upon that point. We are going to hear medical evidence upon it, but is there anything that you yourself wish to say with reference to it?— The Early Closing Association has an honorary medical staff, and it gives to its members privileges with regard to this staff, that is to say that for the payment of a membership subscription of 2s. 6d. they are entitled to see members of the staff at certain times free of further cost, except their medicine, of course. That brings us a number of applications for these membership tickets, and incidentally it brings us a lot of information as to the very prejudicial effect which the long hours of standing particularly has upon the health of young women. I have known in my experience a number of girl assistants who have been thoroughly invalided out of their occupations, and have either become a charge upon their parents or friends, or have had to enter into fresh fields of industry.

2428. Therefore, without speaking of course with medical authority, you have had very large experience, and are strongly of opinion that these long hours are very prejudicial to health, specially I presume, in the case of women?—Yes; and I may say that Sir James Risdon Bennett, the late President of the Royal College of Physicians, was one of our honorary medical staff; he spoke more than once at our public meetings, and he very strongly denounced the evils of long standing, and the general effect of overworking upon shop assistants, particularly young women.

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Ibid. Report of the Lancet Sanitary Commission on Sanitation in the Shop.

. . . Undoubtedly the standing for such long hours is a great and terrible grievance. Young shop assistants have explained to us how towards the evening they became giddy, "a swimming sensation" overcame them, and they continued to serve almost unconsciously. In time they became hardened to the excessive strain, but in the course of years many were obliged to lie up, the most frequent complaint from which they suffered being that of varicose veins. (Page 245.)

British Sessional Papers. Vol. XXXVII. 1893. The Royal Commission of Labour: Employment of Women. Reports by Misses ORME, COLLET, *etc.*

Statement by Dr. Service: The long hours which shop girls work and the conditions under which they do their work are injurious to their constitutions. Prolonged standing, long hours, and want of proper sanitary accommodations lead to ailments affecting the bladder, bowels, uterus, nervous, vascular (blood) and muscular systems. These ailments are evidenced by the legs becoming swelled with fluid, varicose veins appearing in the lower extremities and muscular pains and weakness being felt from the waist to the soles of the feet. The nervous system is seriously injured by the undue strain which is put upon all the organs of the body. Facial neuralgia, spinal neuralgia, and headache are very common complaints. Anæmia (popularly speaking poverty of the blood) will be found in the majority of shop women. This arises from long hours, close confinement, and long intervals between meals, with consequent disturbance of the digestive and assimilative functions. (Page 318.)

I have also evidence from Dr. Edmistoun, who has had several opportunities for acquiring knowledge of conditions among shop assistants, and who writes he "can bear testimony that the long system of shop hours is exceedingly injurious to young women and is undoubtedly the cause of a train of particular ailments such as anæmia, nervous disorders, constipation, indigestion, and a large number of diseases peculiar to young women. (Page 287.)

British Sessional Papers. Vol. XII. 1895. Report of Select Committee on Shops (Early Closing) Bill.

Witness, Dr. Percy Kidd, M.D., University of Oxford, Fellow of the College of Physicians and member of the College of Surgeons; attached to the London Hospital and the Brompton Hospital:

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5281. . . . The most common effect I have noticed of the long hours is general deterioration of health; very general symptoms which we medically attribute to over-action and debility of the nervous system; that includes a great deal more than what is called nervous disease, such as indigestion, constipation, a general slackness, and a great many other indefinite symptoms.

5303. Have you ever had any complaints from women who come as patients of their being obliged to stand at their work so long?—Yes, I have heard that complained of in many cases. . . . 5313. It is disadvantageous for women to stand too much, is it not?—Yes, it is. 5314. But you do not think many break down from that cause, do you?—It is difficult to separate that from the general exhaustion which results from long hours.

British Sessional Papers. Vol. VI. 1901. Report by the Select Committee of the House of Lords on Early Closing of Shops.

5. We [the committee] are able, however, to appeal to the highest medical testimony as to the injury thus caused (long hours). In 1888 presidents of the two great medical colleges with some of the other leaders of the medical profession, Sir James Paget, Sir Andrew Clark, Dr. Matthews Duncan, Mr. John Marshall, Dr. Playfair, Dr. Priestly, Sir Richard Quain, Sir Wm. Savory, Sir Samuel Wilks, called the attention of Parliament to the subject and urged the passing of the Early Closing Bill.

6. Considering the weight which belongs to that memorial, the committee did not deem it necessary to multiply medical evidence on the subject. The presidents, however, both of the College of Physicians and of the College of Surgeons, have come before us and spoken strongly on the great and increasing evils of the present long hours. (Page v.)

Witness, Mr. J. G. Beaumont, Representative from the Birmingham and District Retail Drapers and Hosiers' Association:

348. The House of Commons Committee reported in 1886 that these long hours were prejudicial and often ruinous to health; have you any evidence on that point? . . .

Sir James Sawyer wrote: "The manifold evils which arise in impaired health, induced diseases and shortened lives from working too long by day, and especially in a standing posture and in impure air, are well known to physicians, and are prominent and preventable causes of human suffering." Dr. Jordan Lloyd wrote: "Weakened bodies and enfeebled minds are necessary consequences of prolonged confinement and monotonous occupation." . . .

Dr. Malins wrote: "My experience undoubtedly tells me that the long hours of female shop assistants are highly detrimental to their health.". . .

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Witness, Sir William S. Church, President of the Royal College of Physicians:

2309. . . . There is one form of ailment which is aggravated by work such as shop assistants have to do. Those come rather under the observation of surgeons and physicians who practice more especially in diseases of women. But there is another great group which falls under the observation of the ordinary physician, and of which we see a very great deal in our London hospitals, and that is anæmic condition, which is produced partly by long hours of work, and still more so by the confinement that this employment entails. They do not get sufficient opportunity for being in the fresh air and in the sunlight, and the evil is, of course, greatly aggravated by late hours at night. . . .

2319. . . . The longer the hours the greater the detriment.

Witness, Secretary Scottish Shopkeepers' Association:

1034. . . . Professor McKendrick, of Glasgow University, who is identified with our movement as Honorary Vice-President, . . . says: "I have no doubt whatever that the long hours and confinement of shop assistants are injurious to health, and I am glad in a general way to express that opinion." . . . Then Dr. Yellowlees, Governor of the Glasgow Royal Lunatic Asylum, writes: "I am quite sure that the unreasonably long hours and close confinement of shop assistants are a great evil, and are often not only a great hardship, but very injurious physically, mentally, and morally."

The Hygiene, Diseases, and Mortality of Occupation. J. T. Arlidge, M.D., A.B., F.R.C.P., *Late Milroy Lecturer at Royal College. London, Percival, 1892.*

When insufficient muscular activity is associated with almost constant standing, the increased difficulty to the return of the blood from the lower limbs is the most pronounced feature, and productive of varicose veins, and ulcers and thickened knee and ankle joints. (Page 19.)

Workpeople obliged to stand long, and especially when this happens in early youth, lose the arch of the foot and become flat-footed, with deformed ankles and often "knock knees." (Page 558.)

(*b*) Injuries to the Female Functions and Childbirth

Prominent physicians have testified as to the evil effect of overwork and continuous standing in mercantile establishments upon the female functions and childbirth.

British Sessional Papers. Vol. XII. 1886. Report from Select Committee on Shop Hours Regulation Bill.

Mr. William Abbotts, M.D., Member of the Royal College of Physicians, Member of the Royal College of Surgeons:

1982. Does the fact of the assistants in shops having to stand entirely make any difference in point of health?—That is very injurious, to young people particularly.

1983. Have any special cases of that kind come within your experience?—Many cases, more especially as regards women; it affects the pelvis and pelvic organs.

1984. And the effect is serious?—In many cases they have been obliged to leave their employment, and have been unfit for any employment for a considerable time afterwards.

2000. Does their employment injuriously affect them as child-bearing women in after years?—According to all scientific facts it would do so; it leads to pelvic diseases, and would affect them in after years when they become mothers.

2001. You have no doubt in your mind upon that?—No.

2007. And you, as a medical man of considerable number of years' experience, would not look to girls who have been worked so many hours in one position—standing—as the bearers of healthy, strong children?—I should not.

2008. Then it naturally follows, does it not, that this is a very serious matter in the interests of the nation as a whole, apart from the immediate injury to the person concerned?—Yes, as regards the physical condition of the future race.

British Sessional Papers. Vol. XVII. 1892. Select Committee on Shop Hours Bill.

Quotation from Dr. Benjamin Ward Richardson:

1241. "The effects of shop labour is of necessity injurious as impeding their growth and the natural development of the organs of the body. To the female the mischief is of the kind calculated to extend to the offspring she may have to bear. The diseases incident to these long hours in the young are anæmia in both sexes; dyspepsia with much constipation and flatulence; depression of spirits. In the female, suppressed natural function; and in males and females development of pulmonary consumption where there is a tendency to it. The depression and nervous exhaustion produced by overwork and long hours leads without doubt to an exhaustion which seems to be relieved for the moment by stimulants

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and which produces a craving for them of the ultimate injury and further exhaustion of the recipient." (Page 53.)

Quotation from Lawson Tait, Surgeon to the Birmingham and Midland Hospital for Women and Specialist in diseases of women:

1242. . . . Shops as generally arranged, with their atmosphere charged with the products of gas consumption, are not conducive to health. Long hours for women produce a great variety of uterine and ovarian diseases and the general dyscrasies of anæmia. Women should not work more than ten hours a day, and in very many cases not so many as that. A great many cases under my observation, women suffering from uterine displacements, chronic inflammatory diseases of the ovaries and tubes. . . . Quotation from Dr. Norman Kerr: "It is impossible for me to find language strong enough to convey a hundredth part of the mischief which I have seen arise from the excessive hours of labour of shop assistants who have been under my professional care. The great length of the hours at work I have seen break down strong constitutions, seriously aggravated as the evil has been by the dyspeptic misery and disease produced by the necessary . . . bolting of food through the far too short period allowed for meals." (Page 53.)

Witness, W. Abbotts, M.D., Editor of "Hygiene"; Member of the Royal College of Physicians and Royal College of Surgeons:

4813. . . . What is it that women suffer from chiefly in connection with the long hours that the committee are already satisfied shops keep open?—They suffer from various affections in the lower part of the body and from nervous and spinal complaints and from varicose veins. . . .

4815. Is it not the long hours of standing, insufficient time for meals, and bad atmosphere which are the chief causes of the illness to which women are subject?—Those would be.

4816. What are those illnesses?—Those illnesses would be various: irregularities of the parts incidental to women, the female organs; diseases of the spinal cord, causing nervous complaints, and varicose veins arising chiefly from the long standing position.

4817. Well-grown women suffer from these complaints through the long standing as well as young girls under eighteen, say?—Yes, they would. (Page 207.)

British Sessional Papers. Vol. XXXVII. 1893. The Royal Commission on Labour: Employment of Women. Reports by Misses ORME, COLLET, *etc.*

Dr. Edmistown adds that not only is the health of the women themselves impaired by the conditions of their work but the evil results of

these are to be traced in the children of women who have been employed as shop assistants. He concludes by saying that the medical men of our large cities could furnish further evidence of the evil effects of long hours, and expresses his opinion as to the need for immediate attention to this matter. . . . Several other medical men consulted have given general testimony to the same effect, the points chiefly dwelt upon by them as objectionable being the long hours, close confinement, want of regular and sufficient time for meals, bad air, want of seats, and absence of sanitary accommodation. (Page 287.) . . . Again if we look at the children of women who have worked under the conditions mentioned, the evil effects are, if anything, more pronounced. Mothers with children from 1 to 10 or 12 years of age frequently come to us wondering why their children are so delicate. Neither of the parents nor any of their forbears are or were delicate and they cannot see why their children should be. But on inquiry it is found that the mothers worked either in shops, mills, or warehouses under conditions not suitable to sound health, and debility, slight and unnoticed, takes hold of the constitution and it is only after some years of married life that the mischief shows itself in mother and children, and as an unhealthy tree cannot bring forth healthy fruit, no more can unhealthy mothers bring forth healthy children. Lung troubles are frequently seen. The main complaints that have come before me are anæmia, muscular weakness, nervous prostration, and uterine, stomach, and intestinal troubles. These complaints, which are very common and most damaging to the system, are interdependent and traceable to the few causes before mentioned. (Page 318.)

British Sessional Papers. Vol. XII. 1895. Report of Select Committee on Shops (Early Closing) Bill.

Witness, Miss MacDonald, M.D., attached to the Hospital for Women in Euston Road:

5379. Dr. Kidd told us just now that in his experience at Brompton Hospital there was a good deal of general deterioration of health among women?—That is exactly what I should say, anæmia and general nervous debility.

5386. And would not standing so long very much affect women, if they were married, afterwards?—It is not good for women to stand at all really.

5387. If it is not good for them to stand at all, still less will it be good for them to stand thirteen hours a day?—I think it is shocking.

5389. . . . The standing of course would exhaust the women and make them more liable to other illnesses. (Pages 218–219.)

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Witness, Dr. W. Chapman Grigg (formerly out-patient physician for the diseases of women at Westminster Hospital, and senior physician to the Queen Charlotte Lying-in Hospital, and connected with the Victoria Hospital for Children):

5402. Would you please tell us in a general way your experience as to the effects of these prolonged hours on health?—It has a very grave effect upon the generative organs of women, entailing a great deal of suffering and also injuring a very large body of them permanently, setting up inflammation in the pelvis in connection with those organs. . . .

5403. . . . I have had a great many sad cases come before me of women who were permanent invalids in consequence.

5404. . . . If the matter could be gone into carefully, I think the committee would be perfectly surprised to find what a large number of these women are rendered sterile in consequence of these prolonged hours.

5409. . . . I think it must be acknowledged that sterility is often due to this inflammatory mischief arising round the generative organs. I believe that is one of the greatest evils attached to these prolonged hours. I have seen many cases in families where certain members who have pursued the calling of shop-girl assistants have been sterile, while other members of the family have borne children. I know of one case where four members of a family who were shop-girls were sterile, and two other girls in the family, not shop-girls, have borne children; and I have known other cases in which this has occurred. . . . I have patients come to me from all parts of London. It appears to be a most common condition.

5410. When these women have children, do you find that the children themselves suffer from the woman having been affected by these very long hours?—I have seen many cases where I have attributed the mischief arising in childbed to this inflammatory mischief in the mother, which, after delivery, has set up fresh mischief, and I have seen serious consequences resulting.

5413. You think that if the hours were altered, there would be less of this deterioration to health which you speak of?—I am sure of it; they all tell the same tale, and say it is the prolonged hours and not being allowed to sit down. (Pages 219–220.)

British Sessional Papers. Vol. VI. 1901. Report by the Select Committee of the House of Lords on Early Closing of Shops.

Witness, Sir W. MacCormac, President of the Royal College of Surgeons:

2467. And you can hardly expect that women who have been suffer-

ing from such long hours should become the mothers of healthy children? —That is what I ventured to hint. It must have an influence on their offspring undoubtedly.

2468. . . . It is gradual and progressive in its effect, and it goes on, I am afraid, in a cumulative degree.

2469. You mean that from generation to generation the population will become feebler and feebler, and less able to resist disease?—It must suffer from the influence of it, no doubt. (Page 120.)

The Hygiene, Diseases, and Mortality of Occupation. J. T. ARLIDGE, M.D., A.B., F.R.C.P. *London, Percival, 1892.*

Continuous standing for hours together is a strain especially upon the arch of the feet and the ankle joints; a cause of weary spine and spinal curvature, favoring also pelvic fullness, and in the female sex, productive of derangements of the uterine functions and of uterine displacements. (Page 170.)

Women's Work. A. AMY BULLEY and MARGARET WHITLEY. *London, Methuen, 1894.*

The long hours of standing are, of course, apt to be injurious to the health of women, and especially of young girls. Physicians give evidence of diseases contracted in this manner, and the report of the "Sanitary Commission" of the *Lancet*, though moderate in expression, is sufficiently explicit upon this point. (Page 56.)

(4) THE NECESSITY FOR LEGISLATION: VOLUNTARY ACTION INSUFFICIENT

In the United States as well as abroad the failure of voluntary action in regulating the hours of labor in mercantile establishments has proved that legislation is necessary to protect saleswomen from extreme overwork.

The uniform requirement of limited working hours therefore checks the unscrupulous purchaser, as well as the unscrupulous merchant, and enables the enlightened and humane employers to shorten the working day without fear of underbidding competitors.

UNITED STATES

Report of the Consumers' League of the City of New York for the Year 1904.

Many merchants regret that they and their employes must add hours of evening work to the already fatiguing experiences of holiday selling, and almost all of them express themselves as willing to close their stores earlier, if all their neighboring competitors would do the same; but as long as a few merchants hold out against this willingness to stand together, the great burden of Christmas overwork will continue to fall upon those least able to bear it. (Page 23.)

Ibid. 1908.

If merchants are honestly willing to close, "provided their competitors will do the same," but feel themselves unable to do so because their competitors will not fall into line, it is certainly time for enlightened public opinion to demand legislation preventing such strain upon women and young girls. (Page 31.)

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British Sessional Papers. Vol. XVII. 1892. Report from Select Committee on Shop Hours Bill.

Mr. Dudley C. Cornes, Employe of the Early Closing Association:

1754. Then, notwithstanding the assistance which your society can give, and the agitation which you can carry on, may we look upon it that voluntary efforts are, more or less, a failure?—They are, more or less.

1755. Practically a failure?—Practically a failure.

1758. As you say that voluntary effort has been practically a failure, do you see any way in which it is possible to bring that about, except by legislation in some shape?—I see no way at all except by legislation.

Mr. Thomas Sutherst, Barrister:

1366. I think you also admit that voluntary action has been a failure; that is substantially the sum of your replies?—I say that to effectually deal with the evil, although it has done some good, I am afraid it never would accomplish any substantial improvement.

1368. You consider legislation is the only real remedy?—I do.

British Sessional Papers. Vol. XII. 1895. Report of Select Committee on Shops (Early Closing) Bill.

Mr. James Austin Stacey, Secretary of the Early Closing Association:

12. You gave evidence then (1892), that, in your opinion, though voluntary action had done much good in many cases, it was not competent

to cure the evil as a whole. Is that still your opinion?—Yes. And that, I may say, is the opinion of various traders' associations in various parts of the country.

147. You support this legislation because you contend that voluntary action has ceased to have effect; is that so?—It has ceased to make the progress that the traders themselves declare to be necessary for the health and well-being of their assistants, and for economical reasons to themselves.

148. You would say that your Early Closing Association has not been able to get any further early closing by voluntary action?—Not further than we have gone. We have gone a great way.

149. You are at a standstill?—Year by year we bring about a certain number of improvements, averaging over 1,000 improvements during the past four or five years, but then the mischief is, as in the case of Brixton, one or two men come along and upset the whole thing, and the work has to be done over again, not always successfully.

Mr. John Adams Cooney, Chairman of the Scottish Shopkeepers' and Assistants' Union:

914. Then your impression is that voluntary action would not be of much use?—It is useless.

915. For what reason?—It has been so often tried, and has been a failure in each case.

Mr. Thomas W. Flint, Scottish Shopkeepers' and Assistants' Union:

1182. Do you not think there has been a great improvement of late years under the voluntary system, and that the hours are much shorter than they were twenty years ago?—No, I do not.

1183. Do I understand you to say you have not found any great improvement under the voluntary system?—I do; I have seen no great improvement.

1184. That is why you are in favor of some compulsory measures being adopted?—Yes.

Mr. Edward Day, Secretary of the West Yorkshire Federated Chamber of Trade:

1279. When voluntary arrangements are made with regard to the hours of closing, is it within your experience that those voluntary arrangements frequently break down?—Quite so.

Mr. John Griffin Beaumont, Honorary Secretary of the Birmingham Early Closing Association:

2770. Have you any hopes of being able to diminish those hours by voluntary action?—None whatever.

2771. I understand that you have almost abandoned any voluntary

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action in the matter?—Yes, we have. The association has been working for many years with practically no result, except a little in the matter of the weekly half-holiday.

2772. And there is no tendency at present to shortening the hours?—There is a strong public sympathy with the movement, and a tendency on the part of the employers; but at the present time we are at the mercy of the minority.

British Sessional Papers. Vol. VI. 1901. Report from Select Committee on Early Closing of Shops.

Mr. James Austin Stacey, Secretary of the Early Closing Association:

7. But the evidence given before the Committee of the House of Commons which sat in 1886 I think satisfied your association, did it not, that a reasonable hour could only be obtained by legislative action?—That is so.

Mr. John Griffin Beaumont, Representative of the Birmingham and District Retail Drapers' and Hosiers' Association:

332. Have you and the associations that you represent any hope of shortening those hours by voluntary action?—We have no hope of shortening the hours to any appreciable extent by voluntary effort. Unless reasonable arrangements are protected by legislative enforcement, there is but little hope of any curtailment of hours in any large center of population.

Mr. Frank Dawson Chambers, Representative of the Eastward District Associated Trades:

2422. Has your association any hope of getting early closing by voluntary action?—None whatever. Voluntary action has succeeded to the extent of inducing the larger shops to close one afternoon a week, but earlier closing has failed altogether.

Mr. James Macpherson and Miss Margaret G. Bondfield, General and Assistant Secretaries of the National Amalgamated Union of Shop Assistants, Warehousemen, and Clerks:

2575. Have you any hope of getting a more reasonable state of things by voluntary efforts?—No. Many years ago those who are associated with the working of our organization have abandoned that hope.

(5) Adaptation of Customers to Shorter Hours

Experience shows how the demands of customers yield to the requirements of a fixed working day. When shoppers

are not able to make purchases late in the evening, they become accustomed to shop earlier in the day, and thus enable merchants to shorten the working hours of their saleswomen.

Bulletin of the U. S. Bureau of Labor. No. 91. November, 1910. Working Hours of Wage-Earning Women in Chicago. UNITED STATES

The need of keeping these neighborhood stores open evenings on half of the nights each week seems to be due rather to competition between stores than to the real need of the customers. Both managers and girls reported that not many years ago the stores were open every night except one. Now they are closed three nights a week. The owner of a large store in one neighborhood reported that he does better business now than he did under the longer hours, and if all the stores were obliged to close earlier he would be glad to close, for he could so arrange the hours that there would be no inconvenience to him. . . . The manager of the largest one stated that there had been no loss of trade because of the closing. The people quickly learn to adapt themselves to the store hours. Since the saleswomen in these stores speak the language and know the taste of the people who buy of them, and since even car fare downtown is an expense item to be considered among the people of these neighborhoods, there seems little danger that the neighborhood stores would be deserted for the downtown stores. Besides, they are too great a convenience in a city of "long distances."

Among the more experienced saleswomen who were interviewed on the subject, the general opinion was that the people could be educated to do shopping during the week days just as well as at night and on Sundays. But all the stores would have to close or none could afford to. (Page 895.)

British Sessional Papers. Vol. XII. 1886. Report from Select Committee on Shop Hours Regulation Bill. GREAT BRITAIN

Mr. Whateley Cooke-Taylor, Inspector of Factories:

3823. Do you think that there would be any inconvenience to the public in limiting the hours of shopping?—No, I think that the public would very soon get used to it.

3824. In your opinion, would there be any diminution in the amount of business done?—Not in the long run. It is conceivable that for a short time there might be, but I think it would be an extremely short time; in fact, in the long run it is conceivable that there would be more business done.

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Mr. Alexander Redgrave, C.B., Principal Inspector of Factories:

54. And do not you think that the work would be so much improved by the hours being shortened, that the shopkeepers would practically get as much labour out of their assistants in the shortened hours as they get now in the longer hours?—I think that the public would learn that they must go to the shops at an earlier hour in the day, and that the same amount of work would be done.

British Sessional Papers. Vol. XVII. 1892. Report from the Select Committee on Shop Hours Bill.

Mr. George Sutherland, Representative of the Northwestern Shopkeepers' Association of Glasgow:

663. I think that is an adequate answer to the objection that if all the shops were closing early it would be a great inconvenience to customers, seeing that such a large body of the general public deal at shops where already these shorter hours really have been in force?—I speak with a life-long experience of between thirty and forty years behind the counter in Glasgow and in the country of Scotland, and my decided conviction, based on that experience, is that no inconvenience is felt by the customers through the earlier closing of the shops.

Mr. Frank Debenham, Member of the firm of Debenham & Freebody:

2358. How about those poor neighborhoods where the shops are kept open until 9.00 or 10.00 o'clock at night; do not you think something requires to be done to shorten the hours there?—It would be a very good thing if something could be done; I should not despair of bringing public opinion to bear, even among the classes that support the shops that keep open late, with a view of getting them to close early. . . . It is a question of adjustment; there is a good deal of carelessness, and unnecessary carelessness, in the matter.

Mr. John Griffin Beaumont, Honorary Secretary of the Birmingham Early Closing Association:

2824. I do not think that the late shopping in the suburbs is consequent upon that in any way; it is simply due to the fact that the shops are open, and to people's thoughtlessness in the matter. The shops are open, not because the employers wish to keep open, but because one man opens, and the custom becomes law.

2894. You would think, I dare say, that they could rearrange their shopping arrangements to meet the new condition of affairs without much inconvenience?—Without any inconvenience, and that has been done within the last five years. In our own establishment we have reduced

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our hours an hour a day without any decrease in the returns, or any complaint on the part of the public.

Councillor John Jamieson, Representative of the Scottish Shopkeepers' Union:

3293. From your acquaintance with Edinburgh would you say there was much difference in the interests of the different quarters of the city?—A good deal; but a great deal of it is just "use and wont." Undoubtedly, where the late shopping prevails they could be easily educated into early shopping.

3296. What would you say was the reason of it?—Just an extremely bad habit that has grown up by the custom of years.

History of Factory Legislation. B. L. HUTCHINS and A. HARRISON. *London, P. S. King and Son, 1911.*

It is highly probable that the supposed inconvenience to the working-class consumer of early closing is more a matter of habit than necessity, and that if a uniform limit were applied, gradually reducing the hours that could be worked in shops, the habits of the community would adjust themselves to the change without involving any hardship or tyranny nearly so oppressive as that now endured by the employes themselves. (Page 222.)

C. *Millinery and Dressmaking Establishments*

(1) SEASONAL CHARACTERISTICS

These occupations are "season trades," entailing a "rush" period of intense activity followed by enforced idleness. Where there is no legal limitation of the day's work, it is often limited only by the worker's endurance, during the "rush" season.

UNITED STATES

The Training of Millinery Workers. ALICE P. BARROWS. *Proceedings of the Academy of Political Science. Columbia University. New York, 1910.**

The season also has its effect upon workroom conditions. "It's rush, rush all the time, and then nothing to do." In 62% of the shops investi-

* This article is based upon a report not yet published on *Women at Work in Millinery Shops in New York City.* It is the result of an investigation carried on for the Alliance Employment Bureau of New York from the autumn of 1907 until the

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gated the girls worked nine to nine and a half hours daily. A large majority had a working week of fifty to fifty-five hours. In only eight was the week less than fifty hours. In 86% of the shops the day's work lasted regularly until six o'clock or later—an important fact when the question of evening school work is to be considered. 71% of the girls worked overtime in the busy season. During the overtime season the total hours varied from less than ten up to fifteen a day. (Page 44.)

Millinery. An unpublished investigation made in New York City.

In 41 establishments there was no overtime.
103 establishments required overtime.
In 34 of these there was no overtime after 9 P. M.
In 36 of these there was overtime after 9 P. M.
The closing hour was not stated definitely for the remaining 33.

TOTAL HOURS DAILY INCLUDING OVERTIME, IN MILLINERY ESTABLISHMENTS

	Number	*Per cent*
Less than 10 hours	10	16
10 to 11 hours	12	19
11 to 12 "	14	22
12 to 12 "	19	30
13 to 14 "	8	12
14 to 15 "	1	1
Total	64	100

Makeshift workrooms arising out of the precarious character of the trade, crowded rooms due to taking on the casual workers for the rush season, "bad air" made worse because of this overcrowding, long and irregular hours caused by the necessity for doing six months' business in three, unregulated piece-work resulting in a poor product and homework, petty nagging in order to squeeze the greatest profit out of every moment of time,—these were some of the features which made the workroom conditions in the millinery trade worthy of the study of the legislators. These conditions were not flagrantly bad in any one particular. They compressed two hours work into one so that "it was eating and sleeping at the

spring of 1909. Two hundred millinery girls were interviewed. More than two hundred shops including all in which the two hundred workers had been employed since July, 1907, were visited.

same time," and strained the nerves of forewomen and workers, leaving them limp and lifeless after a ten-hour day. (Page 54.)

How Girls Learn the Millinery Trade. MARY VANKLEECK *and* ALICE P. BARROWS *of the Committee on Women's Work, Russell Sage Foundation. The Survey, April 16, 1910.*

The blight of the slack season falls upon establishments in all parts twice a year . . . emptying workrooms and dismantling show rooms, completely shutting down some establishments or leaving four or five girls listlessly working on a few hats in rooms which a month before had been packed with two hundred girls working at machine speed. . . .

The seasons are not only short. They are irregular. Some wholesale houses begin fall work in July, some in the middle of July, some in August. The retail season begins at any time between September and October. (Page 107.)

Studies in the Economic Relations of Women. Issued by the Department of Research of the Women's Educational and Industrial Union. Boston, 1911. Millinery. (*Forthcoming Report.*)

Millinery is a striking example of a seasonal fashion trade. There are two busy seasons, the fall season, beginning usually in September, and ending in November or December, and the spring season, opening a few weeks before Easter and closing in June. The date of opening of the seasons varies and is usually determined by the uncertain weather.

At the very beginning of the busy season there is a leisurely air about the workroom. The girls coming back after their vacations are glad to see each other, and eager to begin work upon the new hats to satisfy their woman's curiosity as to the new styles and materials. . . . Gradually as pioneer customers recover from their first feeling of uncertainty as to the new styles and begin to purchase their hats, the girls are made to work more swiftly, a tense feeling creeps into the atmosphere, hats are brought back for alterations while hat-weary customers impatiently await their return.

Work begins to pile up which must be gotten out "by Saturday night at the latest." The workroom discipline of silence is rigidly enforced, and the whole force is working under a nerve-racking pressure. This continues for several weeks without cessation until perhaps after an especially busy, trying Saturday "Madame" enters the workroom to inform her force that she has no orders for the next week, that she will have

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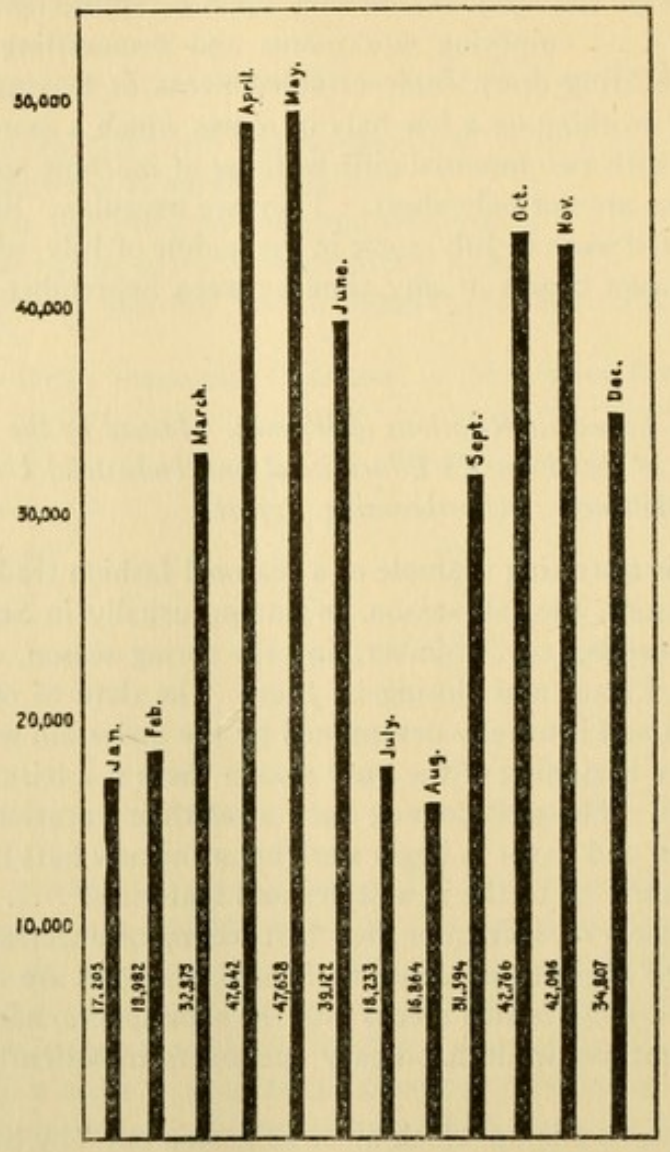
to let some of her help go. It is this sudden rush and the uncertainty of its continuation that makes the seasonal question such a very serious one in millinery. (Chapter II, MS Pages 10–11.)

Number of women employed in custom millinery work during the year in the United States, 1900. Census of manufactures, 1900, Vol. VII, General Tables, p. 54.

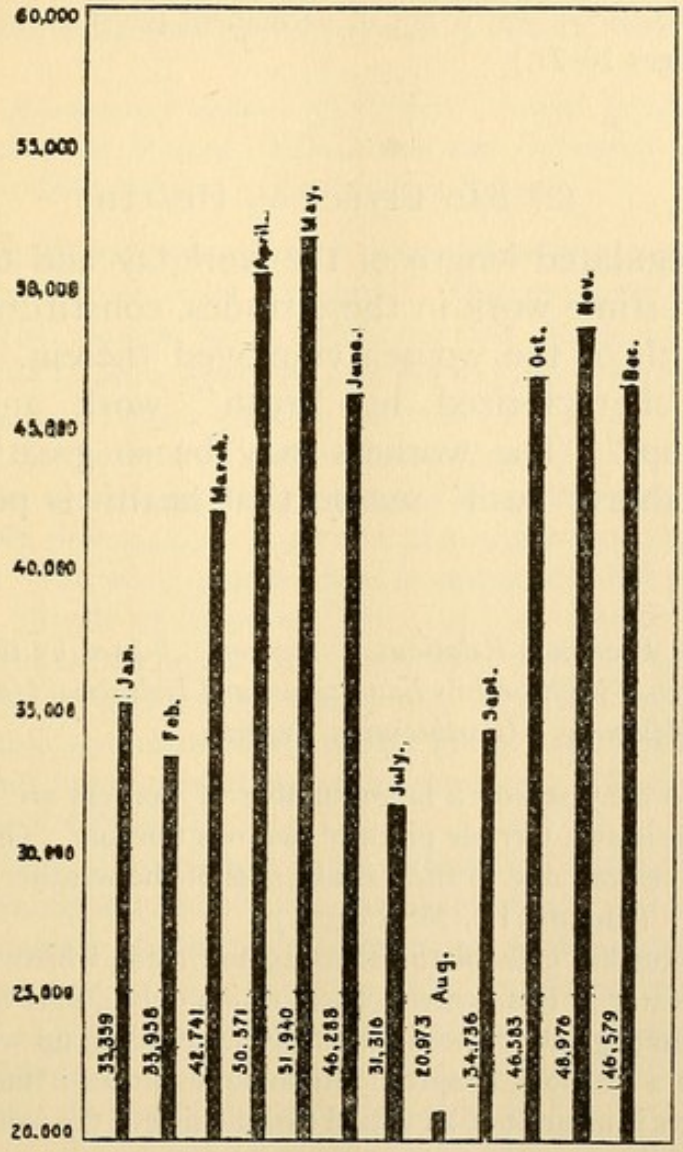


Three . . . difficulties accompany the seasonal question of millinery. They are (1) the necessity of taking on during the busy season a large force of workers which must be dismissed as soon as the early rush is over; (2) the almost inevitable overtime which goes with the filling of

rush orders, and (3) the nervous strain both of the employer and employee of doing rush work under pressure. (Chapter IV, MS Page 12.) UNITED STATES

The general characteristic of the seasonal aspect of the millinery trade is one of vagueness. Nobody can predict with any degree of assurance what

Number of women employed in custom dressmaking during the year in the United States, 1900. Census of manufactures, 1900, Vol. VII, General Tables, p. 54.



the situation will be at any time, in any establishment, for any worker. Yet the investigation has shown some tendencies which stand in relief against the general background of uncertainty and indefiniteness.

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1. The majority of milliners can obtain from six to nine months' employment in a year. The minimum for most workers is six months, while the girl of exceptional ability can often work the year round, or nearly that.

2. A maker's season varies *somewhat* with the type of shop in which she works. The longest seasons are obtained by makers in wholesale houses, and the shortest by makers in department stores.

4. Unemployment is not the only evil of the seasonal trade. The rush season with its long hours, and its pressure on the worker, is productive of intense discomfort, if not of permanent physical injury. (Chapter V, MS Pages 20–21.)

(2) Bad Effect on Health

The unregulated length of the workday and the requirement of overtime work in these trades, constitute a menace to the health of the women employed therein. The busy season is characterized by "rush" work and extreme "speeding-up." The workers may be so greatly strained by even a short "rush" season that health is permanently impaired.

Studies in the Economic Relations of Women. Issued by the Department of Research of the Women's Educational and Industrial Union. Boston, 1911. Millinery. (*Forthcoming Report.*)

During the busy season a large number of workers are taken on and the workroom is at a terrible pitch of nervous tension. The very uncertainty of the season, due to the variableness of the weather, adds greatly to the strain. (Chapter IV, MS Page 9.)

There are certain evils of the short season trade which affect all milliners to a greater or less degree, others which only a part of the workers feel. Chief among the former is the terrible speeding up which has been mentioned in a previous chapter. In some instances it means overtime work, in others it means not an actual lengthening of the working day, but quickening of the pace throughout the workroom, until every one in it is working up to the limit of endurance, if not beyond it. Over and over again came the refrain from the workers, "It's a terrible life." This of a trade which many girls enter because they are "too delicate" for store or factory work! (Chapter V, MS Page 11.)

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The nervous strain upon both employer and employee of doing rush work is very great, how great only one who has experienced it can tell. (Chapter IV, MS Pages 9–16.)

Vocations for Boston Girls. Issued by the Vocation Office for Girls. Boston, Mass., 1911. Bulletin No. 6: Millinery.

The hours are long,—often as long as the law permits during the busy seasons, and the work is unusually strenuous. In many of the smaller establishments evening work is required once or twice a week. (Page 6.)

Studies in the Economic Relations of Women. Issued by the Department of Research of the Women's Educational and Industrial Union. Boston, 1911. Dressmaking. (Forthcoming Report.)

In one large alteration workroom men and women were discovered working side by side on coats and shirts. The men were Russians and Armenians. The women were Americans and Nova Scotians. The women earned $8 to $10 a week, the men $14 to $15. "Men can turn out three to four times as much work by the end of the week," said the foreman. "They can be pushed more without showing bad effects. They are more stable, and less inclined to nervous strain and overwork."

On the whole, dressmaking, as carried on at the present day, is a nerve racking trade. The work must be done in certain definite periods of the year. Orders all pile up at once. "It's the 'nerve work' in it that I can't stand. People are in and out. They want this ready and that ready at such a moment," said a waist draper receiving $20 a week. Nervous and unreasonable customers make nervous and irritable employers, which in turn rebounds to the misfortune of the employee. (Chapter on Industrial Problems, MS Page 47.)

The evil effects of long hours and overtime for women have been so clearly and voluminously portrayed in the United States and Europe that it seems unnecessary to deal with them except in a cursory way. The physical and nervous strain of overtime added to the regular working day is self evident. The work begins at the regular hour the following day regardless of the hour at which the worker left the shop the preceding night. (Chapter on Hours of Labor, MS Page 16.)

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British Sessional Papers. Vol. XVII. 1893. Report of Chief Inspector of Factories and Workshops.

It should always be borne in mind that in the majority of cases where overtime is made the work is especially trying and the rooms stuffy, ill-

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ventilated, and the air rendered very impure by the large quantity of gas required to be burning. Perhaps no class of work is more enfeebling than dressmaking, and the making of other various articles of wearing apparel. (Page 90.)

Much of the good done by the Factory Act is undone by allowing delicate women and girls to work from 8 A. M. to 10 P. M. for 2 months of the year. (Page 92.)

British Sessional Papers. Vol. XXI. 1894. Report of the Chief Inspector of Factories and Workshops for the Year 1893.

Few persons enjoying the comforts and conveniences which civilization provides for them are aware that the articles of clothing, utility, or ornament, which they possess are in many instances purchased at a fearful cost in the deterioration, or even destruction within a brief period, of the health of those who are engaged in their manufacture.

Even where these evil effects are not so marked, there are often influences at work which are sapping the vital powers of the industrial population and stunting their growth.

This is a matter of national interest and importance. . . . It seems evident from the reports of the inspectors that the confinement in close workrooms and the long hours of work allowed in milliners' and dressmakers' establishments, under the denomination of overtime, are injurious to the health of the workpeople.

The reduction of overtime for women and young persons would do much to bring about a more healthy state of things. (Page 6.)

The arguments against overtime seem to me to be:

2. That the long hours of confinement are injurious to the health of the workers. (Page 17.)

Overtime allows but scanty opportunities for leisure, and for indoor workers it often means that but one day in the week is available for exercise or amusement. The consequent effect upon the health of the workers is exceedingly injurious, especially in the case of the indoor workers to whom I have referred and who have been practically imprisoned for five days in the week, and until the evening of the sixth. (Page 11.)

They (i. e. the workers at these trades) are accustomed to sitting for long hours at what is probably the most trying to the constitution of all trades, and when one takes into consideration the impurity of the air in the average workroom where gas has been burning for some time, it is not surprising to see how anemic and fragile many of them look. (Page 16.)

. . . Do we know of the numbers that fall in the struggle for existence,

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how many are used up as soon as the seasons are over, and what efforts are made to gain strength enough to endure the next year's term of toil. (Page 23.)

It (overtime) is not desirable for, in many cases (that of milliners and dressmakers especially) the long hours are most prejudicial to the health of the employees. (Page 299.)

FRANCE

Rapports présentés à M. le Ministre de Commerce, de l'Industrie, des Postes et des Télégraphes par les Inspecteurs du Travail. [*Reports presented to the (French) Minister of Commerce, Labor, etc., etc., by the Factory Inspectors.*] *La Question de l'Interdiction du Travail de Nuit.* [*The Question of Prohibiting Night Work.*] *Paris, 1900.*

Late hours of work, as well as actual night work, are destructive to the health of girls and women. We have had occasion more than once to observe the injurious effect of evening overtime. When night hours are added to those of the day's labor the result is overwork which directly saps the strength and promotes the craving for alcoholic stimulant. During an inquiry made in Marseilles a number of sewing girls complained that after a certain number of evenings with late overtime they found it impossible to sleep. Though overcome by fatigue, they lay awake until early morning, when it was nearly time to go to work again. In consequence, they did not have the seven hours of sleep imperatively necessary for an adult. Failing to have restful nights after the days' work, insomnia supervenes with all its terrors. Sleep has so vast an importance with regard to health that there is perhaps no function deserving of more serious consideration. Everything that interferes with the hygiene of sleep is dangerous, because the equilibrium of the nervous system is imperilled. (Pages 84–85.)

La Revue de Paris, Sept.–Oct., 1904. Le Travail de Nuit des Femmes. [*Night Work of Women.*] GEORGES ALFASSA.

But night work is especially injurious when, in place of substituting it for day work it is added thereto; in other words, when, in addition to the day, there is evening work, as was the case in Paris before the law of 1892. . . . They were kept until midnight, 2 A. M., sometimes all night. Such overtime working hours are extremely exhausting, for the workers have had no food since midday except some hasty mouthfuls in the early evening. (Pages 368–369.)

FRANCE

First International Conference of the Consumers' Leagues at Geneva, 1908. La Veillée: Abus et Responsabilités. [*Overtime: Abuses and Responsibilities.*] MME. A. PAUL JUILLERAT, *French Factory Inspector. Fribourg, 1909.*

Those who have not seen clothing establishments in full activity can hardly imagine the dreadful fatigue and sapping of strength resulting from these days of frenzied speed. (Page 52.)

The sewing girls, hurried on all sides, fingers trembling, are literally exhausted when their work is done. . . . At seven, instead of going away to get supper they are told "We will work overtime." They have lunched at noon, and since then have not left their chairs; perhaps a bite was snatched at four; . . . without being able to send word home, they must resume work for the evening. . . . Eleven o'clock comes . . . midnight. . . . At one o'clock the poor sewing girl, thoroughly worn out, is not hungry, has but one wish—to sleep a little before beginning again the next day. Sometimes, at night, the last car has run, and the young woman has to go home on foot. (Page 54.)

AUSTRIA

Le Travail de Nuit des Femmes dans l'Industrie. Rapports sur son importance et sa réglementation légale. Préface par ÉTIENNE BAUER. [*Night Work of Women in Industry. Reports on its importance and legal regulation. Preface by* ÉTIENNE BAUER.] *Le Travail de Nuit des Femmes dans l'Industrie en Autriche.* [*Night Work of Women in Industry in Austria.*] ILSE VON ARLT. *Jena, Fischer, 1903.*

What we have just said (regarding evils of night work) is equally applicable to establishments less important than factories, with this added circumstance, that the fatigue arising from the day's work is increased by late overtime, making the task still more arduous.

Here, after a day's work already too long, when "night work" must be accomplished in addition, the body becomes incapable of enduring the more intensive demands which are unremittingly made upon it. This overtime is the most destructive form of night work, and it is found in all those establishments that are not classed as factories. (Page 82.)

. . . The suitable limits of working time vary with individuals but it is acknowledged that not only is a regularly long day of work injurious, but also that a single isolated instance of overstrain may be harmful to a woman all the rest of her life,—a fact that is of importance for workers in seasonal trades, and all the more so because the general ignorance of people as to hygiene for women gives no reason to anticipate any initiative for reform among the workers themselves. (Page 86.)

(3) Legal Limitation of Working Hours Promotes Better Organization in the Season Trades

Where the employment of women has been prohibited more than ten hours in one day, the supposed necessity for dangerously long and irregular hours in the season trades is shown to be in large part avoidable. Employers have found it possible to obviate such irregularities by foresight and management.

Studies in the Economic Relations of Women. Issued by the Department of Research of the Women's Educational and Industrial Union. Boston, 1911. Millinery. (*Forthcoming Report.*) UNITED STATES

It would be safe to say that practically none of the better and larger stores, parlors and department stores, where stock hats are kept and the business does not depend entirely upon orders, demand overtime of their workers. The fact that this class of establishment is under closer supervision than the others, probably serves to mitigate the evil here. The worst offenders are those shops which depend very largely upon orders for their trade. The smaller parlors, milliners and stores, located usually in a lodging or a foreign section, and the wholesale milliners offend in this subject. (Chapter IV, MS Pages 14–15.)

Studies in the Economic Relations of Women. Issued by the Department of Research of the Women's Educational and Industrial Union. Boston, 1911. Dressmaking. (*Forthcoming Report.*)

Some shops have worked out a highly systematized arrangement of work, so that there is little rush, overtime, or irregularity. "Every morning," said one worker, "a schedule is posted showing just how much work must be finished that day. . . . Not a moment of time is lost when the force is on up to the last minute of the last day of the season."

The work is carefully and systematically arranged and planned by the employer or head of the workroom. The employer knows just how much can be done in a specified time and refuses to take more orders than can be completed by a certain date. It is portioned out among head girls who are in turn responsible for their particular portion of the production. The head girl at the head of her table supervises and directs her various workers who sit about the table, each doing her particular phase of the

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work. In a well-systematized workroom, there is little overtime or rush, but a continuous and fairly steady rate of speed throughout the working season. . . . Where consideration and kindness are shown the employees . . . and regularity of work is secured a remarkably steady force is discovered. An employer of 55 workers has had most of her girls for years. She likes to train them up through the stages. Another employer of 30 girls says a large proportion have worked up from the bottom, beginning as errand girls. (Chapter on Industrial Problems, MS Pages 43–46.)

Systematic organization of the work is also an equally important factor in maintaining a regular working day. Some well-regulated shops open and close like clock work. Workers who have been employed there for years have never known five minutes overtime. Others are unanimously reported by the workers as regular offenders in the matter of overtime. There are not sufficient workers and the work is poorly systematized and arranged. Consequently, the gowns are not completed at the specified time and the workers must finish them before they go home at night. (Chapter on Hours of Labor, MS Page 4.)

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British Sessional Papers. Vol. XVII. 1893. Report of Chief Inspector of Factories and Workshops.

. . . There will always be some people who do not know how to refuse orders, however little they may be prepared to execute them, and who expect their workpeople to help them out of the difficulty by working excessive hours. . . . The most serious offenders are still the dressmakers and milliners, who despite the fact of the special sanction which they have under the law to work exceedingly long hours are not satisfied, and frequently exceed the more than liberal legal allowance. (Page 88.)

British Sessional Papers. Vol. XXI. 1894. Report of Chief Inspector of Factories.

The greater part of my work so far has been connected with dressmakers, tailoresses, milliners, etc. The question of overtime has been much before me. Much of the necessity for overtime . . . arises from want of method and forethought on the part of employers, forewomen, and customers, rather than from extreme pressure of business. Promises are made, no doubt, which without having recourse to overtime it is impossible to keep. Sometimes by the employer who, unwilling to risk losing an order, shuts his eyes to the fact that his workers have already more to do than they can well manage, sometimes by the forewoman who is anxious

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to turn out as much work per week as possible, and thinks she will manage it "somehow," and yet in many workrooms where the management is efficient, and the fact is accepted that an order must sometimes be refused, overtime is not required at all, and the employer apparently prospers. (Page 15.)

It (overtime) is not necessary, for in a large proportion of cases in so-called season trades, advantage is simply taken by certain firms to monopolize a larger share of work than they are warranted by their plant in undertaking, or by customers in unnecessarily delaying their orders knowing that overtime will come to their rescue. (Page 299.)

British Sessional Papers. Vol. XIX. 1895. Report of the Chief Inspector of Factories and Workshops.

There are many large firms of dressmakers and milliners who never work overtime, and I can only think that if they are able to do without surely others can. In the latter case all work is taken, no orders refused on account of not being able to complete within the time specified by the customer, however unreasonable this may be. If overtime were not permitted it would simply mean that the customer would have to give the order earlier and it might perhaps give employment to more girls. (Page 192.)

BELGIUM

Royaume de Belgique. Rapport présenté à M. le Ministre de l'Industrie et du Travail. [*Report made to the Belgian Minister of Commerce and Labor.*] *Travail de Nuit des Ouvrières de l'Industrie dans les Pays Étrangers.* [*Night Work for Women in Industry in Foreign Countries.*] MAURICE ANSIAUX. *Brussels, 1898.*

A great Parisian costumer, though hostile to governmental interference, told me that previously the forewoman never hastened the preparation of work, so that owing to this slackness evening work frequently became indispensable. At 7 o'clock in the evening it would be noticed that the skirt or waist undertaken was still incomplete; it was necessary, therefore, to work part of the night.

To-day the forewomen know that evening work is prohibited, consequently they so arrange the work that all can be finished within the period prescribed by the law.

Under the previous system was the worker free to refuse to take part in the night work? By no means. Very often at the moment when she was preparing to leave the shop, the forewoman would say to her: "We

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continue work this evening." It was necessary for her to remove her hat and to remain in the shop until work ended.

"The liberty of the workers was purely fictitious," said one of the women before the Investigation Committee. "It was necessary to work or to quit. Between two evils, we chose the less." (Pages 60–61.)

D. The Telephone Service

(1) Character of the Business

CANADA

Report of the Royal Commission on a Dispute Respecting Hours of Employment between the Bell Telephone Co. of Canada and Operators at Toronto, 1907.

Connections on a switchboard are made by inserting a small plug in a small hole above which the number of the telephone requested appears. The eye is attracted in the first instance by the glowing of a light which announces the call. It has then to immediately find upon the switchboard the hole in which it is necessary to insert the plug to make the desired connection. Similarly, in disconnecting, the eye detects the extinction of the light, and then seeks on the switchboard the number with which the connection has been made. This means constant employment of the muscles of the eye in different directions, and use of the optic nerve. The ear, in receiving calls, is required to distinguish between a multitude of different voices, to ascertain at once, and so as to avoid repetition, the number asked for, no matter how indistinctly or ill-pronounced the number may be; this necessitates constant alertness of the auditory nerve, whilst the vocal organs are scarcely less constantly in use in the answering of calls, the repetition of numbers, and the conducting of such conversations as may be necessary. The sensations created by the working of the several senses in this manner, transmit their several messages to the brain, which, in turn, directs and governs the actions they suggest. The brain is the center of the nervous system. A mere statement of the case is sufficient to show that viewed from this point the rapidity or speed with which operators are called upon to carry on their work becomes a matter of great concern, regard being had to the mental constitution and nervous system. (Page 60.)

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Investigation of Telephone Companies by the United States Bureau of Labor. Senate Document No. 380. 61st Congress. 2d Session. 1910.

The operator must have her wits always alert, a quick eye, auditory nerves always ready to catch the words of the subscriber for supervisor,

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a steady hand, a pleasant and clear voice, and, first and last, ability to keep her temper unruffled, no matter what happens. Not only must she be alert while actively occupied in answering calls, but she must watch constantly even when she sees no signal to be answered lest one escape her notice.

This is more readily appreciated when it is remembered that in the handling of the simplest form of connection, as above described, there are involved eleven processes on the usual type of common battery board. First, when attention is attracted by the pilot lamp (the general signal) the operator's eyes follow the lines of signals on the terminals on her position; (2) this located, she (3) puts the plug into the terminal, (4) opens her listening key, (5) asks for number desired, (6) locates that number on the multiple, (7) tests the jack to see that the line is not in use, (8) inserts her plug, (9) rings the called party. She then (10) must watch the signal lamps to see that the called party answers and that connection is established. As soon as the lamps relight she must be alert for this signal and (11) take down the cords at once. This is the simplest form of connection, and these processes—more complicated on the less direct forms of connection—are carried on during the entire working day, sometimes with such rapidity that over 350 connections are made in a busy hour. In fact one exchange reported a record of twenty-five calls answered in two minutes and nine seconds, or an average of 5.16 seconds per call. While this speed is nowhere long maintained, or even aimed at as a constant standard, there is even at the dullest hour the need of watchfulness lest a signal go unnoticed. This constant alertness for possible signals in itself involves continuous strain. (Pages 104–105.)

Let us watch an operator at her work during the "peak of the load." The lines terminating in her position are, we will say, 100, that is 100 telephone users send their call signals directly in the first instance to her position. With each call a light flashes on a signal cap in front of her. Several lamps glow simultaneously, showing that a number of users are calling for numbers at the same time. She is expected to give all the quickest possible service in the order in which their calls come in, but when several signals come at once and others come before these can be cared for the order of calls is necessarily lost and the effort is concentrated merely on clearing the board, or catching up. It must not be forgotten that with each signal there is not only the flashing of a small light in the operator's eyes, but there is a clicking sound in her ears through the receivers fastened to her head. So when the impatient subscriber, angry because his call has not been answered, moves the receiver hook of his 'phone up and down rapidly, he flashes the signal light in front of the

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operator, and produces a click in her ears every time the hook goes up and down. The consciousness of numbers of people waiting for call connections she is unable to make, and that each one is growing more impatient each second; that a supervisor is standing behind her either hurrying her or calling her numbers to be taken by other operators; that a monitor may plug in and criticise any moment—these, with the height of up-reach and length of side-reach, go to form the elements of strain on the operator who is "overloaded." (Page 56.)

(2) Bad Effect on Health

CANADA

Report of the Royal Commission on a Dispute Respecting Hours of Employment between the Bell Telephone Co. of Canada and Operators at Toronto, Ontario, 1907.

Twenty-six medical practitioners gave evidence before the commission. The physicians subpœnæd were nearly all selected from the medical faculty of the University of Toronto, and were, without exception, among the leading members of the profession in the city. (Page 65.)

Dr. William Britton, practicing thirty-one years, Toronto, representative of the University of Toronto and Medical Council, attended employes: Many suffering from nervous debility occasioned by the strain of that particular work upon the nervous system, which includes the senses of hearing, speaking, seeing, and using arms, causing too much strain upon the nerve center. . . . In a number of cases of young ladies whom I had known as the physician of the family, before they entered into the telephone service and were apparently healthy, after a length of service in the telephone office, I had to prescribe for them for various types of nervous debility, and my advice to the majority of them was to discontinue the work. The constant listening and the keen buzzing means a state of tension of the nervous system all the time; fifteen minutes' relief would be a very slight one. I have quite often seen nervous hysteria from this nervous strain to the telephone girls. (Page 66.)

Dr. Charles R. Clark, medical superintendent of the Toronto Asylum:

Work is automatic only to a limited extent. It requires a mental effort every time. Nervous strain is intense and would react on the physical health in a marked way after three years' service, and might pass on to the next generation in a more striking way than even in the present generation. I am basing that statement on my every-day experiences with just such cases, having an experience on that kind of thing for several years. (Page 72.)

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Dr. J. M. McCallum, Professor of Therapeutics, and teacher in connection with the eye and ear in Toronto University:

The result of work would be nerve fag and might be a nervous breakdown. . . .

We know practically that changes in illumination from dark to light do irritate the optic nerve, and that is going on all the time. . . . Flashing of the light has an irritating effect and is in that way injurious. The nerves governing the extra ocular muscles which focus the eye upon the object looked upon, are the nerves where the greatest part of the strain comes. The sound kept up for hours must have an effect on the auditory nerves, and if for long hours, an injurious effect might cause deafness. The possibility of receiving shocks would add to the nerve strain, effect on vocal organs not much. The effect upon the nervous system is through the nerves of the eye and the auditory nerves; reaching is subsidiary; operating together causes the difficulty. (Page 72.)

Dr. Walter McKeown, 16 years' practise in Toronto. Have had telephone operators as patients suffering from nervous exhaustion. Five hours extreme limit for such service with a break in it of an hour. (Page 68.)

Dr. James M. Anderson, practicing 20 years, Toronto, specialist in eye, ear, nose and throat. Treated a number of telephone girls, mostly for eye troubles, headache, and nervous troubles. Business of a telephone operator is the most trying of any I have ever seen, so far as it affects the eyes and through the eyes the general system. Three hours twice a day fill safe limit of service, with two hours, at least, rest between the two periods. . . . The twenty minutes' relief in the two periods of four hours a great deal better than the eight hours with one hour, but not of much service. . . . The periods not long enough for rest; five hours divided into two periods with an hour for lunch better than any of the other propositions, and an operator might do that, but the others would be too great a strain upon her. After a service of three or four years would expect to find an exhausted womanhood . . . harmful upon the future motherhood. (Page 69.)

(3) Overtime Work

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Investigating of Telephone Companies by the United States Bureau of Labor. Senate Document No. 380. 61st Congress, 2d Session, 1910.

Overtime work is frequent. . . . The practise of requiring overtime is attended by hardships. In the first place it means the lengthening by one or even two hours of a workday that in itself is not short.

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The hours of work, as well as the character of the work itself, must be considered in any discussion of nervous and physical strain growing out of an occupation. It was shown that relief periods were sometimes curtailed, that Sunday work was required twice a month in many companies, that holidays were difficult to obtain, that hours were not short. (Page 33.)

Overtime seems to be an integral part of the schedule of hours in a number of telephone companies. Operators not only are asked to take their turn in working extra hours, but in some companies a regular extra period is assigned for certain days each week to each operator. She is virtually compelled to do this extra work, lest by refusing she incur the displeasure of her chief operator or get the reputation of shirking her share of work.

This overtime varies in length from a few minutes to two and one-half hours, one company even posting a list apportioning two nights a week to each operator, on which night she must be prepared to work overtime, if required. (Page 110.)

These conditions—curtailment of relief, compulsory overtime work, Sunday and holiday work—cannot perhaps be done away with entirely, owing to the peculiar conditions of telephone work. That these conditions could, to a large degree, be modified by the employment of a proportionate relief force is shown by the experience of exchanges where this is done. In these exchanges overtime comes but seldom, and then usually as a result of abnormal number of absences from the operating force or of an unexpected load of business on the wires. . . .

These conditions can be remedied, as is shown by the schedule of several important companies. A small force of extra relief operators would, to a large degree, minimize the curtailment of relief periods and the amount of overtime required, as well as somewhat reduce the amount of holiday work required. While there must always be Sunday and holiday work, at least two large companies have discovered that this need not mean seven days' work each week. They require their operating force to take one day's holiday during the week when Sunday service has been rendered. (Pages 111–112.)

Women and the Trades. The Pittsburgh Survey. ELIZABETH B. BUTLER. *Russell Sage Foundation Publication. New York, Charities Publication Committee, 1909.*

It would seem that the experience of the Bell Telephone Company in one city should not need to be repeated by its own branches or by other

companies in other cities. Where the social loss caused by this business policy has been so clearly demonstrated, public opinion in a local community should demand a change, so far at least in accordance with the laws of health as has been found practicable in Toronto. The human cost to a city is too great if before adopting a change in policy the need and the practicability of which have already been proved elsewhere, it must repeat the same laboratory experiment with the nerve cells of its young girls. (Pages 291–292.)

E. The Telegraph Service

Women and the Trades. The Pittsburgh Survey. ELIZABETH B. BUTLER. *Russell Sage Foundation Publication. New York, Charities Publication Committee, 1909.*

The main office of a telegraph company impresses the uninitiated observer but does not enlighten him. . . . You see men and women, row back of row, receiving, sending, writing messages. You hear the intermittent click of the telegraph keys, the banging of typewriters, and you are conscious of a steady undercurrent of haste, concentration, quick efficiency. . . . Managers and operators as a rule agree that the lesser physical strength of women tells against them after several years of light wrist and finger motions; that because of this lesser strength, women have neither the speed nor the accuracy of men; and that they get "glass arm," a nervous inability to work, more frequently. (Pages 292–293.)

F. Work in Hotels and Restaurants

Recent government investigation has shown the duration of working hours of waitresses.*

These statistics show that many employers employ waitresses less than ten hours in one day and sixty hours in one week. But the practice of other employers of requiring hours of labor so long as to be dangerous to health proves the necessity of the ten-hour law for women employed in hotels and restaurants.

The differences between work in hotels and in boarding

*This section was part of the Brief in defense of the Illinois Act of 1911; hence the hours of labor in Illinois are quoted. They are typical of all large cities, as well as of Chicago.

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houses justifies the inclusion of the former, and the exclusion of the latter from the scope of the ten-hour law.

Report of Condition of Woman and Child Wage-Earners in the United States. Vol. V. Senate Document No. 645. 61st Congress. 2d Session. 1910.

Waitresses are employed to work in shifts, according to the number of meals they serve, and in different cities there are different names applied to these shifts. . . . For purposes of tabulation they have been divided into groups of girls who serve three meals, girls who serve two meals, and girls who serve one meal per day. . . . In the average number of hours of actual labor per week the time allowed the girls for eating their meals is deducted as well as any time during the day they may have "off duty," *i. e.*, time during the day in which they may leave the restaurant entirely. The three-meal girls often have from two to three hours "off duty" in the afternoon, when there is little business being done in the restaurant. The girls serving three meals usually begin work at 6, 7, or 8 o'clock in the morning and work until the corresponding hours in the evening. The two-meal girls work from 9, 10, or 11 o'clock in the morning until 7, 8, or 9 o'clock at night, and they seldom have any time "off duty." In a few cases where girls worked all night they are included with the three-meal girls. (Pages 191–192.)

There was much complaint among the waitresses that the work was very hard and they could stand it but a few years. A number of the girls interviewed had worked as three-meal girls until their health was broken; then they took positions as one-meal girls and barely made a living. Carrying the heavy trays and the constant standing or walking cause ill health. Usually a man is employed to carry away the empty dishes, but the waitress must bring the trays loaded with food. (Chapter X, MS Page 199.) (See table on opposite page.)

Labor Laws and Their Enforcement with Special Reference to Massachusetts. Edited by SUSAN B. KINGSBURY. *New York, Longmans, Green and Co., 1911.*

In fourteen of the fifteen restaurants where we worked, conditions were worse from a standpoint of health than in any other class investigated. There was a marked lack of cleanliness and long and irregular hours were almost universal. . . . In one of the fifteen restaurants almost every law for the protection of the health of employes was violated. The kitchen was unclean, walls and ceilings black with smoke, grease and cobwebs. Odors arose from the sink and refuse was allowed to collect for days in uncovered barrels. Here flies and vermin were the most in evidence,

THREE-MEAL GIRLS			TWO-MEAL GIRLS		
Number	*Average Weekly Hours of Labor*	*Av. W'kly Rate of Pay, with Meals*	*Number*	*Average Weekly Hours of Labor*	*Av. W'kly Rate of Pay, with Meals*
*a*7	70 9/14	$9 86	12	45	$7 25
*a*4	68 5/12	8 75	66	48	7 00
5	57¾	8 00	12	42	5 00
*a*5	55	7 00	13	53 5/26	6 92
10	48	7 00	15	45	7 00
8	57	7 00	32	39	6 50
10	54	7 00	2	40½	7 50
2	(*c*)	7 00	12	46½	7 00
14	58½	8 50	14	54 1/7	7 57
6	65	8 00	24	41½	6 50
2	66½	8 00	4	56	6 00
10	58½	7 00	2	57¾	7 00
2	51	7 00	4	42	7 00
2	68½	7 00	3	43¾	7 00
3	66½	8 00	4	18	3 00
8	51	8 00	18	39	6 50
26	78	7 00	11	49¾	7 57
*e*5	64 2/5	8 60	1	52½	7 00
6	63 1/3	9 00	2	56	6 00
2	55½	7 00	6	31½	6 00
1	57¾	7 00	3	42	6 50
2	66½	9 00	13	51	7 00
4	49½	7 00	2	52½	6 00
2	60	7 00	1	49	8 00
9	67½	7 77	22	57	7 00
6	61¾	8 00	6	21	4 00
2	67½	7 00	176	45	5 50
*f*15	51 1/5	8 47	55	48	6 73
6	62	8 00	2	36	6 00
*g*3	84	9 00	4	42	7 00
1	73½	7 00	5	28½	5 00
*e*4	77¾	8 00			
3	57	7 00			
6	58½	8 83			
2	80½	8 00			
4	70	8 00			
4	56 4/5	8 25			
3	72 1/6	8 00			
5	85¾	8 20			
2	66	7 00			
3	60	7 00			
10	55½	6 50			
8	63 11/12	8 00			
8	45	7 00			
30	63	8 20			

a Two are all night waitresses.
c Not reported.
e One works all night.
f All or part serve at night.
g Work all night.

(Page 359.)

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although receptacles for bread and crackers were also infested. One kitchen was ventilated by one small window and one door, with no screens for either. Added to the discomfort, the men in kitchen were frequently smoking and spitting. The toilet was dirty and dark with no provision for ventilation except from the door, but it was not situated in the kitchen, as was the case in three restaurants where we worked. The total number of hours that I worked at this place was sixty-six per week and I was not on an exceptional schedule for the other waitresses worked as long. The hours of cooks and servers were even longer. (Pages 154–155.)

Brief of Griffin and Yanckwich in the Supreme Court of the State of California. [*In the Matter of the Application of* FRANK A. MILLER *for a Writ of Habeas Corpus.*] *July, 1911.*

In hotels the work of chambermaids is both injurious and unpleasant. The work of keeping hotels clean compels chambermaids to come into contact with linen used by diseased persons, and to inhale air exhaled by diseased persons. The work of waitresses is arduous; the waitresses are compelled not only to stand on their feet most of the time, but to walk. It has been estimated that a waitress working ten hours a day walks twenty miles. (Page 89.)

Brief of Denman and Arnold in the Supreme Court of the State of California. [*In the Matter of the Application of F. A. Miller for a Writ of Habeas Corpus.*] *July, 1911.*

We have a clear judicial expression that women's hours of labor may be limited for the prevention of any of the following purposes:

1. Injury to the woman herself, (a) by long standing on her feet in any occupation, (b) by physical or mental strain due to the long continuance at or confinement in any single occupation, (c) by worry and anxiety in the competition to secure and hold place, a worry and excitement greatly increased during her periodical semi-pathological condition.
2. Injury to her offspring as a result of physical or mental injuries to herself, or by bringing contagion home to her children.
3. Her absorption in gainful occupation to the detriment of the rearing and education of her children.
4. Her occupation in these employments to the detriment of the maintenance of the home.
5. The likelihood of her submitting to oppressive conditions in her employment, due to her inferior nervous and physical capacity to cope with her employer.

The question then is: Can this Court say beyond a reasonable doubt, that none of these evils exist or are likely to exist to a greater degree in the public institution of the ordinary hotel, than in the private institutions of the lodging and boarding house? Unless it can say that the equality of amount or kind of danger in the two classes, does not even seem dubious it must uphold the law.

The Difference Between the Possible Evils to Women in the Hotel, a Public Institution Open to All Travelers, and in Boarding or Lodging Houses, Private Institutions, Which Are Not.

It was suggested that the fact that the hotel is a public institution to which all travelers customarily go and the lodging or boarding house is a private institution to which travelers go but infrequently, would not warrant a different health law for one than for the other.

It is of course true that some low boarding or lodging houses may present more unsanitary conditions than the average hotel. But this is no more true than that some private schools are less sanitary as far as contagion is concerned than the public.

The hotel is distinguishable from the boarding house by much more than the dry legal incident of the power of the keeper of the latter to choose his guests. An examination of the consequences flowing from the public character of the hotel or inn in so far as they affect the woman employe, shows that they are vital in their nature.

In the first place with regard to communicable disease. The hotel chambermaid must handle the soiled bed linen and perform other intimate services for the traveling guests. The hasty arrival and short stay of the traveler make it impossible that there shall be any attempt to segregate the diseased from the healthy, save in very obvious cases. The consumptive, the typhoid patient, the syphilitic, the children with all their contagious diseases, are hurried up to their rooms and are off again the next day, quite likely traveling to reach hospitals or medical treatment.

It is the women in the hotel who are chiefly exposed to the danger of contagion from these sources. Is it not reasonable to suppose that the number of exposures to disease a chambermaid will receive from the very large number of travelers in hotels, will greatly exceed the number among the less changeable occupants of boarding and lodging houses? Can this Court say beyond a reasonable doubt that the danger from contagion is not greater in the former class than in the latter? Even if the Court should think that the distinction is a dubious one, is it in possession of the facts upon which to determine the relative danger? Or is it not plain that this question of degree is one for the Legislature?

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A court may take judicial notice that making up a bed is the same whether it is in a hotel or a boarding house. But will it therefore take judicial notice of the relative number and kind of disease germs, the admittedly different classes and numbers of persons who frequent the two different kinds of places of entertainment, leave upon such bed linen?

Take again the matter of disease germs arising from sweeping carpets. It is common knowledge, amongst chambermaids at least, that the traveler is more filthy in his habits of expectoration and the use of common conveniences as well as bed linen, than the permanent boarder or lodger. The instinct not to foul his own nest exerts no pressure on his inclinations where he knows he is leaving his room not to return. Has the Court any common knowledge—can it take judicial notice of such conditions? We submit that from the very fact of their unpleasant and repellant nature, such matters do not become of common knowledge and hence that the Legislature alone is the proper forum for their determination.

What has been said applies to the risk of disease to the woman herself. We must remember, however, that the courts have clearly settled that the Legislature may enact laws to protect her in her maternal relationship. Not only is she subject to danger to herself from diseases of mature persons, but she is liable to bring the contagion of children's diseases into her family. Can this Court say beyond a reasonable doubt that this risk is not greater in hotels than in boarding houses? Can it say beyond a reasonable doubt that the worn and exhausted woman hurrying home after ten or twelve hours of work will not take less precaution to prevent this spreading of disease than her fresher sister after but eight hours? The Court may say this is dubious, but it must then resolve the doubt in favor of the law.

But entirely apart from the question of contagious diseases, there is another manner in which the health of woman may be differently affected in hotel work from that of the private institution. The hotel must receive its guests at all hours of the day and night, and in the average commercial hotel there is a continual current of guests arriving and leaving. Every member of this Court at some time in his career must have been compelled to wait at a crowded hotel even in the late hours of the evening, till his room, just vacated by a departed guest, has been made up. This means in all likelihood irregular extra work for the chambermaid in addition to the day's regular quota. Can this Court say beyond a reasonable doubt that this difference is one on which the people through their Legislature can not make a distinct classification?

Again, the average commercial hotel, much of its time, is only partially filled and for purposes of economical management its supply of servants is based only on its average number of guests. Any increased work is absorbed by the regular force. This exposes the woman in the hotel

employ to an extra strain and increased hours of labor, to which the far greater regularity of those institutions not catering to the traveler are not subject. Perhaps the Court may say this is not a matter of which the Court can take judicial notice, but that is not the criterion. Can the Court take judicial notice that the facts are not as stated? It seems a reasonable enough condition of fact and if dubious, the classification must be deemed to have been constitutional.

The courts have recognized in woman's inferior capacity for competitive bargaining, a basis of remedial legislation. Can it be said beyond a reasonable doubt that the hotel keeper will not, from time to time, impose more onerous conditions of excessive hours and strain on his women employes than the boarding or lodging house keeper? Will not the irregularity and sudden strains necessarily incidental to hotel keeping, tend to drive him to compel a more oppressive kind of service from his women than the landlord of the boarding house with his more regular and calculable business? Can this Court say such a ground of distinction is not even dubious? Unless it can the law must stand.

In concluding, we submit that each of the above distinctions presents sufficient reason to sustain the Legislature in its classification. When all are considered together, the classification no longer seems even dubious. In fact, if there is any reasonable doubt, it would seem to be as to the reasonableness of any one who would contend that there was no ground of distinct classification between the hotel and other places of lodgment.

On the Right of the Legislature to Choose the Point of Cleavage in Classification When the Occupations Gradually Merge from One Class into Another.

It is apparent that there are some points of resemblance between the hotel, the large boarding house, the small boarding house, the family taking several boarders the year round, the farmhouse with its two or three summer boarders, and the family with one "parlor" guest. For instance, both travelers and steady boarders have property which they leave under the protection of the landlord. Hence, we find a common law for both hotel and boarding house keepers in the matter of the protection of property.

On the other hand, the law expects that the body of travelers will go to the hotel and not the boarding house, and makes it a crime for the former, but not the latter, to refuse his hospitality to such transient guests. (Penal Code, 365.)

Some large boarding and lodging houses approach very closely to the hotel in the duties of its employes. The line between these boarding

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houses, with their more complex organization and those in which the simpler organization is more nearly allied to family life, is one impossible to be drawn with scientific accuracy. Certainly the Court can not take judicial notice of any sharp line of cleavage; and yet as certainly can it be said that the Legislature has the power of placing the dividing line somewhere in the succession.

So also with the hotel which entertains the great bulk of travelers and the boarding houses which entertain the great bulk of permanent guests. The classification in so far as the danger to woman is concerned is, as we have shown, a reasonable one, and the very difficulty of placing it anywhere else in the line between the hotel and the home with its parlor boarder "gives evidence itself that it is a reasonable class distinction."

G. Employment by a Common Carrier

Recent government investigation has shown that before the ten-hour law was enacted, women employed by the elevated railways in Chicago were obliged to remain at their posts twelve hours in the day, and seven days in the week.

*Bulletin of the U. S. Bureau of Labor. No. 91. Nov., 1910. Working Hours of Wage-Earning Women in Chicago. Woman Ticket Agents of the Elevated Railways.**

The elevated railway companies of Chicago employ 284 regular woman agents and an average of about 100 "extras." The regular agents work from 7 A. M. to 7 P. M.—12 hours a day, for 7 days a week. There is no allowance whatever for an occasional afternoon off, or for a Sunday or a legal holiday. If a girl desires such leave she makes request and an "extra" is sent to relieve her, the "extra" receiving the full rate of pay which is deducted from the regular agent's wage. It is quite common for an agent to ask for a half day off on a legal holiday—as Christmas or Thanksgiving—and the "extra" called upon to substitute must respond whenever called, for, while these extras are not necessarily employed continuously (in the case of one company the average earnings of extras amounts to $35.00 per month each), they must be prepared to respond promptly; otherwise the chances are that they will not be considered desirable as regulars.

* The tabulation of information from the transportation companies not only covers the two years previous to January 1, 1910, but represents conditions in September and the early part of October, 1910. (Page 869.)

The lunch hour brings no relaxation, for the girl must bring her lunch, or send for it, and it is eaten at her station as opportunity occurs. Some of the agents have appliances for heating coffee, etc.

A majority of the roads have a "relief agent" who is constantly traveling, stopping off to relieve the agents along the line for 10 or 15 minutes morning and afternoon. On the lines where there is no relief agent the girl must call upon the colored porter to take her place during a necessary temporary absence. . . . The morning hours are generally busy ones for the agent, but there are several hours during the day where in most districts the work is very light, and except for the fact that the girl must remain at her station she may make herself very comfortable, often finding time for fancy work or a magazine, the only stipulation being that she shall not neglect her duty.

The real strain comes during the last two hours of the working day when the girl is least prepared to meet it, from 5.00 to 6.30 or 7.00 P. M., when the exodus from offices, stores and factories keeps the agent nerved to highest effort to keep up with the insistent demands of waiting patrons.

The manager of one of the roads describes the successful agent as the one who, under sometimes very trying circumstances, maintains perfect self-control. Her occupation necessarily places her in contact with all classes and conditions of people, and by the exercise of self-control and tact many an unpleasant situation is averted. The management particularly desires the agents to avoid anything like conflict. (Pages 880–881.)

The following table shows for each railway the number of women regularly employed, with the daily and weekly hours of work and rates of pay:

NUMBER OF WOMAN AGENTS IN THE SERVICE OF THE ELEVATED RAILROADS OF CHICAGO, WITH HOURS OF LABOR AND RATES OF PAY

Company Number	*Number of Women Regularly Employed*	*Hours per Day*	*Days per Week*	*Hours per Week*	PAY PER	
					Day	*Week*
1	100	12	7	84	$1 90	$13 30
2	64	12	7	84	1 95	13 65
3	45	12	7	84	1 90	13 30
4	24	12	7	84	1 70	11 90
5	51	12	7	84	*a*2 00	*b*14 00
Total	284	12	7	84	$1 91	$13 39

a $1.70 during first year; agents at 3 department stores $1.75 each, and relief agents $1.60.

b After working 1 year at $1.70 per day.

OPINION OF THE SUPREME COURT OF THE UNITED STATES

In the Case of Muller *v.* State of Oregon

Delivered by Mr. Justice Brewer, February 24, 1908

On February 19, 1903, the legislature of the State of Oregon passed an act (Session Laws, 1903, p. 148) the first section of which is in these words:

"Sec. 1. That no female (shall) be employed in any mechanical establishment, or factory, or laundry in this State more than ten hours during any one day. The hours of work may be so arranged as to permit the employment of females at any time so that they shall not work more than ten hours during the twenty-four hours of any one day."

Section 3 made a violation of the provisions of the prior sections a misdemeanor, subject to a fine of not less than $10 nor more than $25. On September 18, 1905, an information was filed in the Circuit Court of the State for the county of Multnomah, charging that the defendant "on the 4th day of September, A. D. 1905, in the county of Multnomah and State of Oregon, then and there being the owner of a laundry, known as the Grand Laundry, in the city of Portland, and the employer of females therein, did then and there unlawfully permit and suffer one Joe Haselbock, he, the said Joe Haselbock, then and there being an overseer, superintendent and agent of said Curt Muller, in the said Grand Laundry, to require a female, to wit, one Mrs. E. Gotcher, to work more than ten hours in said Laundry on said 4th day of September, A. D. 1905, contrary to the statutes in such cases made and provided, and against the peace and dignity of the State of Oregon."

A trial resulted in a verdict against the defendant, who was sentenced to pay a fine of $10. The Supreme Court of the State affirmed the con-

viction (48 Ore. 252), whereupon the case was brought here on writ of error.

The single question is the constitutionality of the statute under which the defendant was convicted so far as it affects the work of a female in a laundry. That it does not conflict with any provisions of the State constitution is settled by the decision of the Supreme Court of the State. The contentions of the defendant, now plaintiff in error, are thus stated in his brief:

"(1) Because the statute attempts to prevent persons, *sui juris*, from making their own contracts, and thus violates the provisions of the Fourteenth Amendment, as follows:

"'No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.'

"(2) Because the statute does not apply equally to all persons similarly situated, and is class legislation.

"(3) The statute is not a valid exercise of the police power. The kinds of work prescribed are not unlawful, nor are they declared to be immoral or dangerous to the public health; nor can such a law be sustained on the ground that it is designed to protect women on account of their sex. There is no necessary or reasonable connection between the limitation prescribed by the act and the public health, safety, or welfare."

It is the law of Oregon that women, whether married or single, have equal contractual and personal rights with men. As said by Chief Justice Wolverton, in *First National Bank* v. *Leonard*, 36 Ore. 390, 396, after a review of the various statutes of the State upon the subject:

"We may therefore say with perfect confidence that, with these three sections upon the statute book, the wife can deal, not only with her separate property, acquired from whatever source, in the same manner as her husband can with property belonging to him, but that she may make contracts and incur liabilities, and the same may be enforced against her, the same as if she were a *feme sole*. There is now no residuum of civil disability resting upon her which is not recognized as existing against the husband. The current runs steadily and strongly in the direction of the emancipation of the wife, and the policy, as disclosed by all recent legislation upon the subject in this State, is to place her upon the same footing as if she were a *feme sole*, not only with respect to her separate property, but as it affects her right to make binding contracts; and the most natural corollary to the situation is that the remedies for the enforcement of lia-

bilities incurred are made co-extensive and co-equal with such enlarged conditions."

It thus appears that, putting to one side the elective franchise, in the matter of personal and contractual rights they stand on the same plane as the other sex. Their rights in these respects can no more be infringed than the equal rights of their brothers. We held in *Lochner* v. *New York*, 198 U. S. 45, that a law providing that no laborer shall be required or permitted to work in bakeries more than sixty hours in a week or ten hours in a day was not as to men a legitimate exercise of the police power of the State, but an unreasonable, unnecessary, and arbitrary interference with the right and liberty of the individual to contract in relation to his labor, and as such was in conflict with, and void under, the Federal Constitution. That decision is invoked by plaintiff in error as decisive of the question before us. But this assumes that the difference between the sexes does not justify a different rule respecting a restriction of the hours of labor.

In patent cases counsel are apt to open the argument with a discussion of the state of the art. It may not be amiss, in the present case, before examining the constitutional question, to notice the course of legislation as well as expressions of opinion from other than judicial sources. In the brief filed by Mr. Louis D. Brandeis, for the defendant in error, is a very copious collection of all these matters, an epitome of which is found in the margin.*

* The following legislation of the States impose restriction in some form or another upon the hours of labor that may be required of women: Massachusetts, 1874, Rev. Laws 1902, chap. 106, sec. 24; Rhode Island, 1885, Acts and Resolves 1902, chap. 994, p. 73; Louisiana, 1886, Rev. Laws 1904, vol. i, sec. 4, p. 989; Connecticut, 1887, Gen. Stat. revision 1902, sec. 4691; Maine, 1887, Rev. Stat. 1903, chap. 40, sec. 48; New Hampshire, 1887, Laws 1907, chap. 94, p. 95; Maryland, 1888, Pub. Gen. Laws 1903, art. 100, sec. 1; Virginia, 1890, Code 1904, tit. 51 a, chap. 178 a, sec. 3657 b; Pennsylvania, 1897, Laws 1905, No. 226, p. 352; New York, 1899, Laws 1907, chap. 507, sec. 77, subdiv. 3, p. 1078; Nebraska, 1899, Comp. Stat. 1905, sec. 7955, p. 1986; Washington, Stat. 1901, chap. 68, sec. 1, p. 118; Colorado, Acts 1903, chap. 138, sec. 3, p. 310; New Jersey, 1892, Gen. Stat. 1895, p. 2350, secs. 66 and 67; Oklahoma, 1890, Rev. Stat. 1903, chap. 25, art. 58, sec. 729; North Dakota, 1877, Rev. Code 1905, sec. 9440; South Dakota, 1877, Rev. Code (Penal Code, sec. 764), p. 1185; Wisconsin, 1867, Code 1898, sec. 1728; South Carolina, Acts 1907, No. 233.

In foreign legislation Mr. Brandeis calls attention to these statutes: Great Britain, 1844, Law 1901, 1 Edw. VII, chap. 22; France, 1848, Act Nov. 2, 1892, and March 30, 1900; Switzerland, Canton of Glarus, 1848, Federal Law 1877, art. 2, sec. 1; Austria, 1855, Acts 1897, art. 96 a, secs. 1 to 3; Holland, 1889, art. 5, sec. 1; Italy, June 19, 1902, art. 7; Germany, Laws 1891.

Then follow extracts from over ninety reports of committees, bureaus of statistics, commissioners of hygiene, inspectors of factories, both in this country and in Europe, to the effect that long hours of labor are dangerous for women, primarily because of their special physical organization. The matter is discussed in these

While there have been but few decisions bearing directly upon the question, the following sustain the constitutionality of such legislation: *Commonwealth* v. *Hamilton Mfg. Co.*, 125 Mass. 383; *Wenham* v. *State*, 65 Neb. 394, 400, 406; *State* v. *Buchanan*, 29 Wash. 602; *Commonwealth* v. *Beatty*, 15 Pa. Sup. Ct. 5, 17; against them in the case of *Ritchie* v. *People*, 155 Ill. 98.

The legislation and opinions referred to in the margin may not be, technically speaking, authorities, and in them is little or no discussion of the constitutional question presented to us for determination, yet they are significant of a widespread belief that woman's physical structure, and the functions she performs in consequence thereof, justify special legislation restricting or qualifying the conditions under which she should be permitted to toil. Constitutional questions, it is true, are not settled by even a consensus of present public opinion, for it is the peculiar value of a written constitution that it places in unchanging form limitations upon legislative action, and thus gives a permanence and stability to popular government which otherwise would be lacking. At the same time, when a question of fact is debated and debatable, and the extent to which a special constitutional limitation goes is affected by the truth in respect to that fact, a widespread and long continued belief concerning it is worthy of consideration. We take judicial cognizance of all matters of general knowledge.

It is undoubtedly true, as more than once declared by this court, that the general right to contract in relation to one's business is part of the liberty of the individual, protected by the Fourteenth Amendment to the Federal Constitution; yet it is equally well settled that this liberty is not absolute and extending to all contracts, and that a State may, without conflicting with the provisions of the Fourteenth Amendment, restrict in many respects the individual's power of contract. Without stopping to discuss at length the extent to which a State may act in this respect, we refer to the following cases in which the question has been considered: *Allgeyer* v. *Louisiana*, 165 U. S. 578; *Holden* v. *Hardy*, 169 U. S. 366; *Lochner* v. *New York*, *supra*.

reports in different aspects, but all agree as to the danger. It would of course take too much space to give these reports in detail. Following them are extracts from similar reports discussing the general benefits of short hours from an economic aspect of the question. In many of these reports individual instances are given tending to support the general conclusion. Perhaps the general scope and character of all these reports may be summed up in what an inspector for Hanover says: "The reasons for the reduction of the working day to ten hours—(a) the physical organization of woman, (b) her maternal functions, (c) the rearing and education of the children, (d) the maintenance of the home—are all so important and so far-reaching that the need for such reduction need hardly be discussed."

That woman's physical structure and the performance of maternal functions place her at a disadvantage in the struggle for subsistence is obvious. This is especially true when the burdens of motherhood are upon her. Even when they are not, by abundant testimony of the medical fraternity continuance for a long time on her feet at work, repeating this from day to day, tends to injurious effects upon the body, and as healthy mothers are essential to vigorous offspring, the physical well-being of woman becomes an object of public interest and care in order to preserve the strength and vigor of the race.

Still again, history discloses the fact that woman has always been dependent upon man. He established his control at the outset by superior physical strength, and this control in various forms, with diminishing intensity, has continued to the present. As minors, though not to the same extent, she has been looked upon in the courts as needing especial care that her rights may be preserved. Education was long denied her, and while now the doors of the school-room are opened and her opportunities for acquiring knowledge are great, yet even with that and the consequent increase of capacity for business affairs it is still true that in the struggle for subsistence she is not an equal competitor with her brother. Though limitations upon personal and contractual rights may be removed by legislation, there is that in her disposition and habits of life which will operate against a full assertion of those rights. She will still be where some legislation to protect her seems necessary to secure a real equality of right. Doubtless there are individual exceptions, and there are many respects in which she has an advantage over him; but looking at it from the viewpoint of the effort to maintain an independent position in life, she is not upon an equality. Differentiated by these matters from the other sex, she is properly placed in a class by herself, and legislation designed for her protection may be sustained, even when like legislation is not necessary for men and could not be sustained. It is impossible to close one's eyes to the fact that she still looks to her brother and depends upon him. Even though all restrictions on political, personal, and contractual rights were taken away, and she stood, so far as statutes are concerned, upon an absolutely equal plane with him, it would still be true that she is so constituted that she will rest upon and look to him for protection; that her physical structure and a proper discharge of her maternal functions—having in view not merely her own health, but the well-being of the race—justify legislation to protect her from the greed as well as the passion of man. The limitations which this statute places upon her contractual powers, upon her right to agree with her employer as to the time she shall labor, are not imposed solely for her benefit, but also largely for the benefit

of all. Many words cannot make this plainer. The two sexes differ in structure of body, in the functions to be performed by each, in the amount of physical strength, in the capacity for long-continued labor, particularly when done standing, the influence of vigorous health upon the future well-being of the race, the self-reliance which enables one to assert full rights, and in the capacity to maintain the struggle for subsistence. This difference justifies a difference in legislation and upholds that which is designed to compensate for some of the burdens which rest upon her.

We have not referred in this discussion to the denial of the elective franchise in the State of Oregon, for while that may disclose a lack of political equality in all things with her brother, that is not of itself decisive. The reason runs deeper, and rests in the inherent difference between the two sexes, and in the different functions in life which they perform.

For these reasons, and without questioning in any respect the decision in *Lochner* v. *New York*, we are of the opinion that it cannot be adjudged that the act in question is in conflict with the Federal Constitution, so far as it respects the work of a female in a laundry, and the judgment of the Supreme Court of Oregon is

Affirmed.

True Copy.

Test:

JAMES H. McKENNEY,
CLERK, SUPREME COURT, U. S.

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