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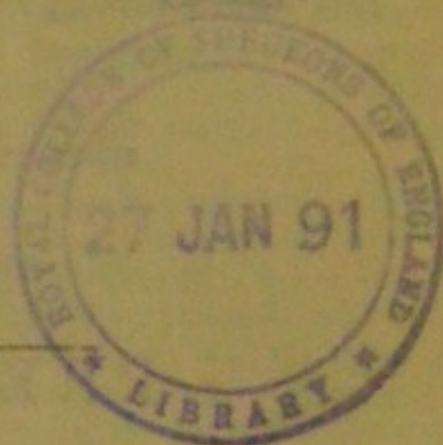
TWENTIETH THOUSAND.

2

RESULTS OF RESEARCHES

ON

ALCOHOL.



BY

BENJAMIN W. RICHARDSON, M.A., M.D., F.R.S.

LONDON:

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1877.

PRICE ONE PENNY.

TO MY FRIEND,

WHOSE FRIENDSHIP FOR MANY YEARS HAS BEEN DEARLY PRIZED,
AND WHOSE ESTEEM IT IS A CONSTANT PLEASURE TO RETAIN,

H. W. ACLAND, M.D.,

LL.D., D.C.L., F.R.S.

Regius Professor of Medicine in the University of Oxford,

THIS SIMPLE EFFORT, IN BEHALF OF A GREAT CAUSE,

IS

SINCERELY DEDICATED.

PREFACE.

THIS Address was delivered in the Sheldonian Theatre, at Oxford, on March 30th, 1876, at the request of the CHURCH OF ENGLAND TEMPERANCE ASSOCIATION. It has already been issued in the Report of the excellent and most useful body to whom it was originally addressed, and has met with much favour. At the earnest request of the present Publishers, and of many others whose labours are devoted to the cause of Temperance, it is here published in a separate form, with the hope that the anticipation as to its usefulness may be equal to the desire.

12, HINDE STREET, W.,

Christmas Day, 1876.

RESULTS OF RESEARCHES ON ALCOHOL.

SUPPOSE it were possible for every one in this large assemblage to say with all truthfulness, while recasting the experiences of life, "I know of one particular agent or thing which has directly killed one person whom I knew. The human being thus slain had the slaying agent under his own absolute control. He need not have touched it unless he had willed so to do, and he would never have felt any want for it if he had not been trained to feel the want!"

Suppose this audience, as an English audience merely, were enlarged until it included all who might fairly form an audience capable by experience and years and capacity of mind to make a correct statement on what they had clearly and definitely seen. Suppose every one of them could say, "I, too, know that the same agent has killed one person who lived in my circle of acquaintance, so that taking us all in combination in the span of our lives, which may fairly be included in thirty years, the fatal effects of the said agent have been witnessed by ten millions of observers"!

Suppose we could listen to a foreign voice speaking to us from across the Atlantic, and could hear it declare on the authority of an official census return: "For the last ten years this one agent has imposed upon the nation (The United States) a direct expense of 600,000,000 dols.; an indirect expense of 600,000,000 dols.; has destroyed 300,000 lives; has sent 100,000 children to the poorhouses; has committed at least 150,000 people into prisons and workhouses; has made at least 1,000 insane; has determined at least 2,000 suicides; has caused the loss by fire or violence of 10,000,000 dols. worth of property; has made 200,000 widows, and 1,000,000 orphans"!

Suppose, returning to our own country, we were to discover that among those unhappy persons who fill our asylums for the insane, two out of three were brought there owing to the direct or indirect effects of this destroyer. That amongst the paralysed who sit or lie there day after day until inevitable death takes them away—all of them already in the shroud of a living death, toneless, speechless, helpless, existing only by their mere vegetative part—that nine-tenths of these are brought to the condition in which we see them by the direct or indirect effects of this one destroyer!

Suppose we entered the cells of our prisons, and amongst those we met wearing out their lives in solitude, shame, and misery, so that the noblest of all that is human, *work*, sank the victims into a sense of deeper degradation: and suppose as we stood that we heard the voice of the most scientific scholar who ever graced the Judicial Bench of England since the days of the illustrious Chancellor, Bacon, saying, as the voice of Mr. Justice Grove lately said, that the most potent influence for securing these incarcerations, and for placing the miserables before us in such terrible position, was this same agent.

Suppose we could at the present moment see before us, passing in

sad panoramic display, some of the broken-heartedness of this still unhappy country. Tortured women, undergoing torture, or listening with palpitating hearts, and with their children scared and hidden away, waiting for the dreaded footsteps of him whose faintest sound ought to be the joy of their expectant lives. Could we see all the weeping mothers and fathers hoping against hope for the reformation of their children; mourning a loss that the grave even will relieve—loss to truth, honour, self-respect, affection, duty, honesty, every virtue on which parents find new life in their offspring. Suppose, seeing these things in their unutterable vastness, we could say they are the work of the one and the same destroyer!

Suppose we could, day by day, keep under our observation for one year the thousand depôts in which this agent is stored up, and from which it is dispensed in million potions a-day to smite and to slay young and middle-aged and old, rich and poor, deluder and deluded, polluted and polluting. Could we watch the inroads of death into each of those centres of distributing death, and discover that out of them the marauder tore one hundred and thirty-eight to one hundred of his other victims elsewhere, and seeing this fact could recognise that death, more than just, acted on the sellers through the thing sold!

Suppose we took into our consideration the reckoning that the capital which is invested in this destroyer represents in the British Islands alone the sum of £117,000,000 sterling. That the duties paid in one year amount at least to £30,000,000 of money; that each taxpayer who has an income of £500 a-year is assessed £31 towards this imposition, whether he avail himself or not of the means to injure himself by the cause of the imposition!

Suppose we knew of two classes of people who were seeking, in forestalment of calamity to their families, to insure their lives, and that the distinction into classes lay simply in one matter:—That a certain class (B) habitually subjected itself, and a certain class (C) did never subject itself, to this particular substance. Suppose it were found in respect to these applicants that Class B showed a mortality of 7 per cent. below the calculated average of life, and Class C a mortality of 26 per cent. below that average: that from bonuses, or returns from amount of premium paid, Class B received 34 per cent., Class C 53 per cent.: that dealers in the particular agent under review were hardly admissible even into Class B, and that their vocation added a mortality of two out of three compared with the vocations of Class C!

Suppose, in passing through our hospitals for the cure of the sick, the physician in attendance were to name all the forms of diseases there, and were to say, as he might most honestly, these names, very different in kind, and seeming to denote very different maladies,—gout, paralysis, albuminuria, apoplexy, delirium tremens, enfeebled heart, eczema, epilepsy, consumption (in one phase of that disease at least), liver disease or cirrhosis, dropsy,—to say nothing of other maladies under dispute as to their origin: these names do truly but indicate various forms of disease originating in one agency to which these afflicted have been directly or indirectly subjected!

Suppose it were possible, after this general survey, to be able to cast up the sum of misery represented in such varying disguises, and to

prove that they are all the work of one common enemy of mankind, should we not hesitate, almost in fear, fear which familiarity itself would not utterly conquer, as we asked ourselves: Is it really true? Is there such an enemy, such a power, such a *bond fide* devil in our midst?

The facts must stand for themselves in all their terrible reality. There is such a devil, though he is not in polite language called so. He assumes various names. The learned,—owing to his infinite subtlety, a subtlety as refined as the impalpable powder with which ancient ladies of the East dressed their hair,—the learned call him *alcohol*. The unlearned call him *beer*. The savages call him *fire-water*. The rollicking scholars call him *wine*. The slangsters call him *B. and S.*, or *cocktail*, or *gin-sling*. Gentler lips, that ought to know less of him and more of botany, sometimes call him *cherries*. We will call him to-day, because of his subtlety, and because, after all, the term defines him best for our purpose, *alcohol*.

In this audience it is unnecessary to go over again, with proofs in hand, the details of the charges I have made against this subtle agent. He has been arraigned for them over and over again: he has been proved guilty of them all over and over again. Yet hath he always escaped scot-free, and continued his marauding, kept together his retinue, and defied his enemies. He has paid his servants in their own coin and his own, making them obey, killing them as they obeyed, and, stretching out his empire over their graves, has imprinted his brand on the offspring they have raised, whether the offspring approved or loathed the badge of his service.

WHY THE ENEMY EXISTS.

The startling question hereupon faces us—Why is this subtle enemy thus allowed to go free? He is not recently discovered as a new enemy. Not at all! Solomon detected him, and the good race of preachers who take their lead from that wise man have continued his denunciation. The Esculapians from the first have detected him, and, with a few fluctuating periods of complacency or dalliance, have run him down. The law-makers have denounced him in all ages.

And yet he lives!

There are two reasons why this enemy survives and flourishes, which reasons are personal to man. I mean by this that they belong to man individually, according to his likings and beliefs. These are primary or direct reasons because personal. There are other reasons which have sprung out of the personal, and have slipped into the rule of what is called political necessity. These are indirect reasons, and they rest exclusively on the direct. They hold, therefore, notwithstanding their immense practical importance, a second place. They would speedily be set aside so soon as the first came under the control of the majority of the nation. They may even now be brought under correction with a view to the removal of the errors they sustain.

I am aware that many of those who are most earnest in the cause of Temperance, look to the removal of the primary reasons, by which alcohol retains its place, as the grand remedy; and certain it is that until those primary reasons are removed, the greatest reform in legislative action can be but of slight and temporary service. It seems, how-

ever, to me, that sufficient has already been done in the way of influencing the education of the people towards the truth, to enable the Legislature, backed by the large and increasing constituency which holds to Temperance, to begin to invent some practical measure which shall put suppression of the common enemy under certain forms of legal recognition, so that the moral reformer may have a clear course, instead of being impeded, as he is at this time, by the protection which the law systematically extends to the evil he would root up.

I will return to this topic again, at a later stage of my discourse. Let me recur now to the two primary reasons by which the use of alcohol, with all its attendant calamities, is sustained.

AN INBRED ENEMY.

There is an old proverb which says that "What is bred in the bone will never come out of the flesh." The proverb is not quite correct anatomically. It should have said, "What is bred in the brain will never come out of the flesh." Even then it would be imperfect, physiologically, and should read, "What is bred in the brain will never come out of the flesh in one generation." The proverb, with all its faults, is impressive and expressive. It tells correctly enough that those sins which are engrafted into men are not readily eradicated. In this question of alcohol and the errors of life and taste depending upon it, the saying is signally correct. In communities which take wine, as a general custom, there exists a system of breeding the custom, which is not dispelled in one, nor completely in two, generations. This is a peculiarity of the action of alcohol on the nervous organisation, or on that essence of nervous organisation subtler than the mere nerve-matter into which the impressions are instilled, that the impression it makes remains, and is transmitted, like feature, and taste, and disease, from the parent to the child. Of the nature of the inscrutable design, by which attributes and faculties, evil as good and good as evil, pass from the born to the unborn, I pretend to know nothing beyond the fact. But to me it always seems, as I think it must to you, one of the most solemn passages of human knowledge. To know that even in this world we none of us ever die. That our acts, our virtues, our failures, our physical conditions, appetites, passions, pass on to other generations. That the forms we mould ourselves to by acts original to ourselves, pass on to other generations. That habits and passions we subdue in ourselves are subdued, as far as we are concerned, in other generations that spring from us.

Therefore, in relation to the influence of this destroying agent, alcohol, one of the primary reasons for its continued use is that the desire, or appetite, or passion, for it has been transmitted to us by our predecessors. If there were no such foundation of appetite and passion for it, any one of the arguments against it to which I have adverted were sufficient to destroy its potency. With such foundation all the arguments, and as many more equally cogent, were of no direct avail with the masses that are influenced.

Happily the virtues are transmitted not less readily than the errors of mankind; and so in considering this primary cause of the continued power of the destroyer we are not driven as men without hope to doubt our efforts for the destruction of the power. Our efforts, in every

instance where they succeed in the present, are multiplied so many times into the future, that a generation or two will plant a new order, and make what is to us the most difficult portion of our labour the easiest part of the future emancipation.

In every effort it is always best to look the gravest difficulty first in the face; and I put this difficulty in view at once, that all may see and detect for themselves the mode of removing it. Detect that its removal is certain, and some day rapid, if the course of reformation be steadfastly pursued: detect also that patience is necessary, and that time spent is not time lost, but is time employed, in the most useful way, for securing the harvest of good results, the success that will assuredly follow.

FALSE BELIEFS.

The second primary cause for the continued power of alcohol in the world is falseness of belief as to the effect of the agent upon the body and the bodily powers. From the hilarity produced by wine, and which was originally conceived to be its only virtue, to "make glad the heart," there has crept into the habits of men the desire to be made hilarious at every meal. From this desire has come the practice of introducing wine or other spirituous drinks at certain meals regularly; and from this, again, by association of wine and its allies with food, has come the idea that the hilarity-provoking stimulant is also a food.

To this view Science herself, in opposition to common-sense experience, gave, some years ago, her sanction. It was a sanction slowly rendered, and never perfectly rendered. It was a sanction founded on the analogy of physical action of alcohol outside the body, its property of preserving from putrefaction and its burning, rather than on any correct observation as to its true physiological action on living animal organisms. But there is no denying that the sanction was given, and that it has inflicted, for a time, an incomparable wrong. It has given a reason for the habitual use of alcohol, which is, I repeat, a primary reason. It suggests not only that alcohol is a food, but that it is a necessary food. A food man cannot do without. A sustaining food, which in this overworked day is more requisite than ever.

A few persons, whose eyes are opened to the fallacy of this reasoning, use it, notwithstanding, because in their hearts they are infatuated with the liking for alcohol, and are glad to find any excuse that shall minister to their own inclinations. The majority of persons whose eyes are not opened to the truth, believe in this reasoning absolutely, and act upon it with implicit honesty. These often tell you with perfect candour they regret as much as can be regretted the evils they cannot fail to recognise, but, say they, of what use is it deploring evils that spring from a necessity? I have never yet met with a legislator who declined to legislate against alcohol who did not express as the reason for his action this theory of necessity. I have never yet conversed with a member of my own learned profession, who was in favour of alcohol, who did not assign the self-same argument. I have never yet spoken with a clergyman on that side of the question who did not follow the politician and the doctor, and adduce not only their reason but their authority.

It is the duty of us who have seen the true light on the question of

temperance to deal plainly and faithfully with the reasoning on this point of necessity. That false doctrine eradicated, the power of alcohol for all its evil is undermined. That left in doubt, the power of alcohol to continue all its evils remains practically untouched. I believe, therefore, that from the position I now, by your favour, occupy, I cannot do better than tackle this reasoning again on scientific evidence: and on the ground that—

“Truth can never be confirmed enough,
Though doubt should ever sleep,”—

venture in a few sentences to repeat what I have spoken on many public occasions on this vital matter.

ORIGINAL RESEARCHES ON THE ACTION OF ALCOHOL.

In so speaking, I cannot, I think, do better or simpler than narrate the individual method of inquiry by which, in an independent way, I was brought, without being able to avoid the result, to the conclusion I submit to you, viz., that the popular prevailing idea that alcohol, as a food, is a necessity for man has no basis whatever from a scientific point of view.

Let me say, that at the commencement of the labours which brought me to the conclusion above stated, I had no bias in favour of or preconceived opinion respecting alcohol.

Like many other men of science, I had been too careless or too oblivious of those magnificent labours which the advocates of temperance for its own sake had, for many previous years, through good report and evil report, so nobly and truthfully carried out. But for what may be called one of the accidents of a scientific career, I might indeed, to the end of my days, have continued negative on this question.

The circumstance that led me to the special study of alcohol is simply told. In the year 1863 I directed the attention of the British Association for the Advancement of Science, during its meeting at Newcastle, to the action of a chemical substance called nitrite of amyl, the physiological properties of which I had for some months previously been subjecting to investigation. My researches attracted so much attention, that I was desired by the physiological section of the Association, over which Professor Rolleston most ably presided, to continue them, and, in the end, I was enabled to place in the hands of the physician one of the most useful and remarkable medicinal agents that has ever been supplied by the chemist for the relief of human suffering. The success of this research led the Association to entrust me with further labours, and in the course of pursuing them, other chemical substances, nearly allied to that from which I started, came under observation. Amongst these was the well-known chemical product which the Arabian chemist, Albucasis, is said first to have distilled from wine, which on account of its subtlety was called alcohol, which is now called ethylic alcohol, and which forms the stimulating part of all wines, spirits, beers, and other ordinary intoxicating drinks.

In my hands this common alcohol, and other bodies of the same group, viz.: methylic, propylic, butylic, and amylic alcohols, were tested purely from the physiological point of view. They were tested exclusively as chemical substances apart from any question as to their general use and employment, and free from all bias, for or against their influence on mankind for good or for evil.

The method of research that was pursued was the same that had been followed in respect to nitrite of amyl, chloroform, ether, amylene and other chemical bodies, and it was in the following order. First, the mode in which living bodies would take up or absorb the substance was considered. This settled, the quantity necessary to produce a decided physiological change was ascertained, and was estimated in relation to the weight of the living body on which the observation was made. After these facts were ascertained the special action of the agent was investigated on the blood, on the motion of the heart, on the respiration, on the minute circulation of the blood, on the digestive organs, on the secreting and excreting organs, on the nervous system and brain, on the animal temperature, and on the muscular activity. By these processes of inquiry, each specially carried out, I was enabled to test fairly the action of the different chemical agents that came before me.

In the case of alcohol, tried by these tests, I found then a definite order of facts, the principal of which I may narrate. It was discovered that alcohol, being a substance very soluble in water, would enter the body by every absorbing surface: by the skin, by the stomach, by the blood, and by the inhalation of its vapour in the lungs. But so greedy is it for water that it must first be diluted before it can be freely absorbed. If it be not so diluted it will seize the water from the tissues to which it is applied, and will harden and coagulate them. In this way it may even be made to coagulate the blood itself, and in some instances of rapid poisoning by it, the death has occurred from the coagulation of blood within the vessels, or in the heart.

The quantity required for absorption in order to produce distinct effects is from twenty to thirty grains of the fluid to the pound weight of the animal body, in those who have not become habituated to the influence of it. In quantities that can be tolerated it affects the blood, making that fluid unduly thin or coagulating it, according to the amount of it that is carried into the circulating system. It acts on the blood-corpuscles, causing them to undergo modifications of shape and size, and reducing their power of absorbing oxygen from the air. It changes the natural action of the heart, causing the heart to beat with undue rapidity and increasing the action, in extreme instances, to such a degree that the organ in an adult man is driven to the performance of an excess of work equal to the labour of lifting over twenty-four tons weight one foot in twenty-four hours. In some instances the number of extra strokes of the heart produced by alcohol has reached 25,000 in the twenty-four hours. The effect on the respiration follows that on the heart, and is correspondingly deranged.

On the minute blood vessels, those vessels which form the terminals of the arteries and in which the vital acts of nutrition and production of animal heat and force are carried on, alcohol produces a paralysing effect in the same manner as does the nitrite of amyl. Hence the flush of the face and hands which we observe in those who have partaken freely of wine. This flush extends to all parts, to the brain, to the lungs, to the digestive organs. Carried to its full extent it becomes a congestion, and in those who are long habituated to excess of alcohol the permanency of the congestion is seen in the discoloured blotched skin, and, too often, in the disorganisation which is planted in the vital organs, the lungs, the liver, the kidney, the brain.

On the digestive system alcohol acts differently according to the degree in which it is used. In small quantities it excites the mucous membrane of the stomach so as to increase the secretion of gastric juice, and from that circumstance some think it assists digestion. In larger quantities it impairs the secretion and weakens digestion, producing flatulency and distension of the stomach. On the liver, if the action of the spirit be at all excessive, the influence is bad. Organic change of the structure of the liver is very easily induced. The same is true in respect to the action of the agent on the kidney.

On the nervous system alcohol exerts a double action. There are two nervous systems in man and in the higher animals, viz.: the vegetative or mere animal nervous system, and the cerebral and spinal nervous system which receives the pictures of the external universe, and is the seat of the functions of reason and of the suprema mental faculties. On both these systems, vegetative and reasoning, alcohol produces diverse actions, all of which are perverse to the natural. At first it paralyses those nervous fibres of the organic or vegetative system which control the minute vessels of the circulation. By this means a larger supply of blood is driven by the heart into the nervous centres, and nervous action from them is first excited, afterwards blunted; the brain is in a glow, and that stage of mental exhilaration which is considered the cheering and exciting stage of wine-drinking is experienced. After a time, if the action progresses, the opposite condition obtains; the function of the higher mental centres is depressed, the mere animal centres remain uncontrolled masters of the intellectual man, and the man sinks into the lower animal in everything but shape of material body. In the lower animals a state of actual madness accompanies this stage, and in man, sometimes, the same terrible condition is also witnessed.

Not only are the brain and nervous centres thus paralysed, the other vital organs of the body which have their fine minute vascular structures governed by the nervous current, the lungs, the brain, the liver, the kidney, the lining or mucous surface of the digestive system, the various serous surfaces of the body, are also through their weakened vessels surcharged with blood. They are congested as the skin is when the body of the drinker is flushed with wine; or, to use another *simile*, as the surface of the body is after the vessels, long stricken by cold, are relaxing and glowing red under the application of heat.

In this manner, by the course of experiment, I learned, step by step, that the true action of alcohol, in a physiological point of view, is to create paralysis of nervous power. It acts precisely as I had seen nitrite of amyl and some other chemical bodies act.

Previously to the performance of these researches, some distinguished physiologists had shown that mechanical division of the nervous cords which govern the vascular supply of special parts of the body leads to flushing those parts with blood. I traced, a little later, that the local paralyzing action of extreme cold was practically the same process, and was therefore followed by the same effects. And now in these inquiries into the influence of chemical agents, I discovered an exact analogy, nay, I may say, in all but the method, an identity of principle. If we could temporarily divide with the knife all the nervous supplies of the vascular structures of the body, we should temporarily produce the

same conditions as are produced by such diffusive escaping agencies as nitrite of amyl or alcohol. We should set the heart at liberty to work against reduced resistance: we should see the vessels of the skin and other parts intensely injected with blood: and, if we repeated the process many times, we should witness structural changes of parts, organic disease, structural diseases; such changes as are produced in those who suffer from excess of alcohol during long periods of time.

In brief, my experimental inquiries led me to discern, without original intention of such discernment, that the power for which alcohol is esteemed, its power as an agent to liberate the heart, to excite the nervous centres and influence the passions, to afterwards congest the centres and dull the passions, to make men violent and mad, then imbecile and palsied, is, all through, one power in various stages of development and degree: a power not exercised for the elevation but for the reduction of all the functions of life.

Pursuing still the plan I had set forth for the general method of investigating the action of chemical substances on animal bodies, I was led to study the influence of alcohol on the animal temperature. The prevailing view on this subject had been that alcohol increases and maintains the animal temperature. This view, it is true, had been challenged. Dr. Aitken had challenged it many years ago in the first volume of the *Literary and Philosophical Society of Manchester*. The illustrious Beddoes had challenged it. The late Dr. Cheyne, of Dublin, had challenged it. Dr. Carpenter, Dr. Lees, and some others whose prescience had been far more acute than mine, had challenged it. In perfect candour, the inference had been drawn by many observers that alcohol reduces the animal temperature; that those who are exposed to extremes of cold are best fortified against cold when they abstain from alcohol and depend on warm unintoxicating drinks; and that the popular idea on the subject was wrong. At the same time, it is certain that the impressions of these eminent scientists were not so confirmed by direct and absolute experimental research as to satisfy the world in general of their correctness. For my own part, I was ignorant, and that is why I sought for certain knowledge. To the research I devoted three years, from 1863 to 1866, modifying experiments in every conceivable way, taking advantage of seasons and varying temperatures of season, extending observation from one class of animal to another, and making comparative researches with other bodies of the alcohol series than the ethylic or common alcohol.

The results, I confess, were as surprising to me as to any one else. They were surprising from their definitiveness and their uniformity. They were most surprising from the complete contradiction they gave to the popular idea that alcohol is a supporter and sustainer of the animal temperature.

It will be borne in mind that I have described a flush from alcohol as the first effect of it in its first stage, when into the paralysed vessels the larger volume of blood is poured. In that stage, that is to say in the earlier part of it, I found an increase of temperature. This increase, however, was soon discovered to be nothing more than radiation from an enlarged surface of blood; a process, in fact, of rapid cooling, followed quickly by direct evidence of cooling. After this I found that through every subsequent stage of the alcoholic process, the stage of

excitement, of temporary partial paralysis of muscle, of narcotism and deep intoxication, the temperature was reduced in the most marked degree. I placed alcohol and cold side by side in experiment, and found that they ran together equally in fatal effect, and I determined that in death from alcohol the great reduction of animal temperature is one of the most pressing causes of death. I showed that this effect of alcohol in reducing the animal temperature extends through all the members of the alcohol group of chemical substances, and that with increase of the specific weight of the spirit the reducing effect is intensified.

Thus, by particular and varied experiment, it was placed beyond the range of controversy that alcohol, instead of being a producer of heat in those who consume it, and therefore a food in that sense, is a depressor, and therefore not a food in that sense. The earlier scientists were confirmed in their peculiar views to the letter. I honour them for their originality and truth as heartily as I appreciate the privilege of having been the first to apply the modern and more accurate system of thermometric inquiry to test, and, as it turned out, to confirm and establish their observations and practices.

From the study of the action of alcohol on the temperature of animal bodies, I proceeded next to test it in respect to its effects as a sustainer of the muscular power. Here I had the experience of the trainers of athletes to guide me, an experience which was strongly against the use of alcohol as a supporter of muscular power and endurance. I preferred, however, to test again minutely the direct effect of alcohol on muscular contraction, the result being the determination that, with the exception of a very brief period during the earliest stage of alcoholic flushing, the muscular force, like the temperature, fails under its influence. In a word, I found that the helplessness of muscle under which the inebriated man sinks beneath the table, and under which the paralysed inebriate sinks into the grave, is a cumulative process, beginning so soon as the physiological effect of alcohol is pronounced, and continuing until the triumph of the agent over the muscular power is completed.

SUMMARY OF RESEARCH.

What I may call the preliminary and physiological part of my research was now concluded. I had learned purely by experimental observation that, in its action on the living body, this chemical substance, alcohol, deranges the constitution of the blood; unduly excites the heart and respiration; paralyses the minute bloodvessels; increases and decreases, according to the degree of its application, the functions of the digestive organs, of the liver, and of the kidneys; disturbs the regularity of nervous action; lowers the animal temperature; and lessens the muscular power.

Such, independently of any prejudice of party or influence of sentiment, are the unanswerable teachings of the sternest of all evidences, the evidences of experiment, of natural fact revealed to man by experimental testing of natural phenomena. If alcohol had never been heard of, as nitrite of amyl and many other chemical substances I have tested had never been heard of by the masses of mankind, this is the

evidence respecting alcohol which I should have collected, and these are the facts I should have recorded from the evidence.

This record of simple experimental investigation and result respecting the action of alcohol on the body were incomplete without two other observations, which come in as a natural supplement. It will be asked: Was there no evidence of any useful service rendered by the agent in the midst of so much obvious evidence of bad service? I answer to that question that there was no such evidence whatever, and there is none. It has been urged, as a last kind of resource and excuse, that alcohol aids digestion, and so far is useful. I support, in reply, the statement of the late Dr. Cheyne, that nothing more effectively hinders digestion than alcohol. That "many hours, and even a whole night, after a debauch in wine, it is common enough to reject a part or the whole of a dinner undigested." I hold that those who abstain from alcohol have the best digestions; and that more instances of indigestion, of flatulency, of acidity, and of depression of mind and body, are produced by alcohol than by any other single cause.

This excuse removed, there remains none other for alcohol that is reasonably assignable except that temporary excitement of mind which, in spite of the assumption of its jollity and happiness, is one of the surest ultimate introductions to pain and sorrow. But if there be no excuse favoured by scientific research on behalf of alcohol, there is sufficient of appalling reasons against it superadded when the pathological results of its use are surveyed upon the physiological. The mere question of the destructive effect of alcohol on the membranes of the body alone would be a sufficient study for an address on the mischiefs of it. I cannot define it better, indeed, than to say that it is an agent as potent for evil as it is helpless for good. It begins by destroying, it ends by destruction, and it implants organic changes which progress independently of its presence even in those who are not born.

EXPULSION OF THE ENEMY.

I would venture now for a few minutes to pass from narrative of fact to invite attention to the question of the means that are before us for expelling from our homes, from our nation, from the world, an enemy that is so subtle and destructive. The time has come when that expulsion is the duty of every man who is bold enough to feel that he is his brother's keeper, not less than the keeper of his own selfish interests and desires. The period of silence on this subject has passed; the period of ridicule has passed; the period of fear has passed. The period for united common work amongst all classes of society against the common foe has come.

As I touch this question, I ask myself—What has influenced me to take part in this cause? I answer—The facts I have observed in regard to the action of alcohol on the animal body; the facts of its utter uselessness; the facts of its deadly evil. I argue thereupon that if I, who had no bias against this agent, who was taught indeed in schools of science and from lips I revered, that the thing was a necessity of life; if I, thus trained, can be brought by new light to see the actual truth and to be moved by it, so can all, except those who are so

enslaved that their fetters have become an inseparable part of their existence.

I argue further on this, that the primary duty of all who would join in the war of expulsion of the common enemy is to teach, proclaim, demonstrate, the same facts as I have to-day, with other such persuasions as may be adapted to the mind, and, I may say, to the heart, of him who is being taught. Specially would I urge that the young should be thus impressed. That in every Board school of England there should be a class beyond the three R's—a class where the claims of temperance should be impressed on the scholar with all the force of scientific instruction. If from the present Conference this one suggestion could find its way into practical working, we shall not have met to-day in this great seat of learning in vain.

POWER OF EXAMPLE.

The next advance towards the great reformation we have in view is to place side by side with the propagation of truth the example of truth. I have done something in this crusade by my work as a teacher; but the work would be badly supported indeed if it were not seconded by the practice of that which I have taught. To say to a man who is wavering, who believes the teaching of abstinence to be right, and who yet fears to try it, I, the teacher, can do without the agent you trust in, can work better without it, can live better without it, can live much happier without it, can feel that what I once thought to be a necessity would now be an incumbrance; to say this is to be strung up to the very heart, is to feel the argument strung up to the height of tension, and every word an arrow going straight home. To be able to do less than this is to act "doubtfully," and to experience what the Lord Protector so truly defined,—“whatsoever is so is not of faith; and whatsoever is not of faith is sin to him that doth it.”

THE MODERATION FALLACY.

This thought leads me to add a word on what is called the practice of moderation in the use of alcohol. I believe the Church of England Temperance Association is divided by two lines, one of which marks off total abstainers, the other moderate indulgers. I am one of those who have once been bitten by the plea of moderate indulgence. Mr. Worldly Wiseman, with his usual industry, tapped me on the shoulder, as he does every man, and held a long and plausible palaver on this very subject. If I had not been a physician he might have converted me. But side by side with his wisdom there came fortunately the knowledge, which I could not, dare not, ignore, that the mere moderate man is never safe, neither in the counsel he gives to others, nor in the practice he follows for himself. Furthermore, I observed, as a physiological, or, perhaps, psychological, fact, that the attraction of alcohol for itself is cumulative. That so long as it is present in a human body, even in small quantities, the longing for it, the sense of requirement for it, is present, and that as the amount of it insidiously increases, so does the desire.

On the other hand, I learned that the entire freedom from the agent controls entirely the desire. That he who is actually emancipated is free. But that he who has a single link of the tyrant on his sleeve is

still a slave, on whom more links are attached with an ease that gives no indication until the limbs are bound.

LEGISLATION AND THE PERMISSIVE BILL.

A man of science trusts, naturally, to the development of truth and to progress out of natural growth of scientific labour. He feels but secondary sympathies with the mere legislator who so often, in the present grossly empirical phase of his labour, legislates in darkness and in backward movement towards ages darker than his own. My mind, therefore, has been more directed to the educational part of the alcohol question than to the legislative. Yet I could not close this address without recurring a moment to what I have already said, viz., that the time has come when the Parliament of this country must in earnest legislate for the suppression, at least in part, of that national folly and disgrace,—the raising of national funds from national degradation. It cannot surely be long now that a free Government will extract its resources from the graves of its people!

It is impossible to ignore these truths, and so, as legislation is forced on the attention, we who are in the forward ranks as teachers must guide the uninformed to that legislation which we consider wisest for the moment, most practicable, and most possible. For my part, at the present moment, while keeping up perfect freedom to accept any other measure that may be suggested or may occur to one's self, I see nothing better in the way of proposed legislation than the Permissive Bill. Were I in the House of Commons, I should, in the absence of a better and more comprehensive measure, give it my most earnest support. It would, as the law of the land, do more to remove temptation than anything else I can conceive possible; and what this means let all who are influenced by temptation declare. Those who are not influenced need not vote: they will do no harm.

CONCLUSION.

In summary:—The grand effort for us all to make is to stand firm, in precept and example, by what is right, and to proclaim the right without dismay or fear.

Once, while the thunder of a great conqueror was playing on a doomed city, there stood in that city, in calm repose, a poor scholar speaking to a few earnest students words which, far mightier than the cannon of the conqueror, penetrated his nation, lifted it up, and helped to make it what it now is, the conqueror of the conqueror. Let every son of temperance plant these words in his mind and heart, and he, too, shall conquer the conqueror.

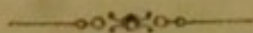
"To this am I called! to bear witness to the truth. My life, my fortunes, are of little moment. The results of my life are of infinite moment. I am a priest of Truth. I am in her pay. I have bound myself to do all things, to venture all things, to suffer all things for her. If I should be persecuted for her sake; if I should even meet death in her service; what great thing shall I have done? What but that which I clearly ought to do?"

WORKS

BY

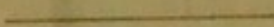
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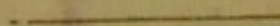


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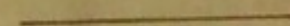
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