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ON THE

DIAGNOSIS OF RENAL FROM OVARIAN CYSTS AND TUMOURS.

BY

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DIAGNOSIS OF RENAL FROM OVARIAN CYSTS AND TUMOURS.

During the few years which have passed since the revival of Ovariotomy in England, great attention has been paid to the diagnosis of abdominal tumours; and a knowledge of their distinctive characters is becoming so general, that mistakes which were formerly not uncommon are now comparatively rare. The diagnosis of ovarian tumours from pregnancy—from fibroid or fibro-cystic tumours of the uterus—ascites—tubercular or cancerous affections of the peritoneum—other forms of intra-abdominal cancer—hydatid cysts in the liver—iliac or pelvic abscess—is made repeatedly, in hospital and private practice, with a readiness and certainty which render a mistake quite an exception in a long series of accurate opinions. But exceptions still occur; and men of great experience must occasionally admit that an exact diagnosis is impossible. In other cases, it is only after an exploratory or incomplete operation, or after the death of the patient, that a mistake is discovered, and the means of avoiding it for the future are learned. Such a case has recently occurred in my own practice—a cyst, believed to be ovarian, proving to be a cystic degeneration of the kidney; and I avail myself of the earliest opportunity of bringing this case before the profession, with a few remarks on other cases in which I have known renal to be taken for ovarian disease.

The first case of the kind which came under my care was one of

SOFT CANCER OF THE RIGHT KIDNEY

in a girl only four years old. She was sent up from the country to me, in 1862, supposed to be suffering from ovarian disease. Her appearance is very well shown in the annexed woodcut, copied from a photograph, taken by Dr. Wright while she was in the Samaritan Hospital.

The diagnosis in this case was made without much difficulty, although the urine was quite normal. The growth was extremely rapid; hardly six months from its commencement to its fatal termination—when the diseased mass weighed between sixteen and seventeen pounds. The tumour occupied the whole of the right side of the abdomen, bulging backwards in the right loin. It was uniformly elastic, but not fluctuant. The intestines were pushed downwards, and to the left side. The rapid growth, and the absence of fluctuation, were, of course, strongly against the opinion that the tumour was ovarian; while the rarity of ovarian disease in young children, and the comparative frequency of renal encephaloid led to a diagnosis which was confirmed by a puncture with a fine exploring needle. A few drops of reddish serum were obtained containing nucleated cells of most varied size and shape. I sent the child home, with a note to Dr. Williamson of Nantwich, expressing my opinion that the tumour was a mass of soft cancer, and that the right kidney was the most probable seat of the disease. This proved to be correct. Dr. Williamson sent me the specimen, and I exhibited it at the Pathological Society, in December, 1862. The whole kidney was infiltrated with encephaloid. Although so enormously enlarged, the shape of a normal kidney was distinctly

preserved. Its surface was soft and elastic, in some spots giving a sense of deep-seated fluctuation; but no cyst was found, nor were there any marks of suppuration or hemorrhage. Coils of small intestine adhered to its inner and under surface. The ureter was completely occluded by the pressure of the tumour. The left kidney was quite healthy. Thus the normal condition of the urine was explained. The diseased kidney added nothing to the contents of the bladder, and the healthy kidney supplied only normal urine.

The following remarks on this point by Dr. Roberts, of Manchester (*Urinary and Renal Diseases*, p. 444), are well worthy of serious consideration. He says:—"The presence of cancer cells in the urine is a sign which usually figures prominently in the catalogue of symptoms of renal cancer, but its value is very doubtful. In all the later cases, especially when there was hematuria, the urine was carefully examined for cancer cells, but without success. Rosenstein mentions a case in which a cancerous villus was actually found projecting into the ureter, yet no cancer cells could be detected in the urine during life. It is by no means an easy matter to identify cancer cells in the urine, in consequence of their similarity to the transitional epithelium of the pelvis and ureter. . . . In two examples of renal cancer, with hematuria, which I have had an opportunity of observing, repeated and careful examination of the urine failed to discover the presence of cancer cells. Mr. Moore (*Med. Chir. Trans.*, xxxv., 466) believes that he succeeded in identifying cancer cells in the urine drawn after death from the bladder of a man in whose kidneys cancerous nodules were found; but his description rather accords with the appearance of the epithelial cells which are always freely detached from the vesical mucous membrane after death."

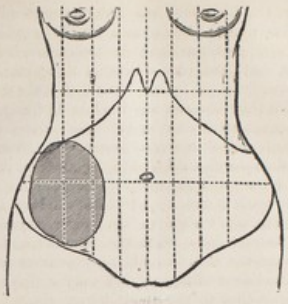
Whether renal cancer be observed in children or in adults—whether it be or be not accompanied by hematuria, or by the presence in the urine of albumen, or of epithelial cells from the ureter and pelvis of the kidney—whether the progress of the disease be slow or rapid—whether there may be much, little, or no pain, or emaciation, or gastric symptoms—or great or little effect upon the general health—the abdominal tumour is the most prominent characteristic of the disease. As Bright observed (*Abdominal Tumours*—Sydenham Society's Edit., p. 199):—"The enlargement shows itself much more towards the anterior part of the abdomen than towards the loins." It is, however, more or

less confined to one side of the abdomen and to the corresponding lumbar region, whence, as a rule it is immovable—and equally, as a rule, some portion of the intestines are fixed in front of it. But in one extraordinary case, an exception was found to both these rules. In the *Lancet* of March 18, 1865, a case is recorded in which an operation was commenced for the removal of a supposed tumour of the left ovary. The patient was in one of our general hospitals, and it was believed by the eminent physician-accoucheur who carefully examined her, and by the skilful surgeon who performed the operation, that "the tumour was ovarian, and that from its great mobility, and the absence of adhesions, its removal would be easy." Yet the uterus and ovaries were found to be healthy, and the tumour to be the enlarged left kidney; which, instead of being fixed, was movable—its peritoneal covering being elongated into a sort of mesentery, admitting of free movements—and instead of pushing the intestines before it, the descending colon and sigmoid flexure were behind it.

The *absence of fluctuation* is the leading sign by which cancerous or other *solid* tumours of the kidneys are distinguished from ovarian tumours; for it is extremely rare to find a large ovarian tumour in some part of which fluctuation cannot be detected. But in some forms of kidney disease fluctuation is as evident as in ovarian cysts. It was perceptible in the second of the three cases on which this paper is founded—one of

PYONEPHROSIS OF THE RIGHT KIDNEY, WITH IMPACTION OF TWO CALCULI IN THE URETER.

On the 16th of May, 1865, I was hurriedly called to see the mother of a patient upon whom I had performed ovariatomy successfully, the daughter telling me that her mother had a tumour like that which I had removed from herself. I found the patient, about fifty years of age, in excessive pain all over the abdomen, but greater on the right side and in the right loin; and I felt a hard tumour between the right false ribs and the right ilium, reaching forward to within an inch of the umbilicus, as shown in the annexed diagram. The patient was so ill that I could not get any sort of history from her. I prescribed a full opiate, and directed it to be repeated in smaller doses at intervals of an hour until the pain abated—hot poultices being also applied. On the next day she was much easier, and I gathered the following history:—



She was fifty years of age; had married when twenty-two; had borne five children. Her last child was seventeen years old. Before this last confinement her health had been very good. This labour was very protracted, the presentation having been transverse. Ever since, she had been subject at times to pain in the back and right loin. It used to come on suddenly, increase in violence, and produce shivering and nausea. After six or eight hours it would cease. Her urine at the time of the attacks was usually thick, with a yellowish sediment; at other times it was clear. For five years, such attacks recurred pretty regularly every six weeks. Then, after a more active life, they recurred more frequently, scarcely a week intervening from one to another. In 1860 the catamenia ceased, and the attacks became milder and less frequent, and she was entirely free for a year or more. In 1862 the pains suddenly recurred with more violence than ever. After great suffering for several hours, "a dozen or two of little stones, as large as a pin's head," were passed with the urine. From this time till the present attack she had been quite well. On the 8th of May, 1865, while out walking, she stumbled and fell upon her abdomen. She was lifted up, complaining of great abdominal pain. She got home, went to bed, and next day the pain was so great that she was unable to get up. During the next six days she passed a good deal of blood in the urine, and she perceived, for the first time, a tumour as large as a cricket ball in the right side of the abdomen. On the 15th, the pain, which had almost ceased, returned suddenly with

great violence, and I was sent for. She was much relieved by the opiate prescribed; and I made a more careful examination of the tumour. It could be felt as shown in the diagram, but its margins could not be made out very distinctly. They appeared to be overlapped, on the right by the cecum, and the left by small intestine. Wherever the tumour could be distinctly felt, it gave a dull note on moderately strong percussion, but a clear one on deeper pressure and sharper percussion. By pressure forwards with one hand on the right loin, while the other was on the front of the tumour, a trace of fluctuation was detected. Pain was kept in check by opiates, and on the 19th of May there was a prominent point near the middle of the tumour. Fluctuation being distinct, I inserted a very fine trochar at this point (which was midway between the umbilicus and right anterior superior spine of the ilium), and drew off between two and three pints of thin pus, by a syringe attached to the canula by an air-tight joint. The urine, before the tapping, had been clear; but the day after, it was found by Dr. De Mussy to be loaded with pus. On the 21st the late Dr. Ritchie reported that it contained a large quantity of pus altered by the action of the urine. On the 27th, notwithstanding this escape of pus through the bladder, the tumour was as large as before the tapping. I therefore tapped again, and after removing two pints of pus, left the wound unclosed. There being no discharge after two days, I inserted a laminaria tent, having re-opened the wound with the lancet.

A very free discharge went on for the next fortnight. At first it was purulent, but afterwards it consisted of clear fluid, which was found to contain urea by Dr. Leared. The pain ceased, and the general health rapidly improved. The urine became clear and free from pus. On the night of the 17th of June some abdominal pain came on, but soon subsided, and the discharge from the opening suddenly ceased. Urine was passed with smarting, and was again found to contain pus, mingled with a little blood. Early in the morning of the 20th of June great desire was felt to pass water. After much difficulty and pain, a calculus of uric acid and urate of ammonia, as large as a broad bean, and much of the same shape, was passed, and was soon followed by a second, of similar dimensions. Relief was immediate. On the 25th a boil was felt just at the seat of the former punctures. On the 27th it burst, discharging about two ounces of grumous matter. The patient now felt so well that she was able to walk about and enjoy herself in the country. On the 1st of July there was still a little discharge, perhaps one ounce in twenty-four hours. The abdomen was everywhere clear on percussion; but on deep pressure a hard painless tumour, as large as an orange, was to be felt in the right loin. After a few weeks this could no longer be felt, and the patient has since remained perfectly well. I heard of her in December, 1866, as being in better health than she had been for years.

This case is in many respects very instructive. The patient probably had a tendency to deposit uric acid before her last labour. The effects of that protracted labour perhaps led to the train of symptoms which ended, for a time, in the passage of numerous small calculi. Then, in 1863 or 1864, two renal calculi began to form, and set up chronic pyelitis. The fall in 1865 dislodged the calculi, and they blocked up the ureter. The pus and urine accumulated behind the calculi, and distended the pelvis of the kidney into the cavity from which I removed the large quantity of pus at the first tapping; and it was not till the calculi passed on into the bladder and left the ureter free that the formation of pus ceased and the artificial opening closed.

I have twice opened peri-renal abscesses in the loin, and in one case removed a small renal calculus through the opening. But the case just related is the only one in which I have punctured the kidney through the abdominal wall. It was clearly a hazardous proceeding, but the danger of rupture of the rapidly increasing sac into the peritoneal cavity appeared to be so great and the suffering was so excessive, that tapping appeared to be ss dangerous than expectation.

The following case of

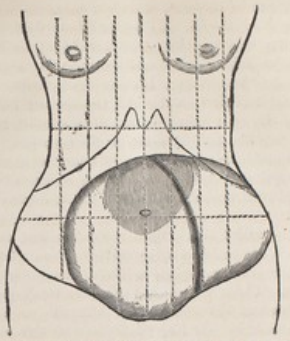
CYSTIC DEGENERATION OF THE LEFT KIDNEY

which was mistaken for a cyst of the left ovary, is not less instructive:—

On the 10th of October, 1866, a married woman, forty-three years of age, called upon me with a letter from Dr. M'Donnell, of Stoke Newington, containing a very full and accurate history of her case. She had been married 25 years, and had 9 children, the eldest being 23 and the youngest 4 years old. She had also had one premature birth, and two abortions; the last in 1861. Dr. M'Donnell wrote as follows:—"In April, 1862, she sought my advice for a hard swelling situated in the hypogastric and left iliac regions, the size of an infant's head. Examination externally, and

per vaginam, convinced me it was an ovarian tumour. Mr. Solly confirmed this opinion on the 8th of May, 1863. In 1854 and 1855 a swelling was complained of, and had been the subject of conversation between husband and wife, but no advice was asked for at the time. Its situation was much as in 1863. Aching pain was felt, from time to time, in the tumour, without causing any alarm, from the time when it was first noticed by the patient herself. It had increased so much in the early part of 1863, as to suggest the question of pregnancy. Some pain has, at times, been complained of in the lumbar region, and lower part of the abdomen, relieved by leeches, fomentations, &c. Leeches have been applied several times; the first time in November, 1863. In the Summer of 1863, the patient began to attend the Hospital for Women, in Soho-square, and became an in-patient in January, 1866, with a view to operation; but no operation was performed. She remained in hospital twelve weeks, her general health being then very bad, and she was much reduced in flesh and strength. After she left the hospital, the tumour increased in size, and extended to the epigastrium, and encroached so much on the chest as greatly to impede the breathing, and even prevent her moving about in bed. Assisted by Mr. Forman, of Stoke Newington, on the 4th of August, 1866, I withdrew, by tapping in the linea alba, two gallons of dark discoloured fluid, of the consistence of pea soup. The opening was made midway between umbilicus and pubes. The operation was well borne; the abdomen was entirely freed from fluid, the resonance being tympanitic everywhere, and no solid tumour to be felt in the pelvis. She recovered very favourably, and has been frequently out of doors since that time. The appetite, which had been entirely wanting for months previously, became, for a short time, very good. Her strength and spirits have much improved, though the cyst has re-filled."

It was rather more than two months after this tapping when I first saw the patient, and I then advised her to come into hospital before she became as much distressed as she had been before the tapping. She was admitted on the 17th of December, 1866. The tumour then occupied the position shown in the annexed diagram. At the upper and central part there was a patch of crepitus, giving the feeling of adhering omentum; and all down the front of the tumour, about an inch to the left of the umbilicus, was a cord-like ridge, which was taken by some who examined it for intestine, though it felt very like a large, long, and thick Fallopian tube. The



measurements were:—Girth at the umbilical level, 36 inches; from umbilicus to ensiform cartilage, 9 inches; to symphisis pubis 7½ inches; to right ilium, 9 inches; and to left ilium, 9½ inches. There was some mobility in the tumour, both vertically and laterally. Fluctuation was distinct across the whole tumour, in all directions. The left loin was dull on percussion, the right tympanitic. The uterus was high; the os hard and fissured, admitting the tip of the finger; the cervix short. No part of the tumour was below the brim of the pelvis. The catamenia were expected in a few days. They recurred regularly every three weeks—lasting five days. Dr. Junker examined the urine, and reported—"No albumen; deposits—urates, mucus, and epithelium." She was subject to occasional nervous attacks, during which she was partially unconscious. She said they began by palpitation. She had four while in hospital; but they were regarded as hysterical, and attracted little attention. The heart and lungs appeared to be healthy. The catamenia came on, and lasted a week, ceasing on December 29th; and on the 3rd of January, 1867, chloroform having been administered by Dr. Junker, I made an incision five inches long, extending downwards along the linea alba, from one inch below the umbilicus. On opening the peritoneum, I at once found that the hard roll, or ridge, observed running down the front of the tumour, was part of the transverse and descending colon, adhering

closely by means of the meso-colon and omentum, both to the cyst and to the abdominal wall. I separated some of these attachments, in order to tap the cyst safely. On introducing the trochar, about fifteen pints of fluid escaped. It had the appearance of pea soup. When the cyst was empty, I made some further separation of omentum and intestine; and when passing my hand round the right side of the cyst, what appeared to be another cyst gave way, and between one and two pints of clear fluid escaped. I then found that the deep attachments of the cyst were too close to admit of separation; and after tying three vessels which were bleeding in the separated omentum, and cutting off the ligatures short, I closed the wound.

The patient rallied slowly from the chloroform, and complained of pain, which was relieved by an opiate. Two other opiates were given at night—the total quantity given amounting to 50 minims of laudanum. Three hours after operation a small quantity of clear urine was drawn off by the catheter. After this not a drop of urine entered the bladder. At 10 p.m., the temperature was 98·4; pulse 116; respiration 28. The next morning the pulse was 120, and very feeble; skin dry; temperature 98; respiration 30. She was comatose, but easily roused, and answered questions sensibly. The coma gradually became more profound, and she died thirty hours after operation.

On examining the body seventeen hours after death there was no *rigor mortis*. The wound had united well. There were about four pints of blood-red serum, and a small tea-cupful of blood-clot in the peritoneal cavity. The right kidney was enlarged, and very soft; the cortical substance very friable, pale yellow in colour. The calices and pelvis were much dilated, and the thin sac formed by this dilatation had given way longitudinally. A calculus, weighing forty grains, was in one of the calices, forming a perfect cast of the calix. The bladder was contracted, and empty. The uterus and ovaries were healthy. The left kidney formed the cystic tumour, which is described as follows by Dr. Junker:—

"The left kidney formed a cyst larger than an adult head. It presented one large cavity, composed of several wide pouches, arranged vertically at one side of the principal cavity. The stroma which formed the external wall was of varying thickness; thicker and stronger at the base of the pouches; thinner and less dense around the main cyst. It had a serous external coat; at some places

hypertrophied, at others atrophied. Next a fibrous structure (fibrous capsule of the kidney). This was followed by what appears to have been the cortical substance of the kidney, and from which portions could be traced into the septa (the former columnæ Bertini) which separated the pouches (the expanded calices). The main cyst (the original pelvis) was formed by the peritoneal and fibrous capsules. The medullary portion could not be well distinguished by the naked eye from the thickened lining membrane. Thus the tumour appears to be a good specimen of genuine hydronephrosis, in which pelvis and calices expand into a large cavity, and produce, by pressure, atrophy of the original structures of the organ.

"The peritoneal coat was rough with shreds of the broken down, extensive, and intimate adhesions. Some of the neighbouring organs, or portions of them, were so intimately connected with the tumour that their separation was impossible, and portions had to be cut off in order to remove the cyst. Such connexions existed between the spleen, the head of pancreas, the great curvature of stomach, principally at the pyloric end, the duodenum, a part of the left lobe of liver, coils of small intestine, omentum and mesentery, and along the entire extent of the vertebral column, as low as the second lumbar vertebra, uninterrupted, to these bodies, and their left transverse processes, and to the right transverse processes of most of the dorsal vertebræ. No adhesion, however, existed between the tumour and the bladder, uterus and its appendages, or the rectum."

After the information obtained by the *post mortem* examination, I made further enquiry into the history of the case, especially as to the state of the urine, and I learned from Mr. Scott that while the patient was under his care in the Hospital for Women, in January, 1866, the urine contained pus and albumen, was alkaline, and of low specific gravity, about 1·005. He had "no doubt of the tumour being ovarian, but considered the case an unfavourable one for operation, believing the front of the tumour was crossed by a loop of intestine which would, in all probability, be firmly adherent throughout its course; from the certainty of considerable adhesion, in consequence of the repeated attacks of inflammation; and from the presence of pus and albumen in the urine, with a feeble circulation. The quantity of pus varied considerably during her stay in hospital; albumen was pretty constantly present." Dr. M'Donnell has ascertained that, when twelve or fourteen years old, she was struck by an iron shovel with great

violence on the abdomen, near the left ilium. "She was felled on the spot, and remained insensible for some (indefinite) time. She was ill afterwards, and attended at St. Bartholomew's and other hospitals for eighteen months as out patient. She told her husband that during all this time she 'suffered much from the urine,' but did not explain more precisely the nature of the suffering; for four or five years subsequent to the first period of eighteen months, and for a like period during the first years of married life, she suffered pain and distress, referred to this injury. Her pregnancies were always attended with distress—indeed during her whole married life, 26 years, she repeatedly suffered from deep-seated pain in the abdomen where the injury was inflicted."

It is evident from the cases just narrated that both solid and cystic tumours of the kidney may be mistaken for ovarian tumours. Solid renal tumours, whether cancerous or innocent, may resemble the malignant, pseudo-colloid, or cysto-sarcomatous tumours of the ovaries; while different varieties of ovarian cysts may be closely simulated by different forms of pyelitis and pyonephrosis, hydronephrosis, cystic degeneration, and the growth of hydatids in the kidney. Perhaps the diagnosis may be facilitated by attention to the following propositions:—

1. Although intestine is sometimes found in front of ovarian tumours, and sometimes behind movable renal tumours, these are very rare exceptions to the general rule that renal tumours press the intestines forward, and ovarian tumours press them backward. In other words, ovarian tumours are in front of the intestines, renal tumours are behind the intestines.

2. Large tumours of the right kidney usually have the ascending colon on the inner border of the tumour. Tumours of the left kidney are usually crossed from above downwards by the descending colon.

3. The discovery of intestine in front of a doubtful abdominal tumour, should lead to a careful examination of the urine. It is possible that one kidney may be diseased and the urine quite normal, because the healthy kidney alone secretes urine. But the rule is that either blood, pus, or albumen, or characteristic epithelium, are detected—or some history may be elicited of their having been detected at some former period.

4. If any doubt be entertained whether a substance felt between an abdominal tumour and the integument be or be not intestine, percussion may not solve the doubt, because the intestine may be empty and compressed. But (*a*) an intestine when rolled under

the fingers contracts into a firm, cord-like, movable roll; (*b*), the patient may be conscious of the gurgling of flatus along it, or the gurgling may be heard on auscultation; (*c*), the intestine may be distended by insufflation, after passing a long elastic tube through the rectum.

5. Ovarian and renal cysts may both be subject to great alterations in size. When the kidney is the seat of disease the fluid usually escapes by the ureter and bladder. An ovarian cyst can only empty itself through the bladder after adhesion and a fistulous opening. It may discharge through the Fallopian tube and uterus, or into an intestine, or through the coats of the vagina. In either case the physical and chemical characters of the fluid discharged will be the chief guide in diagnosis.

6. If a correct history can be obtained, it may be expected that a renal tumour has first been detected between the false ribs and ilium, and that it has extended first towards the umbilicus, next into the hypochondrium, and lastly downwards towards the groin. An ovarian tumour has, in all probability, been first noticed in one inguinal or iliac region, and has extended upwards and inwards.

7. It is only a very small ovarian tumour, with a long pedicle, which could be mistaken for a floating or movable kidney. The latter may be recognized by its characteristic shape, though it is often so misplaced that the hilus is turned upwards. The kidney is usually felt between the umbilicus and the false ribs, and may be pushed upwards and downwards, or laterally, to a varying extent, or into the lumbar region to the normal position of the kidney. When the kidney is pushed away from this position, the sound on percussion becomes tympanitic.

8. Just as renal tumours are usually associated with some evidence or history of hematuria, calculus, albuminuria, nephritic colic, or some notable change in the quantity or state of the urine, so ovarian tumours are usually associated with some change in the quantity and regularity of the discharge, or with suffering at the catamenial periods, and with some alteration in the mobility or situation of the uterus. But as in some rare cases of renal disease the urine may be normal, so in some rare cases of ovarian disease there may be nothing abnormal to be discovered in any of the pelvic viscera, nor in their functions.

By bearing these facts in mind an accurate diagnosis may be made in a very large proportion of cases. Some rare cases of exceptional difficulty may, however, be occasionally expected.

Not as any excuse for the careless and ignorant; but as some solace to others who have erred unwittingly, and as an answer to some who, having little experience of the difficulties of actual practice, are apt to speak of all mistakes as inexcusable, I quote the following remark of one of the greatest clinical teachers of any age or country—Bright:—"I have known the enlarged kidney to be mistaken for disease of the spleen—of the ovary—of the uterus—and for a tumour developed in the concave part of the liver; *nor is it, perhaps, possible, by the greatest care and the most precise knowledge*, altogether to avoid such errors."—*Op. cit.*, p. 198.

CATALOGUE OF ARTICLES

CONTAINED IN THE

MUSEUM OF MILITARY SURGERY

ATTACHED TO THE

ARMY MEDICAL SCHOOL AT NETLEY.

LONDON:
PRINTED BY GEO... E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO ... QUEEN'S MOST EXCELLENT MAJESTY.
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1867.

PREFACE.

THE Museum of Military Surgery at Netley is chiefly intended to afford the means of illustrating certain portions of the course of lectures on Military Surgery at the Army Medical School, more particularly those parts of the course which refer to the duties of medical officers on field service. Some parts of the collection, as, for example, those which illustrate the various methods employed for transporting sick and wounded in different parts of the world, or proposed for the purpose, and those again which exhibit different forms of surgical field equipment, seem capable of being rendered subservient to objects of usefulness beyond those to which they contribute at the Army Medical School. The opportunity of studying the qualities of a variety of forms of ambulance conveyances and equipment, placed side by side with each other, may be advantageous to medical officers in general, and at the same time may interest other branches of the military service, more especially those in which the duties of organizing, supplying, and conducting the hospital transport and hospital field equipment are placed, for I am not aware that any similar collection exists elsewhere in this country. The publication of a list of the contents of the Museum appears, therefore, to be desirable, for the double purpose of making generally known how far the collection is at present available for useful reference and comparison, and also of showing how far, and in what particular directions, additions are required in order to extend the advantages already presented by it.

The articles contained in the Military Surgery Museum are most conveniently arranged under three distinct groups, viz.:

1st. The weapons and various instruments by which wounds and injuries have been, or are still, inflicted in warfare.

2nd. The articles of surgical equipment which have been placed at the disposal of army surgeons in the field for the treatment of the wounds and injuries to which soldiers are there liable ; and,

3rd. The means adopted for removing the wounded from the place of fighting to the places arranged for their surgical treatment.

The collection does not include illustrations of the wounds and injuries themselves—these are illustrated by the preparations contained in the rich pathological collection of the Army Medical Department; neither does it comprise illustrations of those preventive means by which it is sought to preserve the health and efficiency of soldiers under the circumstances of campaigning—these, again, are to be found in the Hygienic Museum in process of formation under the direction of Professor Parkes.

The details of the plan adopted for the arrangement of the several collections in the Museum do not need any lengthened description in these introductory remarks; the general principles on which it has been based may be seen at a glance, by reference to the analytical index which follows. The classification which will be there found was determined upon, not only because it appeared to be the best in regard to a systematic and orderly disposal of the articles at present in the Museum, but also because it equally afforded a convenient method for readily distributing in their proper places any additions which may be hereafter contributed to it. The three leading groups into which the collection has been divided have been already mentioned in a preceding paragraph. In arranging the articles contained in each group a chronological and developmental system has been followed, so far as the contents of the Museum have admitted of this being done. The brief description attached to each separate article enumerated in the catalogue will show that the list in which it is placed commences with the most primitive illustrations of the series; and that, as the numbers advance, the specimens attached to those numbers show also an advance in progress towards perfection of construction, or of other qualities, so far as perfection in these has been arrived at up to the present time. Thus, taking the "Projectiles propelled by mechanical means" for an example, the series commences with bows and arrows,

beginning with the most primitive forms of these weapons; arrows first armed with points of hard wood, then with bone, then with metallic points, these points being first of the rudest manufacture, then gradually improving in temper of metal, in the forms calculated for inflicting injury, and in other qualities; the projectiles at the same time exhibiting other improvements in their general construction, so as to secure for them greater accuracy of flight and power of penetration. These are followed by the arms and projectiles depending for their action upon the explosion of gunpowder, the same system being adopted in cataloguing the collection so far as it goes; the matchlock and flintlock weapons preceding the percussion musket; the smooth-bore weapons preceding the rifled weapons, and so on. Such a series of the variously constructed weapons by which wounds have been inflicted is calculated to supply interesting, and often useful, illustrations to the writings of the successive generations of surgeons who have left records of the surgery of the periods to which the weapons so classified have severally belonged.

A few words are necessary in reference to the sources from which the several articles contained in the Museum have been acquired. These are fourfold: viz., firstly, the Museum of Military Surgery which was formed at Dublin under the direction of Professor Tufnell, formerly the Regius Professor of Military Surgery in Ireland; secondly, a miscellaneous collection of objects of interest attached to the Pathological and Natural History collections of the Army Medical Department which were formerly at Fort Pitt; thirdly, grants from the War Department, either of articles or of money for purchase of articles; and, fourthly, private donations. Mr. Tufnell's collection was formed to illustrate the course of lectures on military surgery which that gentleman commenced to give in the year 1846, but was largely developed after the outbreak of the war with Russia in 1854, at which time the Chair of Military Surgery at Dublin was endowed with an annual sum granted by Parliament at the recommendation of the Government. This grant ceased on the 30th of June 1860, and the Military Surgery Museum was then transferred to Chatham, where it arrived shortly before the opening of the Army Medical School in October of the same year. A room in the new buildings erected for the school was allotted for its reception, and there the collection remained until the removal of the establishment to Netley

in 1863. At the time the Museum of Military Surgery reached Chatham there existed, as already mentioned, an unarranged collection of miscellaneous objects of general interest in the same building as the Pathological Museum and Museum of Natural History. Some of the articles in this collection, chiefly examples of weapons of savage warfare, were transferred to the Military Surgery Museum. Further additions have been made, as already mentioned, by grants from the Ministry of War. From this source have been obtained some of the examples of field equipment of the present authorized patterns, as well as models of the carts designed for its conveyance. Other specimens have been obtained by purchase out of the annual grant which is obtained from the War Department to meet the current contingent expenses of the school. Some articles of interest have also been kindly presented to the Museum by medical officers and others interested in improving the usefulness of the collection. Care has been taken in compiling the catalogue to indicate in every instance from which of the four sources just named the several articles comprised in the collection have been obtained, and to mention the name of the donor in every instance of a gift, when the donor's name has been attached to the specimen or could be otherwise ascertained.

An inspection of the list of contents of the Museum will show that the collection is still in an incomplete state, so much so, that some parts, which it is very desirable should be fully illustrated, can only be regarded as the nuclei of what they may be hoped to expand into in due time. The forms of field surgical equipment and articles of all kinds appertaining to the requirements and practice of surgery in the field, employed in other countries; patterns and models of field conveyances for sick and wounded in foreign armies; the projectiles of other nations, which, in case of hostilities, might be employed against our own troops; these are hardly at all represented at present in the Museum, and would all be valuable acquisitions. Other desiderata will suggest themselves on an examination of the articles enumerated in the subjoined lists. It is hoped that a desire to increase the usefulness of the collection may not be wanting among those officers by whom this catalogue is likely to be seen, and that through their means, as opportunities occur, the wants which at present exist may hereafter be supplied. The plan of leaving occasional intervals in the numbers between the termination of one group of

articles and the commencement of another group, as well as in other parts of the catalogue, and not numbering the articles in one continuously successive order, has been adopted for the purpose of leaving spaces for the insertion of descriptions of any fresh contributions that may arrive, and thus of keeping the catalogue available for years to come without interfering with its unity by the addition of appendices.

Lastly, I have to express my acknowledgments to Mr. Otto Striedinger, Secretary to the Army Medical School, for the valuable assistance which he has given me in the arrangement of the articles described in the catalogue.

THOMAS LONGMORE,
Deputy Inspector General,
Professor of Military Surgery.

Army Medical School,
Netley, November 1866.

ANALYTICAL INDEX

TO THE

MUSEUM OF MILITARY SURGERY.

A. Arms and Weapons.

CLASSIFIED CONTENTS

OF THE

MUSEUM OF MILITARY SURGERY.

A.—ARMS AND WEAPONS.

I.—FOR CLOSE COMBAT.

a. BLUNT WEAPONS.

CLUBS.

1. Plain club, tapering in form: of very heavy hard wood.
* *Probably African.—F.P.*

2. Heavy club, similar in form to No. 1, but handle covered with plaited grass, and fitted with a loop of the same material to go round the wrist.
Probably African.—F.P.

3. Club, heavy; tapering; curved at the larger end and forked. Deeply roughened, and angular on one side of the upper extremity; rounded and smooth on the other side.
From New Zealand.—F.P.

4. Club, tapering in form; straight, very heavy, cleft at the larger extremity, and rounded on one side; roughened and cut to an angle on the opposite side.
Probably from New Zealand.—F.P.

5. Club, with long narrow stem; rounded head formed from the root of a tree; of very heavy wood.
From Caffraria.—F.P.
Presented by 2d Class Staff-Surgeon Sparrow.

6. Club, similar to the preceding one in shape; but with the handle

* The remarks in italics following the description of each specimen are intended to show the station whence it has been obtained, and the donor's name. The absence of any previous catalogue or available records to assist in the completion of this catalogue, must be pleaded as an excuse for many omissions that will be observed under these heads. The names of the donors of the older specimens, as well as the stations from which the gifts were received, have only been obtainable from the labels originally pasted or otherwise attached to the specimens themselves; when these have not been forthcoming the donor's name has unavoidably been omitted, and the station only suggested or named from the characteristic features of the specimen under observation. If any officers whom this catalogue may reach should be able to supply this or any other missing information, and will kindly communicate the same to the Professor of Military Surgery at the Army Medical School, steps will at once be taken to place the communication on record, so as to render it available for rectifying the omissions in any future edition of this catalogue.—T. L.

curved, and head hollowed out, as if for the reception of some heavy material to add to its weight.
From Caffraria.—F.P.
Presented by 2d Class Staff-Surgeon Sparrow.

7. Short club, with curved handle, narrow stem, and large rounded head of heavy wood.
From Caffraria.—F.P.
Presented by 2d Class Staff-Surgeon Sparrow.

8. Similar weapon, but of lighter wood, with plain handle.
From Caffraria.—F.P.
Presented by 2d Class Staff-Surgeon Sparrow.

9. Club, of heavy wood; stem narrow; rounded head.
From Caffraria.—F.P.
Presented by 2d Class Staff-Surgeon Sparrow.

10. Short club; coarsely finished.
From Eastern Africa.—F.P.

11. Short club of heavy wood with three facets on its knob.
From the East Coast of Africa.—F.P.

12 *a–i.* A series of nine club-sticks, similar to the clubs numbered 9, 10, and 11; heads rounded but small; stems plain or slightly ornamented; varying in size, weight, and length of stem; length 3 to 6 feet.
From Caffraria and Southern and South Eastern Africa.—F.P.
Most of these club-sticks were presented by 2d Class Staff-Surgeon Sparrow.

These club-sticks are carried, on ordinary occasions, like walking-sticks by the natives of Southern Africa, but are used on occasion as weapons in fighting.

OTHER WEAPONS, OR RUDE IMPLEMENTS USED IN THE PROPULSION OF WEAPONS.

21 *a–c.* Three woomrahs, each about 2 feet long and 5 inches wide at its broadest part in the middle. Workmanship very rude. Blade flat and thin with a projecting knob left at one end.
From Australia.—F.P.

Used by the natives of Australia in the propulsion of their spears. The foot of the spear is fitted under the knob of the woomrah, and both spear and woomrah are raised over the right shoulder. A vibrating motion is given to the woomrah which imparts itself to the spear; the spear is then thrown, but the woomrah remains held in the hand between two fingers.

22 *a–d.* Four implements or weapons longer and narrower than the woomrahs just described, measuring each 3 feet by 4 inches; the blade is thin, and furnished with a rude handle; the whole somewhat resembling a roughly cut wooden sword.
From New Holland.—F.P.
Presented by Drs. Muir and Davis, 39th Regiment.

23 *a–c.* Three implements or weapons, very similar in shape to the four preceding, but thicker and heavier.
From New Holland.—F.P.
Presented by Drs. Muir and Davis, 39th Regiment.

b. CUTTING WEAPONS OF UNCIVILIZED NATIONS, BATTLE-AXES, STONE IMPLEMENTS, ETC.

41. Ancient stone weapon of the South American Indians.
From Essequibo.—F.P.

42. Ancient cut stone implement.
Probably North American.—F.P.

43. Ancient cut stone implement, highly polished. Fine-grained marble of a green hue.—*F.P.*

44. Ancient American Indian axe.
From Potazwauxx Village, Drummond Island.—F.P.
Presented by Insp.-General Dr. Forbes.

45. Ancient stone axe.
From South America.—F.P.

46. Flint axe, found when digging a 4-foot drain in the parish of Brenchley, Kent, in 1857.—*F.P.*
Presented by J. H. J. Hay Buxton, Chief Constable.

48. A well-made Patoo-patoo or Mery, for close combat; carved head of greenstone, with leather thong to fit on the wrist.
From New Zealand.—F.P.
Presented by Dr. F. McCrae.

49. Adze of heavy green-stone.
From New Zealand.
Presented by Dr. F. McCrae.

50 *a–h.* Ancient cut stone implements and weapons of various shapes and sizes.
Found in Canada.—F.P.
Presented by Staff Assistant-Surgeon Bawtree.

61. Ancient Caledonian battle-axe, made of siliceous iron.
From Scotland.—F.P.
Presented by Staff-Surgeon McLean.

62. A similar stone weapon to the preceding one.
From Scotland.—F.P.
Presented by Staff-Surgeon McLean.

64. Ancient implement of copper.
Found in Canada.—F.P.
Presented by Staff Assistant-Surgeon Bawtree.

65. Adze. Handle of light wood, highly carved, terminating in a head, into which is received a cut stone axe. The head is strongly secured in its place by a plaited grass binding; the handle is square and turreted.
From Otaheite.—F.P.

Capable of being used as a weapon of offence, and also for the ordinary purposes of an adze.

c. SHARP-EDGED WEAPONS.

(1.) *Weapons for Stabbing alone.*

66. Plain straight two-edged dagger, with the handle made of bone and wood.
From the Cape of Good Hope.—F.P.
Presented by Dr. Andrew Smith, Surgeon to the Forces.

67*a–b*. Two horn daggers, sharp pointed, with curved, ornamented handles; each dagger consists of one single piece of tough horn of dark colour, apparently buffalo horn.
From Caffraria.—F.P.
Presented by Dr. Andrew Smith, Surgeon to the Forces.

68. Double dagger made by two twisted antelope horns, joined together by iron bands, so as to make a handle in the centre. The extremity of each horn is tipped with iron, arrow shaped, and pointed for stabbing.
The handle is very ingeniously contrived in this weapon, an oval space being left for the fingers by the natural curves of the two horns.—*F.P.*

69. Short curved dagger of highly tempered steel, with ornamented ivory handle. Point sharp, extremity rather rounded. The scabbard is made of wood and covered with cotton cloth dyed red.—*F.P.*
Evidently of Eastern manufacture.

70. Short dagger. Blade wavy and formed of elaborately twisted steel. The handle is richly carved and composed of ivory and gold. The scabbard is made of copper, lined with wood.—*F.P.*
Evidently of Eastern manufacture.

71. Short one-edged knife, with rudely ornamented carved wooden handle.
In use by the Totonatoma Indians of North America.—F.P.
Presented by A. S. Anderson, 82nd Regiment.
Appears to be more for domestic use than a weapon in warfare.

N.B.—For *Bayonets* see under III. *b*. "Fire Arms."

(2.) *Weapons for Cutting, or for Cutting and Thrusting combined.*

80. Short sword, or Ghoorka knife; much curved, one-edged, sharp-pointed, blade broadening towards the point, carved wooden handle. This weapon is designed for stabbing and ripping purposes. The scabbard is made of wood, and covered with leather.
India.—F.P.

81. Sardinian sword, plain, slightly curved, sharply pointed at extremity, brass handle. Waist belt and scabbard complete.
Probably obtained in the Crimea.—D.M.

82. Russian pioneer's sword. Blade very broad and strong, doubly serrated at the back so as to be used as a saw, point curved and sharp. —*D.M.*

83. Short Russian sword; blade sharp pointed, slightly curved, and broader towards the pointed end. The handle is made of wood, partly covered with leather.—*D.M.*

84. Sword bayonet; in present use by gunners of the Royal Artillery.—*W.O.*

85. One pair of fencing foils.

91. Long, straight, one-edged native trooper's sword; pointed at the extremity, with iron handle.
From India.—F.P.
Presented by Assistant-Surgeon Dr. Mapleton, 40th Regiment.

92. Long curved broadsword, with iron handle, cutting edge, and sharp point; scabbard made of wood, covered with leather.
Probably a Sikh sword.—F.P.

93. Long, straight, two-edged Scottish Highland sword (claymore); open iron handle, scabbard of plain leather. Found near the field of Culloden.
Three grooves exist in the middle of the blade on both sides near its handle. The middle groove bears the name of "*Andrea Ferrara*;" on the other two grooves are three Ws, or Ms, on each.
Presented by Duncan Forbes, Esq., of Culloden.—F.P.

94. Cavalry sword (old pattern).—*W.O.*

95. Cavalry sword (pattern 1853).—*W.O.*

96. Staff sergeant's sword (Infantry).—*W.O.*

97*a*. Drummer's sword (Infantry).—*W.O.*

97*b*. Drummer's sword, with scabbard (Infantry).—*W.O.*

100. Coastguard sword.—*W.O.*

101. Japanese sword; the blade having an edge of very hard steel welded to it.
Purchased in 1862, at Yeddo, by Mr. Birch, now an assistant-surgeon in H.M. Indian Forces, and presented by him, in 1866, to the Military Surgery Museum.

(3.) *Iron Battle-axes, Halberds, &c.*

121. Caffre battle-axe, with iron blade. The blade is directly inserted into the rounded head of the stem or handle. Stem straight.—*F.P.*

122. Caffre battle-axe, with iron crescent-shaped blade. The blade inserted into the rounded head of the stem by an intervening neck. Stem straight—*F.P.*

123. Caffre battle-axe, similar to the preceding, but with the stem curved.—*F.P.*

124. Caffre battle-axe, similar to the preceding, but more highly finished. —*F.P.*

125. Sergeant's halberd. British Service. Date unknown.—*F.P.*

H.—Weapons fit to be used both for Close Quarters and at Short Distances, but propelled or moved by Hand only.

a. Boomerangs.

This class is not represented, at present, by any specimens.

b. Darts, Spears, Lances, etc.

(1.) *With non-metallic points.*

151 *a–e.* Five assegais of plain hard wood, simply pointed at both ends. Length 9 feet.
From the Cape of Good Hope.—F.P.

152. Weapon of hard wood, terminating at one end in a blade formed of the same piece as the handle. The blade is lance-shaped, with an elevated rib on both sides. Whole length 4 feet.
From the Cape of Good Hope.—F.P.

153 *a–d.* Four assegais of plain wood; each being pointed at one end, and furnished with a handle, covered with skin at the other end. Length of each about 8 feet.
From South Africa.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

154 *a–m.* Twelve assegais, with plain thin shafts, and separate barbs of hard wood. The barbs are fixed into the shaft-ends by cord and cement. Length of each about 9½ feet.
From the Cape of Good Hope.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

155. Assegai of hard wood; carved at the upper end, for nearly 2 feet in length, into eight ridges, four of which are deeply toothed. The carved portion terminates by four large barbs at the posterior end of the ridges, and by a pointed conical extremity in front. The assegai gradually tapers off behind, and is not furnished with a handle. Whole length 6 feet.
From the Cape of Good Hope.—F.P.
Presented by S. A. S. James H. Frazer.

156. Assegai of bamboo, with a head of hard wood, barbed and serrated. The head is fixed to the shaft by skin lacing. Length 8¼ feet.
From the Cape of Good Hope.—F.P.
Presented by S. A. S. James H. Frazer.

157. Assegai, shaft of bamboo, very similar to the preceding, but furnished with three serrated heads of hard wood, each 2 feet in length, firmly laced to the shaft. Length of the whole assegai 9 feet.
From the Cape of Good Hope.—F.P.
Presented by S. A. S. James H. Frazer.

158. Assegai of hard and very brittle wood; fitted with nine sets of barbs, arranged in circles around the head of the weapon, and diminishing in size from the posterior circle towards the circle in front. The weapon terminates in a fine conical point. The jagged projections on the head are so carved as to be liable to be easily broken off and to be left behind on withdrawing the weapon from any substance into which it may have been thrust. Length 10 feet.
From South Africa.—F.P.

159. Assegai of hard wood, terminating in four sharp-pointed, diverging, heads, each 2½ feet in length. These heads are fastened to the stem by a highly worked binding of twisted grass cord. Length of shaft 6½ feet, of the whole spear 9 feet.
From South Africa.—F.P.

160 *a–e.* Five assegais; shafts consisting of light reeds, with points of hard wood, varying in length from 1 foot to 2 feet each, inserted into them, and securely fastened by hide-lacing. The length of these assegais varies from 5 to 8 feet.
From South Africa.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

171. Dart of very light wood or reed, with a jagged pointed piece of hard wood, 18 inches long, inserted into the shaft, and neatly fastened by a binding of thin cord and cement. The end is doubly feathered like an arrow. Length from end to end 6 feet.
British Guiana.—D.M.

(2.) *With Iron Heads.*

(With the exception of South Africa, and a few specimens from China, very few nations are represented in this class; and contributions of Indian, Tartar, and other Eastern as well as European lances and spears would be welcome additions to the collection.)

201. Spear or assegai; the shaft consists of reed, and is topped by a double-edged pointed iron blade, with a flat surface. The blade is about 6 inches long by 1½ inches wide, and inserted by a long neck into the shaft. The blade and shaft are held firmly together by means of a tight lacing of leather. Neck of blade not visible. Total length 5 feet.
From the Cape of Good Hope.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

202. Spear or assegai, similar to the preceding, excepting that 3 inches of the neck are exposed, and that the blade has a slightly-raised rib down the centre of each surface. Length 7 feet.
From the Cape of Good Hope.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

203 *a–b.* Two spears or assegais, with thick reed shafts, into which the blades are inserted, and spirally bound by broad strips of wrought iron. The blades have central ribs down each surface, dividing it into two halves. Each half is convex on one side and concave on the opposite side. Length of each spear 5 feet.
From the Cape of Good Hope.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

204 *a–f.* Six spears or assegais; blades varying from 6 to 18 inches in length; shapes, and mode of fixing, as described in specimen No. 203. No necks visible. Shafts of tough but light wood. Total length varying from 5 to 6 feet.
From the Cape of Good Hope.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

205 *a–y.* Twenty-three assegais, very similar to the preceding specimens in respect to the shapes of their blades and kinds of shafts. The width and length of the blades slightly vary in the several specimens. All of them have the necks of the blades exposed, rounded, smooth, and from 2 inches to 1 foot in length. Average length of the whole assegai, blade included, from 5 to 6 feet.
From the Cape of Good Hope.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

206 *a–e.* Three assegais, similar to the preceding specimens, but with the necks longer, squarer, and finely serrated at the margins. Length 4½ to 5½ feet.
From the Cape of Good Hope.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

207. Assegai, of bright tough wood, without blade, but furnished instead with a four-edged pyramidal iron point 18 inches long. This point is fixed to the shaft in the same manner as the fixing of the blades described in the preceding specimens. Length of assegai, point included, 5½ feet.

From South Africa.—F.P.

Presented by Assistant-Surgeon Courtney, 75th Regiment.

208. Assegai, in general character similar to the foregoing specimen, but having in addition a serrated neck between the pyramidal point and the shaft. Length 4½ feet.

From South Africa.—F.P.

Presented by Assistant-Surgeon Courtney, 75th Regiment.

209. Assegai of tough, light, wood; blade barbed like an arrow-head; neck of barb smooth and 2 inches long. Length from end to end 4½ feet.

From South Africa.—F.P.

Presented by Assistant-Surgeon Courtney, 75th Regiment.

210 *a–b*. Two assegais with blades barbed similar to that of the preceding specimen, but with necks quadrangular and serrated at the edges. These serrated necks are 4 and 6 inches long respectively. Total length of weapons 5 and 6 feet.

From South Africa.—F.P.

Presented by Assistant-Surgeon Courtney, 75th Regiment.

211. Assegai. The neck is single and serrated like the last-named for about one-half of its length, but is then separated into two lateral halves, leaving an open space between them of half an inch in width. These parts again meet and converge into a single neck close to the spot of insertion into the shaft. Length from end to end 5½ feet.—*F.P.*

221 *a–b*. Two spears. Shafts made of thick bamboo. The heads are flattened and closely resemble the blades of ordinary knives. Each head is 15 inches long by 1¼ inch broad, with one cutting edge, and is pointed at the extremity. Leather lacing is bound tightly round the top of the shaft where the blade is inserted. Total length 5½ feet.

Presented by Inspector-General Dr. Muir, C.B. (1863.)

222. Assegai or spear. Shaft thin, made of hard tough wood, head heart-shaped, tapering to a fine point with a thick prominently raised rib down the centre of both surfaces. Neck 8 inches long, cylindrical, and hollow. In this weapon the neck of the blade is not inserted into the shaft, as in the preceding specimens, but the shaft is itself inserted into the neck. The foot of the shaft is conical and braced with a strip of iron which is bound spirally round it. This foot serves to balance the weapon when about to be thrown and to keep it level during its flight. Length 6 feet.—*F.P.*

223 *a–d*. Four spears, shafts stronger and heavier than that of the preceding specimen, blades heart-shaped and pointed, thicker in the centres on both surfaces, and ground flatly towards the edges. The necks, which evidently were flat originally, are bent round and fitted into a depression in the top of the shaft so as to embrace it firmly without completely touching each other's margins. A flat piece of iron of fish-tail shape, with a sharp broad horizontal blade, is fixed to the foot of each weapon in the same manner as the spear-head itself. Whole length of each spear 6 feet.—*F.P.*

224. Spear, similar in general characters to the specimens above described. The blade is however much larger and stronger. The neck is completely cylindrical and has the head of the shaft inserted into it; it is also furnished with two ornamental ferrules, one of which has the

appearance of being made of brass. It is fitted with heavy iron foot-pieces, the shape and mode of fixing of which are exactly like those of the four preceding specimens; length 6 feet.—*F.P.*

225. Spear, with shaft of strong bamboo, and head made of an iron bar eighteen inches long, marked by four distinct divisions. The upper fourth of the head is conically pointed; the remainder of the bar is octagonal. The second and fourth divisions of the head are each furnished with two rows of long, jagged, barb-like projections from their sides, and alongside of them are two other rows of similar but shorter barbs. The neck seems to be inserted into the cane, but the place of insertion is hid by an ornamental leather covering, terminating in a loose fringe of strips of the same material. The foot of the cane is inserted into a fish-tail shaped piece of iron. Length 6½ feet.—*F.P.*

226. Lance, with long, thin, tapering blade, sharp at one edge. Neck cylindrical, strong and hollow. A thick round shaft of planed dark wood is inserted into the neck of the blade. Length 7 feet.

From China.

Presented by Inspector General Dr. Muir, C.B.

227*a*. Spear, ending in a short, conical, plain iron head; the lower end or base of the head is hollow for the reception of the shaft, which is made of heavy smooth wood, painted and ornamented by intricate patterns in oil colours. The foot end of the weapon is provided with a heavy iron handle. Length 7 feet.—*F.P.*

227 *b*. Spear, similar to the above, with the exception that the shaft is painted an uniform red colour and that the handle is all made of wood and ornamented with patterns in red and yellow colours. Length 7 feet. —*F.P.*

227 *c*. Spear, similar to the preceding one. Head longer and ending in a pyramidal point. Shaft painted, and ornamented by a device of intricate pattern. Handle plain. Total length 8½ feet.—*F.P.*

241 *a*. British lance of the 9th Lancers. Pattern. Length 9 feet.—*W.O.*

241 *b*. Regulation lance of the 5th Lancers. Pattern (1856); length, 9 feet.—*W.O.*

III.—Projectiles Propelled by Mechanical Means.

a. Bows and Arrows.

aa. Arrows.

(1.) *Non-metallic points.*

301 *a–c*. Three reed arrows, tipped with pointed pieces of plain hard wood, which vary in length from 9 to 18 inches. The wood is inserted into the reed, and fastened by cement. The total length of these arrows varies from 2 to 3 feet.

From Southern Africa.—F.P.

302 *a–c*. Three arrows similar to the foregoing; but fastened by fine grass lacing.

From Southern Africa.—F.P.

303 *a–c*. Three arrow tips, like those above described, detached from their shafts.

From Southern Africa.—F.P.

304 *a–b*. Two arrow tips, of the same class as the foregoing; but each having its point formed of the serrated spine, or dart, of the Sting Ray fish.

From Southern Africa.—F.P.

305. Arrow of light reed tipped with hard wood, pointed and barbed. The tip is inserted into the reed, and fastened with grass or bark binding; not feathered; whole length 3½ feet.

From the West Coast of Africa—F.P.

306 *a–g*. Seven arrows, of reed, with tips of pointed and barbed wood; fastened by cord binding at the point of insertion. The tail-ends bear traces of having had four or more feathers each, fastened by string; length of each arrow nearly 4 feet.

From the West Coast of Africa.—F.P.

307 *a–z*. Twenty-five arrows, of reed, tipped with short pieces of sharp, conically pointed, hard bone. They are bound round at the points of insertion of the bone tips, and at the tail-ends with a kind of catgut lacing; not feathered. For about an inch from the point the bone head of each arrow is covered with a dark gum. Length, 1 foot 8 inches each.

From the Cape of Good Hope.—F.P.

308. A bundle of very short and light reed arrows, tipped with pieces of bone; the bone points bear marks of having been covered with gum. Average length of the arrows 18 inches.

From South Western Africa.—F.P.

309. Arrow. The shaft is formed of wood; the head consists of a roughly worked, triangular, piece of bone, one of the angles of which has been cut so as to form a barb. Two feathers are inserted into the tail-end; the upper ends of the feathers are stuck into a slit in the shaft; the lower ends are held to the shaft by means of skin lacing; the rest of the wings are left free. Total length 2 feet 4 inches.

South Coast of Africa.—F.P.

310 *a–b*. Two reed arrows, with elaborately wrought tips, consisting partly of wood and partly of bone. The points are made of wood; no feathers. Length, 3 feet.

Cape of Good Hope.—F.P.

311. Unusually long arrow; the shaft consists of a light, unjointed reed, into which a tip, 20 inches long, of hard and tough wood is inserted and fixed by string lacing; the uppermost point of this wooden tip is split and tied again with string, as if for the reception of an iron or other point; in its general character this arrow is similar to those described under 306; at the tail-end it has two feathers, neatly bound to the shaft by string. Total length 6 feet.

Probably from the West Coast of Africa.—D.M.

312. Arrow 5 feet long, but apparently broken short at its foot end: in general construction exactly like No. 311; but the wooden tip is armed with a single-barbed hook at the extreme end and a spur of iron, forming a second barb, about 3 inches from the top; a string lacing secures both the hook and the spur to the wooden tip.

Probably from the West Coast of Africa.—F.P.

(2.) *Arrows with Metallic Points.*

313 *a–c*. Three reed arrows, with bone heads, somewhat similar to the arrows numbered 307; the top of each bone head is partially divided by a fine slit, into which a sharp triangular iron point is inserted; the point

is held in its place by lacing; the end of the bone for about an inch behind the iron point is thickly plastered with some dark gumlike substance.

From Southern Africa.—F.P.

314. Arrow similar to the foregoing, but of larger dimensions.—*F.P.*

316 *a–b*. Two arrows, or darts; the shafts, heavier than the preceding specimens, are of wood, and the iron heads are more elliptical in form. They are barbed and thickly plastered with gumlike substance, like the preceding specimens.

Evidently African.—F.P.

319. Reed arrow; with a roughly wrought, quadrangular, iron tip, nearly 3 inches in length, with a single barb on one side.—*F.P.*

321 *a–n*. Twelve light reed arrows, each 2 feet in length, and having a delicate, doubly barbed iron head fitted into the reed by a long neck. At the point of insertion the reed is strongly bound round by grass-cord, strengthened with cement. The blade of the head is divided into two halves by a raised rib, and each half is convex on one side and concave on the other.*

From West Coast of Africa.—D.M.

325 *a–b*. Two arrows, each 2½ feet in length, with iron tips sharp-pointed, not barbed, well finished, inserted into their shafts, and bound by cord; coloured green and red; at the tail-end of each arrow there are five feathers, strongly and neatly fixed by a circular binding of fine cord.

East Indies.—F.P.

326 *a–b*. Two arrows, somewhat similar to the preceding, but rather longer and with their tips triangular in shape, flat and sharp-pointed at their extremities. One angle at the base of each iron tip is prolonged to fit into the shaft, the other angle is left free and forms a barb. Tail-end five-feathered.

East Indies.—F.P.

327 *a–c*. Three arrows, each nearly 3 feet in length, similar in general form to the foregoing, but less highly finished. They are four-feathered, and the heads are lance-shaped, barbed, and inserted by a central neck.

From East India.— F.P.

328 *a–n*. Thirteen arrows, each more than 2 feet in length, with reed shafts, and heads spear-shaped. The end of the shaft into which the neck of the tip is inserted has been split for its reception, and afterwards tightly bound round by some kind of catgut. The arrows are feathered, sometimes with three, sometimes with four feathers, the feathers being fixed in grooves without any cord-fastening. The tail-end of each weapon is deeply indented. Above the feathers the shafts are ornamented with painted bands of yellow, red, white, and black colours.

Probably from Eastern India.—F.P.

329 *a–d*.—Four arrows, each 2½ feet in length, with reed shafts, short, quadrangular, pyramidal tips, and four-feathered. The feathers are not inserted into grooves, but are simply stuck on the shaft with glue or paint. The end of the shaft, where the tip is inserted,

* On comparison, all the iron spear heads from the West Coast and from part of the South of Africa will be found to be fashioned in exactly the same manner as these arrows, viz., with one convex and one concave half on each surface.

is secured by cord, painted green. About 7 inches of the tail end of each of these arrows is ornamented by bands of various colours and patterns.
From the East Indies.—F.P.
Presented by Dr. Burke, Insp.-General of Hospitals.

330 *a–c*. Three arrows similar in general character to the preceding, but with flat, triangular heads.
From the East Indies.—F.P.

341.—Arrow, 2½ feet long, with reed shaft, painted black; iron tip, crescent-shaped; and four-feathered. The two points of the crescent are sharp. The crescent is inserted into the shaft by a strong neck, and this neck has been secured by a binding, which has been elaborately painted and gilded. The tail end is also painted for 7 inches.
From the East Indies.—F.P.

342 *a–z & aa–kk*.—Thirty-four arrows; each 2½ feet in length, with octangular tips three quarters of an inch in length and tapering to a fine point; four-feathered. These arrows are very carefully finished, and are highly ornamented at both ends with bands of delicate colours.
From Burmah.—F.P.
Presented by Dr. Burke, Insp.-General of Hospitals.

343 *a–c*. Three arrows, similar in some respects to the preceding, but with tips spear-shaped, elaborately worked, and secured to the shaft by metal ferrules. The tail-ends are delicately ornamented. Five-feathered.
From Burmah.—F.P.
Presented by Dr. Burke, Insp.-General of Hospitals.

346 *a–b*. Two arrows, one 2 feet the other 3 feet in length; with reed shafts, pyramidal iron heads, and three-feathered. The feathers are both glued to the shaft, and secured by cord on the upper and lower ends.
From Japan.
Presented by Staff Assistant-Surgeon Birch, H. M's. Indian Service, formerly R.N.

Both of these arrows were obtained by Mr. Birch at the action of Simonoseki, Japan, in September 1864, one of them after having wounded one of the attacking party.

351 *a–y*. Twenty four arrows, each 3¼ feet long. The shafts consist of wood; the iron heads are somewhat oval in shape, flat on their surfaces, have rather sharp edges, and are not barbed; they are each inserted by a projecting neck into the corresponding end of the shaft. They are four-feathered; the feathers, each of which is one foot long, are cut elliptically.
From China.
Presented by Dr. Muir, C.B., Insp.-General of Hospitals (1862).

360. A collection of 15 arrow heads, showing various modification in shape and number of the terminal points and barbs.
From the East Indies.—D.M.

361. Arrow head, triangular and barbed, with poison attached; described to be in common use among the more uncivilized tribes of central India for shooting wild animals.
From the East Indies.
Presented by Surgeon Irwin, 1st Batt. 15th Regiment (1864).

(3.) *Blow-pipe Arrows.*

370. Three hundred and forty poisoned blow-pipe arrows. They consist simply of thinly-split pieces of bamboo pointed and dipped in a poisonous material, said to be the same as the Woorara poison.
From British Guiana.—F.P.

bb. BOWS.

400. Bow, formed simply of a rough, light, elastic stick, 4½ fee long, with a notch and leather lacing on one end.—*F.P.*

401 *a–c*. Three bows, 5 and 6 feet long, of plain bamboo. Two of them are pointed at both ends, the third is furnished with a turks-head lacing of leather to hold the bow-string in position.—*F.P.*

402. Bow made of bamboo, 6 feet long. The string is formed by a strip of bamboo, secured to the bow by a cord and leather lacing.—*F.P.*

403. Bow made of light, elastic wood, planed and furnished with a deep, narrow groove on the outer surface, apparently the natural cavity from which the pith has been removed. The bow is 5½ feet long, pointed and notched at both ends for the reception of a three-stranded, well made, bow-string.—*F.P.*

405 *a–b*.—Two bows, each 5 feet long, made of hard, elastic wood, and having a shallow, central groove cut into the outer surface, to give the bow additional elasticity. One of these bows is ornamented by carving at both ends.—*F.P.*

406 *a–b*. Two bows made of hard wood; one 3½, the other 4 feet, long; both carefully rounded. They are furnished at both ends with neat hide lacing which forms at the point intended to receive the string a projecting knob.—*F.P.*

407.—Bow 5½ feet long, elliptically planed; made from the outer portion of the stem of a palm-tree. The material is evidently the same as that of the points of the arrows numbered from 302 to 306.
Probably from South Africa—F.P.

410. Bow; highly finished; straight; 6½ feet long; elaborately painted in various patterns, the ground colours being red and yellow.
From the East Indies.—F.P.
Evidently of the same workmanship as the spears numbered 227 *a*, *b*, and *c*.

421 *a–c*. Three bows, more or less ornamented.
From Burmah.—F.P.
Presented by Dr. Burke, Insp.-General of Hospitals.

422. Bow, similar in general construction to the preceding, but larger.
From the East Indies.—F.P.
Presented by Assistant-Surgeon Laing, 86th Regiment.

423 *a–b*. Two bows; one 4½, the other 5½ feet, long; fitted with ivory shoulders.
From China.
Presented by Insp-General Dr. Muir, C.B. (1862).

425. Cross-bow; fitted with a box for the reception and consecutive discharge of nine arrows.
From China.
Presented by Insp-General Dr. Muir, C.B. (1862).

cc. ACCOUTREMENTS.

451. Quiver, of very rude construction, being formed of part of a hollowed bough of a tree, and furnished with a cap of buffalo hide, and a short strap of untanned hide.
From the West Coast of Africa.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

452. Quiver, very rudely made of a piece of tanned hide sewed together, with a cap, and strap also made of leather.
From the West Coast of Africa.—F.P.
Presented by Assistant-Surgeon Courtney, 75th Regiment.

453. Bushman's quiver, made of buffalo hide. It is generally similar to the preceding specimen, but the hair is not removed from the hide.
From South Africa.—F.P.
Presented by Assistant-Surgeon Leslie, 45th Regiment.

454 *a–c.* Quiver; made very elaborately of ornamented and pressed leather, with long fringes; with waist belt and pouch belt. All of very neat workmanship.
From Sierra Leone.—F.P.

455. Quiver, of small size; apparently intended for very light, probably blow-pipe, arrows.
From South America (?).—*F.P.*

456 *a–c.* Two quivers and one arm shield, of very superior workmanship; made of leather and velvet, and embroidered with gold and silver thread.
From Burmah.—F.P.
Presented by Insp.-General Burke.

460. Oval shield of tanned buffalo hide, with the hair on the outer surface. Diameters 2½ feet and 4 feet respectively.
African (?)—*F.P.*

461. Circular convex shield, made of papier-mâché, japanned, and furnished with four ornamental gilt knobs, to the inner surfaces of which two arm straps are fastened.
East Indies (?)—*F.P.*

b. FIREARMS AND PROJECTILES.

(1.) SMALL ARMS.

(α) FIRELOCKS; SMOOTH-BORE AND RIFLED.

471. Ancient Turkish Pistol.
From Santa Maura.—F.P.
Presented by S. A. S. Robertson.

473. Indian pistol, with flint lock; barrel and handle inlaid with gold.
East Indian.
Presented by Assist.-Surgeon Jopp, M.D., 2nd Regiment.
Taken at the storming of Kelat, and supposed to have belonged to one of the chiefs.

475. Rifled British cavalry pistol.—*W.O.—D.M.*

491. Matchlock.
From the East Indies.—F.P.

492. Matchlock, highly ornamented.
From the East Indies.—F.P.

495. Russian musket, with ramrod and bayonet.
From the Crimea.—D.M.

497. Sardinian rifled musket, with ramrod and bayonet.
From the Crimea.—D.M.

501. Old British regulation musket, or "Brown Bess;" percussion musket, with ramrod, and bayonet.—*D.M.*

503. British regulation rifled musket; pattern of 1853; with ramrod, and bayonet.—*W.O.*

512. British short rifled musket; pattern of 1853; with ramrod, and sword bayonet.—*W.O.*

509. Rifled carbine (Lancaster's), as used by the Sappers; with ramrod, and sword bayonet.—*W.O.*

514. Rifled carbine, with ramrod, and sword bayonet; as used in the Royal Artillery.—*W.O.*

(β.) ACCOUTREMENTS FOR SMALL FIREARMS.

551 *a–b.* Two horn powder flasks.
From South Africa.—F.P.

553 *a–c.* Powder flask of buffalo horn, with two pouches.
From Burmah.—F.P.

554 *a–b.* Two powder flasks, with belts and cartridge pouches.
From Burmah.—F.P.
Presented by Insp.-General Burke.

(γ.) SMALL ARM PROJECTILES.

581. Tray, containing round balls, conical projectiles, &c., in use in the Russian army during the Crimean war.
Presented by S. A. Surg. Dr. Carte to the Dublin Museum of Military Surgery.

582 *a–b–c–d–e.* Five trays of Russian projectiles, exhibiting the different shapes assumed by them after being fired and brought into collision with hard substances. Many of these specimens were extracted from wounded soldiers in the Crimea.
Presented by S. A. Surg. Dr. Carte to the Dublin Museum of Military Surgery.

583 *a–b.* Two trays, containing (*a*) round balls, (*b*) conoidal projectiles, used in the British army during the Crimean war.—*W.O.—D.M.*

584. Two trays of British service cartridges, of the same period.—*W.O., D.M.*

585. Case of round balls and cylindro-conoidal projectiles, authorized for use, A.D. 1866, for the various descriptions of small arms in the British army.—*W.O.*

593. Collection of projectiles, cartridges, &c., for small arms, both of service patterns, and of patterns proposed, but not authorized, for use in the British army.—*W.O.*

603. Double-bladed projectile, contrived and attempted to be used by the rebels in Ireland in 1848; it consists of two straight iron blades fixed to a short central hollow stem, the latter being made to fit round the muzzle of a firelock; it was intended to be driven forward by the force of the discharged bullet.—*D.M.*

(δ.) MISCELLANEOUS ARTICLES CONNECTED WITH FIREARMS.

611. Contrivance for exhibiting the relative directions of the "motion of rotation," and of the "progressive motion" or "line of flight," in round bullets projected from smooth-bore weapons, and in cylindro-conoidal bullets projected from rifled weapons.
The round ball is shown to revolve on an axis which is always at right angles with the line of flight; while the cylindro-conoidal ball is shown to revolve on an axis which is coincident with the line of flight.
Designed and constructed by Sergeant Shortell, A.H. Corps, under the direction of Deputy Inspector-General Thos. Longmore.

(2.) CANNON AND THEIR PROJECTILES.

(α.) CANNON.

619. An ancient cannon or culverin; date uncertain; said to have been found in the bed of the river Medway.—*F.P.*

621. A Russian gunlock.
From the Crimea.—D.M.

(β.) PROJECTILES.

Solid Shot.

a. Loose Round Shot.

631 *a.* Solid iron shot for 32-pounder.
Authorized for use in the British army.—W.O.

631 *b.* Section of ditto.—*W.O.*

(*b.*) *Elongated Shot, Bolts, etc.*

641. Solid shot for 100-pounder Armstrong gun.—*W.O.*

642. Ditto for 40-pounder Armstrong gun.—*W.O.*

643. Ditto for 20-pounder Armstrong gun.—*W.O.*

(*c.*) *Combined Shot. Grapeshot, Case or Canister Shot.*

651. Grape shot for 32-pounder gun.—*W.O.*

652. Case or canister shot for ditto.—*W.O.*

661. Grape shot, altered in form by contact with other shot at the time of projection.
Picked up, after the storming of the Redan, by T. Longmore, Surgeon 19th Regiment, now Deputy Inspector-General, by whom it was presented to the Military Surgery Museum.

662. Plates of grape shot, altered in form after being fired.
Picked up, after the storming of the Redan, by T. Longmore, Surgeon 19th Regiment, now Deputy Inspector-General, by whom it was presented to the Military Surgery Museum.

665. Loose specimens of grape and case shot of various sizes.
Sent from the Crimea to the Dublin Museum of Military Surgery.

Hollow Projectiles.

(*a.*) *Round Hollow Projectiles.*

671 *a.* Common shell for 32-pounder gun.—*W.O.*
671 *b.* Section of ditto.—*W.O.*
672 *a.* Diaphragm Shrapnell shell for 32-pounder gun.—*W.O.*
672 *b.* Section of ditto.—*W.O.*
673 *a.* Naval shell, for 32-pounder gun.—*W.O.*
673 *b.* Section of ditto.—*W.O.*
675 *a.* Carcass for 32-pounder gun.—*W.O.*
675 *b.* Section of ditto.—*W.O.*
679. Hand-grenade; 6-pounder shell; sea service pattern.—*W.O.*
680 *a.* Loose 8-inch mortar shell.—*W.O.*
680 *b.* Section of ditto.—*W.O.*
683. Pieces of shells picked up in Sebastopol.—*D.M.*

(*b.*) *Elongated Hollow Projectiles.*

690. 100-pounder common Armstrong shell.—*W.O.*
691. Section of 40-pounder Armstrong common shell.—*W.O.*
692 *a.* 12-pounder Armstrong segment shell.—*W.O.*
692 *b.* Section of ditto.—*W.O.*
693. 6-pounder segment shell.—*W.O.*

(*c.*) *Rockets.*

698*a.* Twelve-pounder congreve rocket.—*W.O.*
698*b.* Section of ditto.—*W.O.*

(γ.) FUZES, ETC.

711*a.* Armstrong time fuze.—*W.O.*
711*b.* Section of ditto.—*W.O.*
712*a.* Armstrong concussion fuze.—*W.O.*

712*b*. Section of ditto.—*W.O.*

713*a*. Armstrong pillar fuze.—*W.O.*

713*b*. Section of ditto.—*W.O.*

714. Fuze adapter for Armstrong shell.—*W.O.*

715. Iron burster for 12-pounder Armstrong shell.—*W.O.*

B. SURGICAL FIELD EQUIPMENT, AND MEANS OF CONVEYING STORES AND EQUIPMENTS IN THE FIELD.

I.—Separate Appliances and Instruments.

a. TOURNIQUETS, SPLINTS, BANDAGES, ETC., FOR IMMEDIATE USE, IN THE FIELD.

801. Field tourniquets of present army patterns.
From the Army Medical Stores.
N.B.—(In the field case marked No. 851.)

802. Improved American pocket tourniquet, for use in field surgery. It is furnished with concave metal pads, projecting wings, and elastic bands for additional pressure.
The circulation of the principal blood-vessels only is restrained by this form of tourniquet.
Presented by Professor Lee, of New York.

803. Circular military tourniquets, invented by T. P. Salt, Birmingham.—*D.M.*

804. Circular tourniquet, invented by Mr. Bulley.—*D.M.*

805. Read's lever tourniquet.—*D.M.*

811. Box containing a set of splints, labelled "Hospital conveyance cart, No. 32." Crimean period.
From the Army Medical Stores.

812. Set of wooden splints authorized for use in the French army. These splints have printed upon them the particular portions of the body for which they are severally designed.—*D.M.*

813. Professor Tufnell's wheaten straw splints.

813*a*. For leg or thigh, with printed directions for using them in the absence of a medical officer.—*D.M.*

813*b*. For the upper arm with directions as above.—*D.M.*

813*c*. For the lower arm with directions as above.—*D.M.*

813*d*. (*d*.) Wheaten straw used in the manufacture of the splints designed by Professor Tufnell, both unbroken straw, and straw prepared for use.—*D.M.*

817. "Portable fracture apparatus," or field splints, invented by Staff-Surgeon (now Deputy Inspector-General) O'Flaherty, and arranged to be carried in holsters in the same way that pistols are carried.
Presented by the inventor to the Dublin Museum of Military Surgery.

(For drawings and full description of these splints *see* "The Dublin Quarterly Journal of Medical Science," No. IV., Nov. 1846, p. 557. A copy is in the Museum.)

818. Set of Duncan's cane splints.
Presented by the inventor to the Military Surgery Museum.

819*a*. French wire-net splints; close pattern.—*D.M.*

819*b*. French wire splints; open pattern.—*D.M.*

820. Box of Hide's leather felt splints.
Presented by the inventor to the Military Surgery Museum.

821*a*. Assalini's short splint with footboard; old pattern; wooden.
From Army Medical Stores.

821*b*. Assalini's long splint; old pattern; iron.
From Army Medical Stores.

822. Model of portable leg splint and fracture apparatus, invented by Dr. Spencer Thomson of Burton-on-Trent.
Presented by the inventor to the Military Surgery Museum.

831. Field crutches, to assist soldiers wounded in one leg or foot in walking from the field of action, and arranged for use by men of different heights. Manufactured by Messrs. Fischer & Co., of Heidelberg.
Purchased.

b. SURGICAL INSTRUMENTS, SEPARATE AND IN CASES; FIELD COMPANIONS; MEDICAL FIELD PANNIERS; MEDICAL COMFORT BOXES, AND FIELD HOSPITAL APPLIANCES.

841. A case of bullet explorers, and extractors, containing 19 instruments, labelled as follows:—

Explorers:

(1.) Nelaton's test probe.—*Purchased.*

(2.) Tieman's modification of Nelaton's test probe.—*Presented by Insp.-General Dr. Muir, C.B.*

(3.) Lecompte's Stylet-pince.—*Purchased.*

Extractors:

(4.) Coxeter's bullet scoop; authorized for use in the British Army.—*D.M.*

(5.) Savigny's bullet forceps, with separate blades; authorized for use in the British Army.—*D.M.*

(6.) Screw tire-balle; authorized for use in the French Army.—*D.M.*

(7.) Bullet forceps; authorized for use in the French Army.—*D.M.*

(8.) Tufnell's bullet scoop. Read's pattern.—*D.M.*

(9.) Tufnell's bullet scoop. Savigny's pattern.—*Army Medical Stores.*

(10.) Weiss' bullet scoop, with concealed sliding spring.—*Army Medical Stores.*

(11.) Luer's long screw tire-balle.—*D.M.*

(12.) Baudens' tire-balle.—*D.M.*

(13.) Sailmaker's needle, as a substitute for Baudens' tire-balle.—*D.M.*

(14.) Weiss' bullet forceps, with cross action.—*Army Medical Stores.*

(15.) Ruspini's bullet extractor.—*Army Medical Stores.*

(16.) Tieman's bullet forceps, with sharp points.—*Presented by Insp.-General Dr. Muir, C.B.*

(17.) Evan's bullet forceps.—*Army Medical Stores.*

(18.) Bullet forceps used in field cases of instruments (old pattern.) —*Army Medical Stores.*

(19.) Read's forceps for balls or angular fragments.—*D.M.*

842. Surgeon Barclay's pocket case of bullet extractors. These instruments were designed by the inventor for obviating certain special difficulties in extracting bullets surrounded by cellular envelopes, or lodged in the soft tissues of the body.
Presented by Staff-Surgeon-Major A. Barclay, M.D.

851. Portable field case of surgical instruments. Peninsular period. Labelled "Received from surgical stores at Lisbon."
From Army Medical Stores.

861. Lancet used for variolous inoculation. The handle is marked "Small-pox."—*F.P.*

871. Arrault's "Giberne Chirurgicale," or "Combatant Officer's Field Pouch and Necessaire;" for use in the absence of a medical officer. Weight complete, 1 lb. Contents in body of pouch:—One compartment for 36 pistol cartridges; six hæmostatic plaister bandages; one long bandage; charpie; nitrate of silver in case; bisturette; one lancet; one forceps; one painting brush; one oz. bottle of perchloride of iron; one oz. bottle of Arrault's hæmostatic tincture. Inside the lid:—Twenty decigramme doses of sulphate of quinine; six doses of emetic powders; one pair of scissors; one shoemaker's awl; one small étui, containing one ligature needle; six straight needles; 20 pins; six large and six small bone buttons; three pieces of white, black, and red cotton twine; one piece of pitched shoemakers' twine; one sheet of "Instructions."
Presented by Monsieur Arrault, the designer, to Professor Longmore, and by him given to the Military Surgery Museum.

875. Havresack for the use of medical officers in the field. The havresack contains some bandages, tourniquets, a drinking flask, &c. Designed by Dr. Jephson, K.D.G.
Presented by Dr. Jephson to the Dublin Museum of Military Surgery.

881. Medical Field Companion.
Army Medical Stores.
(For description and list of contents, see the medical regulations, page 238.)

882. Water bottle; to be carried with the Medical Field Companion.
Army Medical Stores.

886. Monsieur Arrault's modification of the French Army "Sac d'Ambulance," or ambulance knapsack. Weight 21 lbs. 3 oz.
Contents of knapsack: charpie, 1 kilogramme; 32 bandages; 54 compresses; 1 body bandage; 2 arm-scarves; carded cotton, 150 grammes; agaric, 100 grammes; tape; needles; pins; sewing-thread; wax; corks; pencil; paper; sponges; 5 drinking cups; hæmostatic adhesive plaister, 10 yards; jointed splints, calculated to meet the wants of 10 or 12 fractured limbs; and the following medicines and instruments:—Ammoniaque, 60 grammes; alcool camphré, 250 grammes; perchlorure de fer, 250 grammes; extrait de saturne, 250 grammes; vinaigre de vin, 60 grammes; 2 strong bistouries; 1 strong forceps; 1 artery forceps; 2 tourniquets; 1 pair of strong scissors; 2 ligature needles.
Purchased from the inventor and manufacturer.
(For further description see Mons. Arrault's pamphlet, "Notice sur les secours aux blessés du champ de bataille." Paris, 1866.)

891 *a* & *b*.—One pair of field panniers, No. 1 and No. 2. (Old pattern.)—*D.M.*

892 *a* & *b*. One pair of field panniers, No. 1 and No. 2. (Present pattern.)—*W.O.*

On a full-sized stuffed pony, from the Dublin Museum, to show the manner in which the panniers are carried in the field.

901. Indian lotah, or brass chattie, adapted to answer the purpose of applying irrigation to inflamed wounds in field hospitals. Designed by Staff Assistant-Surgeon H. M. Webb.
Presented by the Inventor.

906. Arm-bath.
Army Medical Stores.—W.O.

907. Junod's "Exhausting Boot."
Army Medical Stores.—F.P.

921. Candlestick, with spring, for use in camps.—*D.M.*

922. Pocket candlestick, with spring, and compartment for matches for camp use.—*D.M.*

931. Model of field table for hospital use, designed by Mr. Turner, of Northfleet.
Presented by him to the Dublin Museum of Military Surgery.

951 *a–b*. One pair of new pattern A and B field hospital canteens; with contents complete.—*W.O.*

952 *a–b*. One pair of medical comfort boxes, marked "No. 1," and "No. 2."—*W.O.*

c. ARTIFICIAL LIMBS, CRUTCHES, AND OTHER APPLIANCES FOR MILITARY INVALIDS.

Artificial Limbs (upper extremity).

1001. Stump arm with cap; and extra strap for support from the neck and across the chest. For use after amputation below the elbow.—*W.O.*

1002. Improved stump arm, for use after amputation above the elbow. With hook, fork, and vice, appliances.—*W.O.*

1003. Improved stump arm of a lighter description, for use after amputation below the elbow.—*W.O.*

1004. Stump arm with moveable strap joint at elbow. Adaptable to stumps of different sizes. For use after amputation below the elbow.—*W.O.*

1005. Jointed stump arm, for use after amputation below the elbow, fitted with a small and large hook, and a fork.—*W.O.*

1006. Stump arm, with ring-joint at the elbow. For use after amputation below the elbow.—*W.O.*

Artificial Limbs (lower extremity).

1021. Wooden bucket leg, for use after amputation above the knee; with stump cap and pillow.—*W.O.*

1022. Box leg, for use after amputation below the knee, with pillow.—*W.O.*

1023. Socket leg, for use after amputation below the knee, with stump and pillow.—*W.O.*

1024. Palmer's artificial leg. For use after amputation above the knee.

Presented by the Inventor to the Dublin Military Surgery Museum.

1025. Model of another description of jointed artificial leg. For use after amputation above the knee.

Presented by the Inventor to the Dublin Military Surgery Museum.

II.—Ambulance Conveyances and Appliances designed for the Transport of Medical Stores, Surgical Instruments, &c.

(N.B.—For Field Equipment Carts, capable of being adapted to the conveyance of wounded men also, see below, under C. II.)

a. portable, or moveable, by human labour.

None.

b. carts and waggons drawn by animals.

1071. Model of Regulation Two-mule Cart for the conveyance of Surgical Equipment. Authorized for use in the British Army. Two-wheeled.—*W.O.*

Manufactured in the Royal Carriage Department, Woolwich.

1072. Model of the 4-wheeled Medical Store Waggon. Authorized for use in the British Army.

Manufactured in the Royal Carriage Department, Woolwich.

c. appliances designed to assist in the transport of medical and surgical equipments.

Pack Saddles.

1081. For the conveyance of the Field Medical Panniers.—*W.O.* (See No. 892.)

1082. For the conveyance of the Medical Comfort Boxes.—*W.O.* (See No. 952.)

1083. For the conveyance of the Regulation Litière.—*W.O.* (See No. 1251.)

C. PATTERNS AND MODELS OF AMBULANCE CONVEYANCES DESIGNED FOR THE TRANSPORT OF SICK AND WOUNDED TROOPS.

I.—Conveyances for the Use of Sick and Wounded exclusively.

(*a.*) appliances and apparatus borne by men.

1201*a*. Appliance made to be worn by a bearer. Designed for carrying a wounded man from the field of action "*en cheval.*"

1201*b*. Strap, for use with the above, to support the patient.

Purchased from the inventors and makers, Messrs. Fischer and Co., of Heidelberg.

(For full description see Army Medical Reports, vol. 6, page 479.)

1202*a*. Turner's patent hammock litter. Pattern. Weight of hammock and nettings, 3¼ lbs.; of pole, 4¼ lbs.

1202*b*. Set of shoulder slings to be used by the orderlies employed in carrying wounded by Turner's hammock litters.

Presented by the inventor, Mr. Turner, to the Dublin Museum of Military Surgery.

1202*c*. Set of shoulder slings, made of strong canvas girthing, and designed for use by orderlies of the Army Hospital Corps, when carrying wounded by means of the regulation stretchers.

Presented by the Inventor, Mr. Turner, to the Dublin Museum of Military Surgery.

1203*a*. Model of "Iron Band Stretcher." This ambulance litter was invented by Sergeant-Major Jones, R.E. The iron bands which are here applied for use in forming a stretcher are used by Sergeant-Major Jones for a variety of purposes, such as making gabions, bridges, field bedsteads, &c., &c. The whole contrivance is readily taken asunder for package.

1203*b*. Bedstead formed of the same iron bands as the litter.

1203*c*. Gabion formed of similar iron bands.

Presented by Sergeant-Major Jones, R.E., to the Military Surgery Museum.

(For full description, see a pamphlet published by Sergeant-Major Jones, entitled "The Iron Band Gabion; and its Applicability to various Field Purposes.")

1204. Model of Millingen's field stretcher. This stretcher consists of a looped cloth through which two poles, or halberts, are passed. A bent cross piece is placed at each end, and through the two cross pieces the poles are made to pass in such a way that the stretcher is raised from the ground and may be used as a field bedstead. The separate portions of this stretcher, when not in use, are intended to be carried on the persons of two bearers.—*D.M.*

(For full description see "The Army Medical Officers' Manual upon Active Service, by J. C. Y. Millingen, M.D., London, 1819.")

1205. Model of Redford's portable field stretcher. Stretcher divisible into two equal portions; each portion when the stretcher is not in use being intended to be carried by a separate bearer.

Presented by George Redford, Esq., late Staff Assistant-Surgeon, to the Military Surgery Museum.

(See full description in Mr. Redford's pamphlet on the subject.)

1206 *a b & c.* Looped canvas stretcher with feet. Pattern. The traverses through which the poles pass are made of iron. The feet fold up crosswise, and are hinged by a simple but secure joint to the traverse. Weight of stretcher and two poles 9½ lbs.—*D.M.*

1207. Captain Russell's spring stretcher or dhooley. Pattern. The feet are iron, and are constructed so as to act as springs. They are arranged to fold up and to be secured along the side-poles for package. The stretcher is provided with hoops and a canvas hood or cover. Weight of the whole 50 lbs.

Presented by Captain Russell, Shropshire Militia Regiment, to the Military Surgery Museum.

1208. Model of regulation stretcher.—*D.M.*

(N.B. Attached to the model of the Chinese Ambulance Barrow, marked No. 1341.)

1209. Model of Surgeon Moodies' (R.N.) stretcher. This stretcher consists of an angular iron framework so jointed and arranged that it may be used as a stretcher for carrying wounded, or as a hospital bedstead. It is provided with support and an awning.

Presented by Staff Surgeon Moodie, R.N., to the Military Surgery Museum.—F.P.

1221. Stretcher adapted for two bearers carrying a wounded man sitting. Pattern. The bearers can either carry the stretcher walking abreast or marching one behind the other, as with ordinary stretchers.

Purchased from the makers, Messrs. Fischer & Co. of Heidelberg.

(For full description, see Army Medical Reports, vol. 6, page 481.)

1222 *a.* Rough skeleton model of Bengal dhooley, designed to show the arrangement of the cover and curtains. The usual cover is made of canvas, painted and made waterproof.

Presented by Staff Assistant-Surgeon Webb.

1222 *b.* Model of a Bengal dhooley. The model consists of the framework only, and is designed to show the mode of suspension by triangular upright ends as well as the arrangements for the removal of the pole and roof when the dhooley is used as a bedstead in a hospital tent. The bottom is made of interwoven canework or bamboo. The dhooley represented by this model is carried on the shoulders of four bearers, two additional men being necessary as reliefs. A bamboo pole is used.

Presented by Dr. Stack, 86th Regiment, to the Dublin Museum of Military Surgery.

1223. Model of a Madras dhooley. The roof and poles, as well as the cover and side curtains, are shown to be a fixed part of the dhooley, not separate as in the Bengal dhooley.

Presented by Dr. Stack, 86th Regiment, to the Dublin Museum of Military Surgery.

1224. Model of a dhooley, adapted to act also as a hospital bed. It is arranged to be carried by iron suspension bands which can be entirely removed from the dhooley for stowage, or when used as a bed. The bands pass outside, and are fixed in position by screws and nuts when the conveyance is used as a dhooley.

Modelled by Mr. Mack, Government Contractor, and purchased at Chatham, 1861.

1225. Model of a dhooley, designed to act also as a hospital bedstead. It is fitted with iron suspension bands, which are attached permanently to the conveyance, and fold inside the framework to facilitate stowage. A portion of each foot is made to turn up, so as to be out of the way of obstructions when the dhooley is being carried over broken irregular ground. The sides and bottom are made of canework.

Modelled by Mr. Mack, Government Contractor, and purchased at Chatham, 1861.

1226. Model of a dhooley, designed to act also as a hospital bedstead, with removable leather suspension bands. The feet are fixed, the sides and bottom are made of canework.

Modelled by Mr. Mack, Government Contractor, and purchased at Chatham, 1861.

1227 *a.*—Model of a dhooley capable of being used as a field bedstead. Designed by Inspector-General Dr. Muir, C.B.

The iron suspenders are fixtures, but are made to fold within the sides of the litter, which are open. The same action that causes the suspenders to fold down, causes the iron feet of the dhooley to fold up close to the canework bottom.

Modelled by Mr. Mack, Government Contractor, and purchased at Chatham, 1861.

1227 *b.* Full-sized pattern of the dhooley last described. Weight of the dhooley complete, 44¾ lbs.

1227 *c.* Pole to ditto. Weight 11¼ lbs.

Made by Mr. Mack, Government Contractor, and purchased at Chatham, 1861.

1231. Model of Bengal palanqueen or palki, in carved wood. The roof, sides, bottom, and poles of this carriage are made of wood. It is fitted with sliding doors.—*D.M.*

Presented by Dr. Lord, 14th Light Dragoons.

1228 *a.* Full-sized pattern of the dhooley constructed for use in China during the war of 1860. Weight of dhooley, without pole or equipment, 45 lbs.—*W.O.*

Received from China. Sent by order of Inspector-General Dr. Muir, C.B.

(For description see Army Medical Reports for 1860. Published in 1862, page 377.)

1228 *b.* Bamboo pole of a Chinese dhooley. Weight 15 lbs. 10 oz.

Sent from China and presented by Surgeon W. Snell, 99th Regiment.

1230. Model of a basket-work cot to be carried either in stretcher or dhooley fashion.

Modelled by Mr. Mack, Contractor, at Chatham.

1241. Model of a jampan conveyance used in the Himalayas.

From Simla.

Presented by Staff Assistant-Surgeon H. M. Webb.

1242. Model of an ordinary stretcher adapted for carriage, jampan-fashion, so as to be capable of being used in mountainous districts.

Sent from India by Staff Assistant-Surgeon H. M. Webb.

This Model was sent by Surgeon Dr. Guthrie to the Inspector-General's Office, in India, to show the kind of conveyance he had employed in transporting sick from Lohoo Ghât, seven days' march to Nynee Tal.

1243. Model of a dandie, a conveyance used in the Himalayas.
From Bareilly.
Presented by Surgeon Franklyn, 7th Dragoons.

1245. Model of a dhooley arranged to be carried jampan fashion. Invented by Surgeon Porter, 97th Regiment.
Presented by the inventor.
See Report on this dhooley, dated Army Medical School, Netley, 22nd January 1866.

(*b.*) APPLIANCES AND APPARATUS BORNE BY ANIMALS.

1251*a*. A regulation mule litière and mule cacolet. Patterns of 1859. They are attached to a regulation pack-saddle so as to show the manner in which they are usually borne in the field.—*D.M.*

The litière and cacolet are borne upon a stuffed horse sent from Dublin with them which bears the following inscription: "Charger taken at "Salamanca and subsequently ridden by Sir Colquhoun Grant at Water-"loo. Presented by Sir C. Grant."

1251 *b*. Model of a mule litière. This model is altered in form from the regulation mule litière so as to make it suitable for additional use as a hand-stretcher, and also for carrying a patient in a sitting posture. With this form of litter a wounded man could be carried from a distance to the place where the mule may be waiting for his reception.
Designed and manufactured by Sergeant Shortell, Army Hospital Corps, Netley.

(C.) WHEELED CONVEYANCES.

(1.) *Drawn or propelled by Human Labour.*

1261. Evan's hand-wheel litter, for conveyance of two patients, one lying, the other sitting. Pattern.—*W.O.*
(For full description and drawing see Army Medical Reports for 1863, vol. 5, page 507.)

1262. Pirogoff's hand-wheel litter, for conveyance of two wounded men, in a semi-recumbent position. Pattern.
Purchased from the manufacturers, Messrs. Fischer & Co., of Heidelberg.
(For description see Army Medical Reports for 1864, vol. 6, page 471. The drawing of Dr. Neudörfer's two-wheeled litter, in vol. 5 of the Army Medical Reports, page 509, closely resembles this litter.)

1263. Neuss's two-wheeled litter for conveyance of one wounded man in a recumbent posture. Pattern.
Purchased from the manufacturers, Messrs. Neuss & Co. of Berlin.
(For a drawing and a report on this litter see Army Medical Report for 1863, vol. 5, page 505.)

1246. Gablentz' hand wheel litter, or adaptation of a stretcher to wheels. For the conveyance of one wounded man in a recumbent posture. The stretcher can be used either on or off the wheels. Pattern.
Purchased from the manufacturers, Messrs. Fischer & Co. of Heidelberg.

(For full description and drawing of this conveyance see Army Medical Reports for 1864, vol. 6, page 477.)

1265. Arrault's *brancard roulant*, or adaptation of a stretcher to wheels. For the conveyance of one wounded man in a recumbent posture. The stretcher can be used either on or off the wheels.
Purchased from the inventor, M. Arrault of Paris.
(For description of this conveyance see Army Medical Report, for 1864, vol. 6, page 483.)

1271. Model of a regulation stretcher, placed upon wheels and resting on two elliptical springs.
Designed and manufactured by Serjeant P. Shortell, Army Hospital Corps, Netley.
1271*a*. Full-sized pattern of the same.

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2. (*Drawn by Animals.*)

(*a*) *Two-wheeled.*

1301. Model of Baron Larrey's original "*Voiture d'Ambulance Volante.*"
Presented by M. Arrault, of Paris.
(For full description see Mémoires de Chir. Mil, et campagnes de D. I. Larrey; Paris, 1812, vol. 1, page 150.)

1302. Model of Indian cart, or bandy, of the Goojerat district, drawn by two bullocks.—*F.P.*
Presented by Staff Assistant-Surgeon Dr. Clarke, 13th Light Dragoons.

1303. Model of the Madras hospital cart, drawn by two bullocks. It is made to convey four men in a sitting position, two on each seat, with a back common to both seats. The seats are slung by straps, and are moveable, so that two men can be accommodated lying at the bottom of the cart, instead of the four men sitting. The cart is not supported on springs, and consequently is very rough and jolting for weakly men. Dr. McPherson's ambulance cart (see 1304) was intended to remedy the inconveniences experienced in this sick-cart.—*D.M.*
Presented by Dr. Stack, 86th Regiment.

1304. Model of Inspector-General McPherson's two-wheeled ambulance cart, contrived for either bullock or horse draught. It is made to hold four men sitting inside, or two men lying down. It is furnished with springs, and is provided with a fixed awning, with moveable flaps for the passage of air and for shade. In the account which accompanied this model, it is stated: "This cart has been tested in Madras, and is reported to have stood the test without a nail starting, and to be able to keep up with cavalry or horse artillery." Length of model, exclusive of shafts, 9 in.; breadth between wheels 7 in.; height from ground to top of cover 10 inches.
From Madras.
Presented by Insp.-General Dr. Duncan McPherson, Madras Army.

1305. Model of Professor Tufnell's ambulance conveyance, constructed on the general principles of the Irish jaunting car. It is supported by double springs, a combination of the C-springs, and springs on the elliptic principle, invented by Mr. Corbett. The conveyance is designed to transport three men lying at full length, or one lying at full length and six or eight men sitting. It also carries two tents for 12 men

10 gallons of water, instruments, &c. The centre seat on being removed forms a stretcher. The vehicle is provided with a moveable awning.—*D.M.*

1311. Model of McAdam's steel spring suspension ambulance conveyance for two wounded men lying at full length; especially intended for men suffering from compound fractures of the thigh. The cart is suspended from a steel-bar spring which is made to work on an axle placed above instead of below the conveyance. When this conveyance is travelling, the part in which the patients are laid will remain constantly level, like a swinging lamp on board ship, and jolting from passing over a rough road will be, in a great measure, prevented. It is provided with a cover, splash board, place for packs, arms, &c. The conductor leads the cart instead of driving.—*D.M.*

1312. Model of McAdam's elastic-band suspension cart. This ambulance-cart resembles the preceding, with the exception that the suspension is effected by four elastic bands which connect the framework with the body of the vehicle. The elastic bands are attached to four iron hooks, one of which is placed at each bottom corner of the cart. The suspension is direct from the shafts and axle, the latter being placed above the cart as in No. 1311. Undue motion of the body of the vehicle is restrained by short chains which proceed from the four upper corners of the cart to the shafts.—*D.M.*

1313. Model of McAdam's suspension cart for four men in a sitting position. The ambulance cart in this instance is suspended above the axle which passes through an opening in the body of the cart between the seats for the wounded men. The suspension is effected by four elastic bands which are carried from the four corners of the bottom of the cart to four hooks fixed in the shafts. The wounded men sit back to back with a partition between them. The packs, arms, &c., are carried under the seats, which are made locker-fashion. The cart is provided with cover, splash board, &c.—*D.M.*

1321. Model of a Maltese cart fitted as an ambulance conveyance, and furnished with two folding litters; made to scale. This ambulance conveyance was authorized at one time for use in the British army.—*W.O., D.M.*

Prepared in the Royal Carriage Department, Woolwich.

(*b.*) *Four-wheeled.*

1331. Model of Inspector General Macpherson's Madras waggon, intended to be drawn by four horses or bullocks. This waggon is arranged for the conveyance of eight wounded or sick men sitting, or two lying and three sitting. It is covered by a fixed covering with moveable flaps for the passage of air and for shade. It is provided with an arm rack for eight rifles beneath the seats with two field stretchers, one being fixed on each side of the waggon, and with receptacles for packs and stores. This waggon is reported to have been subjected to a severe trial over bad roads at Madras and with the result that "not a nail started."

From Madras.

Presented by Inspector-General Dr. Duncan McPherson, Madras Army.

1333. Full-sized vulcanized indiarubber spring for suspended ambulance conveyances; invented by Col. Tulloh.—*W. O.*

In use in the British Service.

(*d.*) APPLIANCES FOR FACILITATING THE CONVEYANCE OF SICK AND WOUNDED IN COMMON WAGGONS BY RAIL OR BY WATER.

1334. Suspension litter, consisting of three separate parts connected by hinges, for railway waggons, or for slinging a patient over the side of ship.

Invented by Messrs. Fischer, of Heidelberg, and purchased from them for the Military Surgery Museum.

1335. Moveable head rest for use on the floor of a railway carriage or in hospitals.

Invented by Messrs Fischer, of Heidelberg, and purchased from them for the Military Surgery Museum.

1336. Litter furnished with telescope handles, and moveable cross supports, intended to rest on the seats of a first-class railway carriage.

Purchased from the Inventors, Messrs. Fischer & Co., of Heidelberg. (1866).

1337. A similar contrivance for use in third-class carriages.

Purchased from the Inventors, Messrs. Fischer & Co., of Heidelberg. (1866.)

1338. Suspension battens, with girths, straps and hooks, to adapt goods vans for the conveyance of sick.

Purchased from the Inventors, Messrs. Fischer & Co., of Heidelberg. (1866.)

1339. Canvass rest, fitted with cross staves, to serve as a temporary bed for slightly wounded during railway transport.

Purchased from the Inventors, Messrs. Fischer & Co., of Heidelberg. (1866.)

1340. Suspension field bed, principally designed for use in railway vans, but capable also of being used in hospitals and camps as an ordinary bedstead.

Purchased from the Inventors, Messrs. Fischer & Co., of Heidelberg. (1866.)

1341. Boat litter or cot, arranged for raising patients from shore or boats on board ship, or, *vice versâ*, for lowering patients from shipboard into boats or on to a shore.—*D. M.*

II. CONVEYANCES COMBINING ARRANGEMENTS FOR THE TRANSPORT OF STORES WITH THE CAPABILITY OF CARRYING WOUNDED TROOPS.

(*a.*) BORNE BY MEN.

None.

(*b.*) BORNE BY ANIMALS.

None.

(*c.*) WHEELED CONVEYANCES.

1345 *a.* China ambulance hand-barrow; adapted to serve either for conveyance of Commissariat stores, or for the carriage of one wounded man. *Pattern.—W.O.*

(For full description and drawing, see Army Medical Reports for 1863, vol. 5, page 508.)

1345 *b.* Model of China ambulance hand-barrow. Made to scale. —*D.M.*

1351. Model of Veterinary-Surgeon Cherry's cart; designed both for Commissariat and ambulance purposes. The main feature of this cart is the ingenious contrivance by means of which it can be used as a vehicle without or with springs, by shifting two blocks which rest upon the axle. These blocks, by simply moving a lever, can be brought under the framework of the cart, when the weight is taken off the springs and lies chiefly upon the blocks; or, by moving the lever in the opposite direction, the blocks can be shifted at a moment's notice and be brought under the floor of the cart, when the cart rests upon the springs only. It is provided with moveable suspended seats, receptacles for medical stores, framework for awning, &c.—*D.M.*

1352. Model of Mr. Storekeeper Butcher's field cart, for Commissariat, ammunition, and ambulance purposes. In this cart the seats are so hinged and arranged that they can be unfolded and turned up to cover and protect the contents of the cart when it is employed for conveying Commissariat stores or ammunition. The cart is suspended on common carriage springs. Beneath the cart, in two side compartments, are two sets of tent poles, and in a third compartment between them are cases for field equipment, and for small arm ammunition when carried in the cart. As an ambulance carriage, this vehicle was designed to convey six men sitting, or two recumbent, together with the driver; as a Commissariat cart, to carry ten tents, with poles and appliances complete; as an ammunition car, twelve quarter barrels of ammunition, or 6,000 rounds. —*D.M.*

1353. Model of the Bulgarian Araba, which was extensively used as a conveyance for sick by the English Army in Bulgaria in the year 1854.—*D.M.*

D.—MISCELLANEOUS ARTICLES CONNECTED WITH THE DUTIES OF ARMY SURGEONS.

1501. Model of a bell-tent supported over ground which has been excavated and suitably arranged as a place for the performance of surgical operations. Designed for use in a standing camp, so as to avoid the necessity of performing amputations and similar operations in the presence of other patients in a hospital marquee.

Modelled by Sergt. Shortell, A. H. Corps, under the direction of Professor Longmore.

1502. Model of a portion of the Green Hill (Chapman's) Battery before Sebastapol for the purpose of showing the assistant-surgeon's bomb-proof quarters in the battery.

Made by Staff Assistant-Surgeon Dr. Carte, attached to the left attack during the winter of 1854, and presented by him to the Dublin Museum of Military Surgery.

1503. Naval cat-o'-nine-tails.—*D.M.*

1504. Military cat-o'-nine-tails.—*D.M.*

Although the duties of army surgeons connect them with the treatment of injuries inflicted by these weapons, it did not appear consistent to place them under the heading A.

E. APPENDIX.—DRAWINGS OF ARMS, FIELD APPLIANCES INSTRUMENTS, CONVEYANCES, &c.

Fire Arms.

Diagram of the law of projectiles (133).—*D.M.*

Diagram illustrative of the effect of the passage of a musket ball (134). —*D.M.*

Diagram illustrative of Dr. Teevan's views concerning gunshot injuries of the cranium (137).

Drawing, illustrative of one of the effects of rotation of a conical projectile (141).

Respective effects of round and conoidal projectiles on striking certain bones (191 and 192).

Projectiles for rifled small arms as used in the British service (115).

Projectiles of various forms which have been proposed for use as well as those used in the French service (116).

Rifle ball of Nessler, in use in the French army in 1863 (118).

Shells and bolts for rifled ordnance (Armstrong and Whitworth) (111).

Thirty-five plates illustrative of all kinds of amunition prepared in the Royal Arsenal at Woolwich.—*W.O.*

Surgical Instruments.

Various patterns of tourniquets (161).—*D.M.*

Lee's tourniquet (166).

Various kinds of bullet extractors (151, 152, 153, 154).

Medical Store Carts and Waggons.

Baron Percy's ambulance conveyance for medical officers and surgical materials (401).

Russian cart for medicines and instruments, taken on the march to Sebastopol in 1854 (405).—*D.M.*

Camp tray (410).—*D.M.*

Field panniers, as carried on the back of a bât-animal (415 *a*).

Field panniers, connected and arranged for an operating table (415 *b*).

Medical store cart, packed (421 *a*.). (2 copies.)—*W.O.*

Enlarged drawing of the same (421 *b*).

Plans and elevations of the divisional and battalion boxes for medical comforts. (422). (3 copies.)—*W.O.*

Litters and Stretchers.

New Zealand native stretcher (451).—*D.M.*

North American Indian hammock stretcher (452).—*D.M.*

Baron Percy's brancard and brancardiers; three sets of drawings (455 *a. b. c.*)

Sergeant-Major Jones' iron band litter (461).

Mr. Turner's tent hammock in use as a stretcher (464).—*D.M.*

Mr. Tuffnell's field stretcher (465).—*D.M.*

Mr. Redford's portable stretcher (467).

French stretcher and bearers, showing the mode of breaking step. (470).

Hindostanee dhooley and bearers, showing the mode of carrying. (476).—*D.M.*

Hindostance dhooley showing the construction and fittings (475).

Colonel Crichton's swinging car for the carriage of sick and wounded (480).

Ambulance Conveyances borne by Animals.

United States horse litter, and Wood's New York "field sedan" (491).

United States two-mule litter (492).

Medical horse litter and chair (493 & 494).

Larrey's Egyptian camel litter (501).

Indian camel chair, or kadjowa (502.)—*D.M.*

Kadjowas and dhoolies on the march in India (503).—*D.M.*

French ambulance conveyances used in the Crimea (504).—*D.M.*

British regulation mule litter (505). 3 copies.—*W.O.*

Wheeled Ambulance Conveyances pushed or drawn by Manual Labour.

British patterns of stretchers, hand-barrows, &c. (511).—*W.O.*

Neuss' two-wheeled litter (513).

Ditto drawn by Animals.

Mr. Tuffnel's ambulance car (521 *a & b.*)—*D.M.*

Mr. Guthrie's hospital conveyance cart (524).—*D.M.*

Regulation hospital cart (531).—*W.O.*

Maltese cart (532). 3 copies.—*W.O.*

Millingen's ambulance waggon (540).

British ambulance waggon (541). 3 copies.—*W.O.*

Hospital waggon (542).—*W.O.*

Dr. Smith's hospital conveyance waggon, three views (550. *a. b. & c*) —*D.M.*

Ditto moved on Railways.

Contrivances for transporting sick and wounded in railway cars, used in the United States campaigns of 1863-5 (555).

Miscellaneous.

French ambulance in the Kanabelnaira Ravine (1856). (No. 580).

Raft (590).—*D.M.*

Sledge (591).—*D.M.*

Three sheets of photographs of Messrs. Fischer's ambulance vehicles and other contrivances for transporting sick and wounded (561, 562, & 563).

Messrs. Fischer's illustrated catalogue of field conveyances and hospital equipment (564).

Three sheets of photographs of the ambulance conveyances authorized for use in the Prussian army, A.D. 1866.

Presented by Assistant-Surgeon H. Chalmers Miles, R.H.A,

LONDON:
Printed by GEORGE E. EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationary Office.
[15135.—600.—3/67.]

For the Library at Netley Hospital
from the Author

PROOFS

OF THE

NON-EXISTENCE

OF A

SPECIFIC ENTHETIC DISEASE

SECOND EDITION.

ADDRESSED

TO *THE*

SECRETARY OF STATE FOR WAR,

BY

DAVID MACLOUGHLIN, M.D.,

MEMBER OF THE LEGION OF HONOUR.

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ERRATA.

At page 5, line 23—
For Vaccine lysuph, read *Vaccine lymph.*

At page 28, line 11—
For all contraire, read *au contraire.*

At page 30, line 6—
For Medical Practitioner, read *Medical Practitioners.*

At page 37, line 3—
For phagedance, read *phagedenic.*

At page 38, line 28—
For no secondary symptoms has occurred, read *have occurred.*

At page 46, line 9—
For postular appearance, read *pustulous appearance.*

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are the fallen females carefully, and *monthly* inspected, but the soldiers and sailors must be inspected once a month, or oftener if the Medical Officer suggests it; and every man found injured is placed, in the first instance, "*dans une Salle de Police*," that his case may be watched to ascertain its nature—and it is only the serious cases that are admitted into hospital, and treated as labouring under syphilis, and reported as such.

PREFACE

TO THE

SECOND EDITION.

At a dinner, which took place at Willis' Rooms on the 16th instant, to celebrate the anniversary of the institution of the Lock Hospital, and over which presided the Field-Marshal Commanding-in-Chief, His Royal Highness the Duke of Cambridge, supported by the chiefs of the Army and Naval Departments and their staffs, it was stated by a noble speaker, that in England, 300 to 400 per thousand of the Army and Naval force were laid up, annually, by the so-called syphilitic disease; while, on the continent, the Army and Naval forces had only 70 to 80 men per thousand annually attacked with this disease.

This fact cannot be questioned.

But we must remark that on the continent, not only are the fallen females carefully, and *monthly* inspected, but the soldiers and sailors must be inspected once a month, or oftener if the Medical Officer suggests it; and every man found injured is placed, in the first instance, "*dans une Salle de Police*," that his case may be watched to ascertain its nature—and it is only the serious cases that are admitted into hospital, and treated as labouring under syphilis, and reported as such.

Whereas in our service, there is neither an inspection of fallen females, nor is there any Medical inspection of the men, and every excoriation, every solution of continuity on the genitals, is at once admitted into hospital, and reported and treated as if he were labouring under syphilis.

At the above dinner, the Secretary of State for War mentioned the agreeable fact that, of late years, the death rates in the army had been reduced to one-half; and he asked if the remainder of the diseases—50 per cent.—should be permitted to spring from one cause, without any attempt at amelioration.

All who are anxious for the advance of Medical knowledge, and for the benefit which Medical knowledge confers on society, must be grateful for this announcement—that the pathology of this so-called syphilitic disease will now be studied scientifically.

And a hope may be entertained that all the diseases to which soldiers and sailors are liable to, will be also scientifically studied.

In December, 1814, I began the Museum of Morbid Anatomy, at Fort Pitt, Chatham, and I obtained that Mr. James Miller should be appointed *curator*. The object in view was the advancement of the knowledge of Medical Science amongst the Medical Officers of the army. Six months after this museum had been begun, the late Sir James Macgregor was appointed Director-General of Army Hospitals. He found the museum in progress—he fostered the undertaking, and it has grown to its present state of usefulness. Happily, the spirit of

usefulness, which animated the late Sir James Macgregor, and which animated the late Lord Herbert, still remains at the War Office, and will bring forth valuable results for the public services; and it is gratifying to look back fifty years, and to remember that the accidental amputation of a diseased hand is the point from which the Museum, at the Royal Hospital at Netley—which is destined to render so much service to the public, started.*

But to the question of Syphilis.—I am informed that the doubt which I ventured to express in the first edition of this pamphlet, as to the existence of a specific syphilitic virus, is not satisfactory to the Government.

However, with every sentiment of respect, the Government are not pathologist. They judge of a pathological question according to the opinion of their official medical advisers, who may, possibly, know as much on the subject as themselves.

When Dr. Harvey announced his discovery of the circulation of the blood, the Royal College of Physicians, of London, pronounced him a Quack.

When Dr. Jenner announced his discovery of the Vaccine Lymph, he was branded as an imposter.

And, when, with the valuable assistance of the Registrar-General, Major Graham, and the officers of

* See the *Lancet*, 17th April, 1858; page 401. The only person present, now living, who knows of the establishment of this Museum by me, before Sir James Mac Grogor came into office, is Mrs. Mouat, widow of the late Dr. Mouat, and mother to Deputy Inspector-General Mouat—now in New Zealand. Dr. Mouat was, in the end of 1814 and beginning of 1815, doing duty with me at Fort Pitt, Chatham.

his department, the first scientific enquiry into the pathology of cholera, publicly undertaken in any country, was carried out here, in London, in 1853, in the presence of the whole Medical profession of London, and when the results of this inquiry were proved to be correct, by the researches of every medical practitioner in England and Scotland, in charge of hospitals, unions, &c.,* the Royal College of Physicians, of London, ignored these researches, and they brought forward a monograph of this disease, without being aware what is the first symptoms of the disease, and they placed before the medical public the list of drugs without being aware if they were useful or injurious to the patients.

With, therefore, these facts before them, the Government possibly will pause before they put implicit confidence in the opinion of their professional medical advisers.

In a question of this importance, which has assumed the proportions of a public calamity, why not consult the best medical practitioners in this country, and why not seek for the advice of the first syphilidographers on the Continent, by having them examined here by a commission. The Government will then be aware that Medical Science has not pronounced its final verdict—that there is a specific syphilitic virus—and that it is possible that the plan of Medical treatment adopted, to cure this so-called syphilitic disease, is the cause of the

* See the Registrar-General's weekly return for 1853—4; and the returns from all the Hospitals, Unions, &c., in England and Scotland, at the late General Board of Health Office.

injury to the constitution of the soldier and sailor, and the loss of life, so feelingly described by the speaker at the above dinner.

In Gunnery, it is reported that if the advice of the greatest military commander England ever had, had been attended to, "*Brown Bess*" would still be the weapon of defence for our soldiers and sailors, and we would have yet to learn the value of Armstrong's and Whitworth's improvements in gunnery.

Therefore, since the Government, after due inquiry, have placed in the hands of the soldier and sailor the best weapon of defence against an enemy—why should they refuse to inquire what are the best means to save the soldier and sailor's life, when prostrate by disease?

In conclusion, what I contend for, is this—that the slightest wounds on the fingers and toes are cured in a few days by rest and ablution, without any bad consequences occurring.

That, in the act of sexual intercourse, in the state of orgasm, in which the genitals of the man and the woman are—the genitals of the man or those of the woman, or both, may be wounded; that these wounds can be cured by rest and ablution without any bad consequences following, any more than follows the cure of the simple wounds on the fingers or toes.

But if the slightest wounds on the fingers or toes are neglected, buboes in the groins, or in the axellas takes place; the constitution sympathises, and, too often, death follows.

And if the slightest wounds in the genital organs of the

man or woman are neglected, if rest and ablution are not attended to, buboes occur; the constitution sympathises, and death too often is the consequence; and this unhappy result occurs without requiring the aid of a specific syphilitic virus.

Further, I contend, that at this moment there is not one symptom, or collection of symptoms, by which a medical practitioner, whether in England or France, is justified to pronounce an ulcer on the genitals, or on any other part of the body, to be a syphilitic ulcer.

That the existence of a specific syphilitic virus was promulgated, without due enquiry, by the Parliament of Paris in 1496—that this existence of a specific syphilitic virus was adopted and promulgated, without due inquiry, by the medical profession in all countries down to this day.

It may be hoped that the Government, before going to the House of Commons for legislative measures, will ascertain if there is such a thing as a specific syphilitic virus, and that they will not do as the Government of France did in 1496—call on the House of Commons to pronounce, without inquiry, that there is a specific syphilitic virus, which error has entailed, and continues to entail, such misery on the human race.

Since the publication of the first edition of this pamphlet, a copy of Dr. Ricord's third edition of his letters on syphilis, published 1863, has fallen into my hands; and I find at page 102, "*Que le diagnostic absolu ne peut etre obtenu que par l'inoculation artificielle;*" and, at page 174-5, he places before his readers, what takes

place in a common solution of continuity, in a state of active inflammation, and tells them this is a syphilitic ulcer!!! without having the slightest idea that he is in error.

Therefore, according to Dr. Ricord, a gentleman who has paid great attention to the pathology of syphilis, he cannot, by his own admission, and by his own demonstration, point out the diagnosis between a so-called syphilitic and a non-syphilitic ulcer on the genitals, or on any other part of the body, even by inoculation.

And, therefore, the French Medical Profession has not one symptom by which they can pronounce that an ulcer, I repeat, on the genitals or on any other part of the body is syphilitic, no more than the English Medical Practitioners have. Both prescribe empirically.

London, 30*th March*, 1864;
34, Bruton Street, Berkeley Square, W.

The object in view for calling the attention of the Secretary of State for War to the following pages, is:—

1.—That no Medical Practitioner who is acquainted with Medical Science, and who respects himself, can, at the bedside, point out what are the pathognomonic symptoms of a primary syphilitic ulcer, on the genitals, or on any other part of the body.

2.—That it follows, that if the best Medical Practitioner, who is acquainted with Medical Science, and who respects himself—cannot, at the bedside, point out what are the pathognomonic symptoms of a primary syphilitic ulcer, on the genitals, or on any other part of the body—how can he point out, at the bedside, the pathognomonic symptoms of secondary syphilis, on any part of the body?

3.—In the interest of the army, the attention of the Secretary of State for War is called to this subject, as the pathology, the etiology, and the Medical treatment of this so-called syphilitic

disease, has never been scientifically studied by the Army Medical Department, and as their Medical treatment is Empirical, annually committing great ravage in the army, depriving the army of the services of thousands of men, if not destroying the lives of hundreds.

4.—And the attention of the Secretary of State for War is called to this subject, as he is in the position to have the pathology, the etiology, and the Medical treatment of this so-called syphilitic disease scientifically studied; and to render, thereby, the greatest service that can be rendered to humanity in general, and to the army in particular.

London, 14*th January*, 1863;
34, Bruton Street, Berkeley Square, W.

To the Right Honourable The Secretary of State for War, Earl de Grey *and* Ripon, *&c., &c., &c.*

My Lord,

The War Office has, for these some years past, inquired with great attention into the means to improve the hygienic state of the army.

But there is another question of greater importance which is the base of all sanitary measures, and which the War Office has neglected to investigate—I allude to the pathology of the diseases which particularly afflict the army.

The War Office assumes, that all diseases, to which the soldiers are liable, are well known; and that the Medical Officers of the army are well acquainted with the pathology, the etiology, and with the Medical treatment of all such diseases.

Therefore, when an epidemic of any kind breaks out amongst the troops, no commission, composed of Medical Officers well acquainted with Medical Science, is appointed to go to the bedside,—there to study the rise and progress of the disease, to collect facts, and to draw rational conclusions from these facts, and to publish these facts and conclusions for the benefit of the public and the army.

But, as was seen in India, in 1861, a commission is

appointed to inquire into the outbreak of an epidemic—not composed of Medical Officers, but composed, in majority, of gentlemen who have never studied Medical Science; who would not know a disease if they went to the bedside; and of gentlemen who have the titles of Medical Gentlemen, but who have not the experience of Medical Practitioners.

Or, an important medical inquiry is referred to one gentleman, not to go, however, himself, to the bedside and there to study the rise and progress of the disease, but to receive the reports of other Medical Gentlemen, and without being aware if these reports are correct, to draw up his report—which report is published by the Government, and which, consequently, commands respect; and is accepted, without examination, as correct by the whole medical world; and after having destroyed millions of the human race, is, at last, found to be the result of untutored imaginations.

I refer to the report on cholera, published in 1820 by Mr. James Jameson, under the patronage of the Indian Government; and also to that report on cholera, published in 1824, by Mr. William Scot, and also published under the patronage of the Indian Government.

These two gentlemen, in their reports on cholera, completely overlooked the first stage—the most essential stage of the disease—that stage when a painless diarrhœa has drained away almost the whole serum from the blood; when the heart has ceased to contract; when the blood has ceased to circulate; when the individual is too often passed all human aid—and, yet, he may be

at the festive board—the life of his party—or he may be at his usual occupation—or walking about for pleasure or for business—unaware that he has anything serious the matter with him.

I repeat, these gentlemen overlooked the first stage of the disease, and fixed their attention and that of the Medical World on the last stage of the disease—that of spasms, vomiting, &c.—and then they recommended a plan of medical treatment which assists the disease to destroy life.

And although forty-seven years have elapsed since these errors were committed by the above two gentlemen, and that thousands and thousands of men belonging to the army have been destroyed by this disease, assisted by the Medical treatment, the War Office has never attempted to have this disease scientifically studied; and if it were now the will of Providence to inflict another outbreak of this disease on the army, it would find the Army Medical Department no better prepared to meet such a scourge than they were in 1817.

But not only has the War Office never attempted to have the pathology, the etiology, and the medical treatment of cholera, scientifically studied, but it has, without examination, repudiated the scientific studies relative to the pathology, the etiology, and to the medical treatment of this disease, which were undertaken to benefit the public and the army, and which have received the approbation of the scientific Medical world.

It has been stated above that Messrs. James Jameson and William Scot, by their reports on the pathology

and medical treatment of cholera, had overlooked the first, the most essential stage of the disease, and had fixed their attention on the last stage of the disease.

I repeat, in 1853 the first scientific inquiry, in any country, was carried out here in London, publicly under the eyes, and with the valuable assistance of the Registrar-General, Major Graham, and the gentlemen of his department, as to the pathology and medical treatment of cholera; and the result was the proof that Messrs. James Jameson and William Scot had misled the Medical world as to the pathology and Medical treatment of cholera—and, I repeat, had been the cause of the destruction of millions of the human race.

And the results obtained by the inquiry in 1853 were confirmed by the inquiries carried out by all the Medical Practitioners in charge of Hospitals, Unions, etc., etc., in England and Scotland in 1854.

See the Registrar-General's Weekly Report of Births and Deaths for 1853 *and* 1854.

See the Reports at the General Board of Health from all the Hospitals, Unions, etc., etc., in England and Scotland for 1754.

When the army was in the Crimea, and almost destroyed by cholera, all was done that could be done by an individual to have this disease scientifically studied by the army Medical department.

But a respectable individual, a naturalist—said to be acquainted with the art of stuffing birds and reptiles and empaling butterflies — but totally unacquainted with Medical science; was Director-General of Army Hospitals, and Medical adviser to the War Office.

This gentleman could not understand the benefit there was in Medical Science to attend to the first deviation from perfect health, and could not understand that administering calomel by tea spoonfuls every hour or every second hour, to a patient labouring under cholera, was aiding the disease to destroy life.

And the consequence was that the Commander-in-chief of the army in the Crimea, and thousands of men of that army, were hurried into untimely graves by the disease, assisted by the Medical treatment.

When, in 1861, cholera broke out in the army in India, attention was again called to the necessity to have this disease scientifically studied by the Army Medical Department.

But the answer received was—"*that the pathology, and that the Medical treatment of this disease, were well-known to the Army Medical Department, and that no further study of this disease was required.*"

And it followed that the views of Messrs. James Jameson and William Scot, as to the pathology and Medical treatment of Cholera, were adhered to, and that the country had to deplore the loss of above 3,000 valuable lives.

In the spring of 1862, cholera broke out in Ceylon; an attempt was again made to induce the Government to have the disease scientifically studied, but in vain.

His Grace the Duke of Newcastle has sent me the copy of an official despatch from the Governor of Ceylon, inclosing the copy of an official report from the Deputy Inspector-General of Army Hospitals at Ceylon,

stating, that it was unnecessary to have the pathology, the etiology, and the Medical treatment of cholera scientifically studied; and the result was, that hundreds of lives were sacrificed.

By the Army Medical Report for 1861, it is seen that another disease, not less injurious to the army than cholera, rages in the army—I refer to syphilis.

The War Office has assumed that, as syphilis has occupied the attention of the civilised world for nearly four hundred years, consequently that the pathology and the Medical treatment of this disease are also well known, and require no further study.

But, with your lordship's leave, I will place before you the opinions of the first French and first English Medical Practitioners, on the pathology and the Medical treatment of this so-called syphilitic disease; and I will analyse their opinions, and I will point out the result of this analysis for your lordship's information.

These gentlemen are answerable for their opinions—I am answerable for the analysis of their opinions.

When this is done, your lordship will see, that in the interest of humanity, that in the interest of the public, and that in the interest of the army, this so-called syphilitic disease ought to be studied scientifically by the Army Medical Department.

But, before bringing under your lordship's notice the opinions of the most distinguished Medical Practitioners with whom I have had opportunities to consult for nearly fifty years—relative to the pathology and Medical treatment of the so-called syphilitic disease—permit me

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Surgical Transactions, published 1819.

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But, before bringing under your lordship's notice the opinions of the most distinguished Medical Practitioners with whom I have had opportunities to consult for nearly fifty years—relative to the pathology and Medical treatment of the so-called syphilitic disease—permit me

to place before you what have been the opportunities I have had to see, and to study this disease at the bedside. Others will tell you what right I have to express an opinion on its pathology, and on its Medical treatment.

I have served in the army, and I have had my share of practice—whether in the army in this country, or on foreign service—or in private practice in Paris, or in London.

When I entered the army, in 1811, I was sent to Portugal. Then all ulcers on the genitals were considered to be syphilitic, and the Medical treatment was mercury, till salivation was induced. The consequence was, that many lives were lost, scores and scores of men suffered the cruelest mutilation that man can suffer, and hundreds and hundreds were rendered unfit for military duty.

At the same time that the Portugese Medical officers treated these ulcers on the genitals as non-syphilitic ulcers, by simple ablution, and without mercury, they cured their patients sooner than us, and without any bad consequences. *See Dr. Ferguson's—Inspector-General of the Portugese Army Medical Department—paper, in the 4th vol. of the Medical and Surgical Transactions, published* 1819.

After the peace in 1814, I was doing duty in December, 1814, at Fort Pitt Hospital, Chatham. In January 1815, two men were admitted into my wards one morning, both having had connection with the same woman the day before—both had ulcers on the genitals.

With these two men I determined to try the ex-

periment, to administer mercury to one, and to do nothing for the other—but to order him to keep the ulcers clean by ablution, night and morning.

This man was discharged, cured, eight days after his admission, and he might have been discharged three days before, but I kept him in hospital to observe what might occur. I accidentally saw this man some months after perfectly healthy.

The unfortunate man, to whom I administered mercury, went from bad to worse; his ulcers increased. I obtained the best Medical advice for him I could lay my hands on. No expense was spared; and had he been the Regent of England, he could not have had more zealous and more devoted care bestowed on him than he received from all the Medical officers of the hospital at Fort Pitt.

But mortification came on, and two months after his admission we had to lament his loss.

After the army entered Paris, in 1815, I was attached to the hospital at St. Denis, where I had charge of the syphilitic patients.

While at St. Denis, I took the opportunity to visit and to attend the civil hospitals in Paris, devoted to the treatment of the primary and secondary stage of this so-called syphilitic disease.

In the beginning of 1816, I was on duty at the General Hospital at Valenciennes. The garrison of Valenciennes was composed entirely of English troops. The municipal law, relative to the fallen women, was rigidly carried out by the French authorities.

Yet, an epidemic outbreak of ulcers on the genitals occurred, that could not be accounted for on the score of connection with infected females. *See Dr. Evans'—then Surgeon of the 57th Regiment—Report*, published in 1819.

I had my share of such cases in the General Hospital. I gave no mercury, and my patients were cured rapidly by attention to ablution of the ulcers night and morning, and by keeping the patient in bed.

Since 1816, either while I remained in the army, or since I have been in private practice—now forty-eight years—I have never prescribed one grain of mercury, for the cure of ulcers on the genitals, and I have the satisfaction to meet, occasionally, friends and former patients of mine—so treated without mercury, for ulcers on the genitals,—themselves, their children, and their grand-children, perfectly healthy.

On the return of the army of occupation from the north of France, in 1818, I was placed on half pay. I settled in Paris as a Medical Practitioner, and for seven-and-twenty years I lost no opportunity to see this so-called syphilitic disease, both in the public hospitals and in private practice, and to consult with the first Medical Practitioners in France, who had, and who have European reputations, on this disease. And with your lordship's leave, I will now place before you, in alphabetical order, the names of these gentlemen, with their opinion on the pathology and Medical treatment of this so-called syphilitic disease.

Alibert, Doctor, and chief Physician to the Hospital

St. Louis, in Paris, well known in the Medical world as the author of a valuable work on the diseases of the skin, with plates.

This gentleman was in the habit of stating in his public lectures at his hospital—and I have had opportunities to hear him repeat the same in private consultations—that he considered all ulcers, on the genitals, or any chronic ulcer on any other part of the body, or any cutaneous eruption on the body, which could be cured by mercury, to be syphilitic.

But if he were informed that the patient never had had connection, his reply was, "*he has inherited this disease from his father, or his mother, or from his grandfathers, or grandmothers, &c.*"

Biet, Doctor, also one of the Physicians of the Hospital St. Louis, in Paris, and also one of the best authorities, in his days, on diseases of the skin.

His opinion was, that no Medical Practitioner could point out the diagnosis between a primary syphilitic, and a non-syphilitic ulcer on the genitals; or on any other part of the body.

But that every Medical Practitioner, acquainted with his profession, could point out the diagnosis between a syphilitic and a non-syphilitic eruption on the body—in other words, secondary symptoms of syphilis.

Cullerier, Doctor (Nephew), Médecen de l'Hopital du Midi à Paris (Lock Hospital of Paris.

This gentleman stated—both at the bedside, in his hospital, and in private consultations—that he considered all ulcers on the genitals, or chronic ulcers on the lips,

the tongue, or in any part of the throat, as syphilitic, and to be treated by mercury.

Duputrain, Baron, Professor of Surgery, and Chief Surgeon to the Hospital Hotel Dieu in Paris, with whom I have had frequent opportunities of consulting, relative to this supposed syphilitic disease. He used to say, that the very fact that an ulcer was on the genitals, was for him the proof that it must be a syphilitic ulcer.

But if the patient told him he had not had any connection for a year, then he said that the individual had caught the disease at the water-closet; and every eruption in the skin, which lasted above ten days, was, according to him, syphilitic; as also ulcers in the throat, on the tongue, &c., and to be treated by mercury.

Marjolin, Doctor, Professor, and chief Surgeon at l'Hopital Baujon. At an important consultation in 1827, where there were thirteen Medical Practitioners, he admitted that he was not aware that there was any Medical Practitioner that could point out the diagnosis between a primary syphilitic, and a non-syphilitic ulcer on the genitals, or on any other part of the body.

Ricord, Doctor, Surgeon de l'Hopital de l'Urbine—also a Lock Hospital. At a public consultation, two-and-twenty years ago, which I had with him, and at which were present some Medical Practitioners, now in London, I brought him to admit, that neither by the eye, or by the touch, could he establish a diagnosis between a primary syphilitic and a non-syphilitic ulcer on the genitals, or any other part of the body. But that he could establish this diagnosis by *inoculation*.

Roux, Doctor and Professor, Surgeon-in-Chief of Hopital de la Charité. He also considered that all ulcers on the genitals, that all ulcers in the throat, that all chronic ulcers on any part of the body, and that all cutaneous eruptions that could be cured by mercury, were syphilitic.

It is seen above, that we have here before us the opinion of seven Medical Practitioners, who, in France, were, and are, held up as the best authorities on the pathology, and on the Medical treatment of this so-called syphilitic disease, and whose opinions are looked up to as authorities in the Medical world, in all countries, up to this day.

From what has been stated above, four of these gentlemen, Drs. Alibert, Cullerier, Baron Duputrain, and Professor Roux, never attempted to study the pathology of this so-called syphilitic disease, so as to be able to establish a diagnosis between a primary so-called syphilitic, and a non-syphilitic, ulcer, on the genitals, or any other part of the body. They assumed that all ulcers, on the genitals, were syphilitic; that all ulcers on the throat were syphilitic; that all chronic ulcers, on any other part of the body, and that all cutaneous diseases, that could be cured by mercury, were syphilitic.

These opinions are empirical, not scientifical; and deserve no attention from pathologists, and from scientific Medical Practitioners.

It was stated above that Professor Marjolin, at an important consultation in 1827, where there were thirteen Medical Gentlemen consulted, admitted that he

was not aware that any Medical Practitioner could point out the diagnosis between a primary syphilitic and a non-syphilitic ulcer on the genitals, or on any other part of the body; and that for his part he did not know of any.

In a not less important case, Dr. Biet gave it as his opinion that no Medical Practitioner could point out the diagnosis between a primary syphilitic and a non-syphilitic ulcer on the genitals, or on any other part of the body.

But that every Medical Practitioner, acquainted with his Profession, could point out the diagnosis between a syphilitic and a non-syphilitic eruption on the skin.

The case for which he was consulted was the following:—

A young gentleman aged sixteen years, had connexion with a female of the town. This was the first time he ever had had connexion. The next day he had connexion with another female of the town.

The day after he presented himself to a Medical Practitioner, with an excoriation on his prepuce. He was directed to have a warm bath, to wash the excoriation night and morning with warm water, and to take some cooling medicines.

Three days after this he was quite well.

Three days after, being quite well, he dined at a public dinner. He got intoxicated, so much so as to be obliged to be carried to bed. During the night he was taken very ill, with vomiting and purging, and with a

severe attack of nettle-rash. He was so ill that a consultation was called. These gentlemen prescribed a warm bath and some medicines, which eased him very much, and he had some hours sleep.

In the morning his whole body was *maculated*, wherever he had rubbed himself strongly, in consequence of the nettle-rash ecchymosis had occurred The Medical Gentlemen in attendance on him pronounced this ecchymosis to be secondary symptoms of syphilis. Other Medical Practitioners were called in consultation, who expressed a doubt that this was a case of secondary symptoms of syphilis; and, by mutual consent, Dr. Biet, then the highest authority on cutaneous diseases, was called in.

He at once pronounced these ecchymosis to be true eruptions of secondary symptoms of syphilis.

It was certain that this young gentleman never had had connection but with these two females of the town.

These two females were found. They were carefully examined by Dr. Biet and the gentlemen composing the consultation. They were found to be perfectly healthy.

Their register at the police was referred to, and they never had been reported as being attacked with ulcers on the genitals. The Surgeon-Inspector was requested to examine them, and he reported them as being in perfect health.

Thus, therefore, it is evident, that the best authority then in France, on cutaneous diseases, was not aware what are the pathognomonic symptoms of syphilitic eruptions on the body.

Dr. Ricord, whose name is mentioned above, is a gentleman well-known in the Medical world, as having paid great attention to the pathology of the so-called syphilitic disease.

It is stated above, that two-and-twenty years ago, that at a public consultation in Paris, relative to the pathology of this disease; that I brought Dr. Ricord to admit that there were no pathognomonic symptoms by which it was possible, by the examination of the ulcer, either by the eyes, or by the touch, to establish the diagnosis between a so-called primary syphiltic and a non-syphilitic ulcer on the genitals, or on any other part of the body; but that he could establish this diagnosis by *inoculation*.

He states, in his third edition of his letters on syphilis, published in 1863, at page 102, that the only pathognomonic symptom of a syphilitic ulcer is, that it secretes inoculable pus, for nearly fourteen days after it has appeared.

And at page 174-5, he adds that, after fourteen days, the ulcer has begun to heal, and that it secretes no longer inoculable pus.

But what is this, but what takes place in all wounds on the human body? For ten to fourteen days, according to the general health of the person, after he has received a wound, the wound secretes a virulent pus. If this pus comes in contact with any slight wound on the surgeon's fingers, or hands, he may lose his fingers, or hands, or his life, without requiring the assistance of a specific syphilitic virus to account for this deplorable event—and after the fourteen days the pus is no longer virulent.

Is not the pus secreted by Herpes præputialis, and by Herpes labialis, inoculable?

Therefore, we must conclude that inoculation is no test of the existence of a specific syphilitic virus.

Dr. Ricord tells us, at page 183, of his letters on syphilis—"*Soyez bien convaincu, qu'en depit de l'acte le plus intime, de la fusion la plus complète et de L'orgasame le plus voluptaeux, avec une peau intègre et une muqueuse irreprochable, on peut sortier sain el sauf des rupports les plus compromettants.*

All Contraire, sayez bien convaincu, qu'une portion de peau déchirer qu'une magueuse éraillée, rendront funestes les attouchements les plus légers; et nous, médècens, nous avons mille précautions à prendee à cet égard."

Again, what does this declaration mean?

That a supposed syphilitic ulcer, in a state of active inflammation, secretes pus, which will inoculate a wound on the genitals, but will not inoculate the skin, or the mucous membrane of the genitals, which is perfectly sound.

But, again, I repeat, what is this, but what takes place in a common fresh wound in a state of active inflammation?

Therefore, by Dr. Ricord's own admission, he has placed before us a common ulcer in a state of active inflammation, and he tells us—"This is a syphilitic ulcer, *because I say that it is syphilitic.*"

To accept Dr. Ricord's opinion, one must never have entered the walls of an hospital, or seen and felt the consequences of a recent wound; and I must here repeat

what I told him two-and-twenty years ago—that when he put forward the assertion, that he could, by inoculation, establish the diagnosis between a syphilitic, and a non-syphilitic ulcer on the genitals, or any other part of the body, I told him, I repeat, publicly, at the above consultation, that he had put an error in the place of another error.

And, finally, it follows, that in France, the Medical Profession know nothing of the pathology of this so-called syphilitic disease, and that their Medical treatment is empirical.

With your lordship's leave, I will now place before you, the names and the opinions of the first English Medical Practitioners, who have a right to have, and to give, an opinion on this pathological question.

But, before doing so, I feel it a duty to express my grateful acknowledgments to the gentlemen who have been so kind as to favour me with their opinions on the question I am now endeavouring to call attention to, and who have allowed me to make what use I pleased of their opinions.

As I am seeking, only, for truth; if, by careful examination of their opinions—founded on careful recorded facts—I can throw any light on the pathology of syphilis, they will be the first to thank me.

If I fail, they will be the first to be grateful to me for having mooted this question.

The deplorable event which occurred in the wards of

the Hospital at Fort Pitt—of which I had charge in the beginning of 1815—as stated above, caused me to pay more attention to the pathology of this so-called syphilitic disease—than is generally done; and, since 1815, I never lost an opportunity to ascertain the opinions of the best informed Medical Practitioner on the pathology of this disease; and your lordship has above the opinions of the best Medical Practitioners in France.

And the same motive, which prompted me to study zealously this disease while I resided in France, prompts me now, in the interest of the public, to call your lordship's attention to this so-called syphilitic disease, as you are in a position to render humanity in general—and the army in particular—the greatest service that can be rendered.

But, before I submit to your lordship, how you can benefit humanity, and the army, permit me to place before you the opinions of thirteen of the first English Medical Practitioners, who also have European reputations—on this question.

Bell, Sir Charles, Professor of Surgery.

I was invited, in 1818, to hear a lecture on syphilis, delivered by the late Sir Charles. He had heard what the Army Medical Officers had observed in the Portugese Army, that is, to consider ulcers on the genitals, as simple ulcers, and not caused by a syphilitic virus, and to treat these with success—without mercury, and without any bad consequences.

Sir Charles fully expatiated on this, to him, error. He pronounced the so-called Hunterian chancre as pathognomonic of the existence of a syphilitic virus, and to be cured, only, by mercury.

Cooper, Sir Astley, Bart.

In 1818, I brought a friend to consult Sir Astley, and, in the course of conversation I put the question to him; what were the symptoms, according to him, pathognomonic, of a primary syphilitic ulcer?

He unhesitatingly informed me—that he knew of no symptom to establish a diagnosis between a syphilitic and a non-syphilitic ulcer.

That he had, long since, made it a rule, in the interest of his patients, not to give a decided opinion on this subject.

That if he were to pronounce, at once, that the ulcers before him were but common excoriations—or common ulcers, and required no medical treatment but ablution and rest, such was the dread of syphilis, that his patients might seek for other advice, and might fall into the hands of empirics, who might destroy their constitution by mercury.

Therefore, he hesitated to give a decided opinion. He was guided in his plan of treatment, according to the impression on his patient's mind. If his patients were under alarm, as to the nature and consequence of their ulcers, he prescribed a very small quantity of mercury, internally, to satisfy them that something was done to eradicate the virus; in the meantime ablution, rest, etc., was enjoined, and a cure soon followed.

If his patients were strong minded men, he enjoined rest, ablution, and some cooling medicines; and success here, also, attended this practice.

Coote Holmes, Esq., Surgeon and Lecturer on Surgery at the St. Bartholomew's Hospital, states,

1.—That he believes in the existence of one syphilitic virus only; and that it is generated in the female, wherever the condition attending prostitution prevails, this is, one woman receiving many men.

2.—That this poison produces ulceration; the character of the ulcer being chiefly dependant upon the nature of the tissue on which it is seated.

3.—That the ulcer, with the indurated base, is, almost without exception, found on the loose tissue, connecting the prepuce and the glans penis.

4.—That the induration ceases when the ulcer is situated on the firm tissue of the glans.

5.—That the absence or presence of the hard base constitutes no distinction whatever between syphilitic and non-syphilitic ulcers.

6.—That the indurated ulcer is rarely seen in women, in whom constitutional symptoms are as common as in men.

7.—That the "soft chancre" is equally the result of the syphilitic poison, and liable to be followed by constitutional syphilis.

8.—That he considers that syphilitic ulcers present appearances by which they may, almost always, be recognised.

9.—That the test of inoculation is a liable source of fallacy.

10.—All sores may be successfully treated without mercury; but some require it more than others.

Curling, Thomas, Esq., F.R.S., Surgeon, London Hospital, says,

That it is often very difficult to ascertain, by the eye, if an ulcer on the genitals, or on any other part of the body, be syphilitic or not.

That according to him there are two kinds of syphilitic ulcers.

1.—That ulcer having a hard base, and known by the name of *Hunterian chancre.*

2.—That ulcer, having no hard base, and known as *the soft ulcer.*

In the first ulcer, that with the hard base, there will occur buboes; but these seldom ran into suppuration. This ulcer is generally followed by secondary symptoms.

The soft ulcer, on the genitals, is, almost always, followed by buboes, which soon suppurate, and are often difficult to be cured.

He doubts that inoculation can assist, as a true diagnosis, as to what ulcer is, or is not, syphilitic.

He believes that syphilis can remain dormant in the constitution for years; then to break out on the individual, and manifest itself also in his offspring.

Fergusson, William, Esq., F.R.S., Professor and Surgeon, King's College Hospital, &c., &c., &c., says—

As to the primary syphilitic ulcers on the genitals,

That he considers the so-called Hunterian chancre as the best proof we have that it is caused by a syphilitic virus.

That yet, he has seen ulcers on the genitals, with a hard base, which were not syphilitic.

Therefore, that it requires great caution, before pronouncing that an ulcer on the genitals is syphilitic, or non-syphilitic.

As to the secondary symptoms of the so-called syphilitic disease, too much caution cannot be exercised by the Medical Practitioner—that such, and such symptoms, are secondary symptoms of syphilis.

And as to establishing a diagnosis between a syphilitic and a non-syphilitic ulcer on the genitals, by the eye, or by the touch, or by inoculation, he does not believe that this can be done.

Gascoyen, George Green, Esq., Assistant-Surgeon, Lock Hospital.

He has no doubt that the ulcer, on the genital organs, which has a hard base, and which goes by the name of the Hunterian chancre, is a true syphilitic ulcer.

But he adds, that there is another ulcer, which is also syphilitic.

This has no hard base. It is, as it were, punched out of the parts. It is readily inoculable. There are small, unhealthy granulations at the bottom of the ulcer, often accompanied by buboes. The discharge from this ulcer resembles ordinary pus—is of a pale yellow colour, &c., &c.

The first ulcer—that known by the name of the Hunterian chancre—if not promptly and properly cured, is followed by secondary symptoms. These are ulcerated in the throat, or ulcers on the lips, or tongue, eruptions on the skin, of a pale yellow colour, falling off of the hair, &c., &c., &c.

He believes that the second kinds of syphilitic ulcer, if left to itself, will often be cured by the efforts of nature, and is not, when promptly cured, usually followed by secondary symptoms.

As to the possibility of establishing a diagnosis between a syphilitic, and a non-syphilitic ulcer on the genitals, by the mere ocular examination, he believes this, in the majority of cases, impossible; and as to inoculation, he believes it to be, *per se*, the best test—though not infallible.

He considers that there is no *one* certain means of establishing a diagnosis between a syphilitic, and a non-syphilitic ulcer; but that by making a careful examination, and attentively noticing the several diagnostic points, between the two kinds of ulcers, in the majority of instances, it is possible to distinguish the one from the other; and, finally, he believes that syphilis, once acquired, can lay dormant in the constitution, and be transmitted to the offspring.

Lane, James Robert, Esq., Surgeon to the Lock Hospital:—

Question 1.—Two ulcers on the genitals being given, one a self-created ulcer—the other, the result of supposed impure connexion. Can a diagnosis be established between these two ulcers, by the mere inspection by the eyes?

Answer.—An ulcer, originating spontaneously; as, for instance, in Herpes. Or an ulcer produced by mechanical abrasion in sexual intercourse, as from the prolonged contact with irritating secretions; as, for

instance, gonorrhœal discharge, cannot, in all cases, be distinguished at once by ocular inspection from a true syphilitic ulcer. But the progress of the case will, in most instances, soon clear up the doubts.

Question 2.—Is inoculation a certain test, that the ulcer, from which the matter was taken, is a syphilitic ulcer?

Answer.—Inoculation, the result being *positive*, is a certain test that the ulcer, from which the matter is taken, is truly syphilitic. But the negative result of inoculation does not necessarily prove the non-syphilitic character of the ulcer, since the inoculation may have failed from various causes.

Question 3.—Is it your opinion that syphilis can remain dormant in the constitution, so as to be transmitted to the third or fourth generation, without having manifested itself in the intermediate generations?

Answer.—My opinion is decidedly against the possibility of any such transmission.

Lawrance, William, Esq., F.R.S, Senior Surgeon to the St. Bartholomew's Hospital, etc., etc., etc.

Question 1.—What are the diagnostic symptoms between a primary syphilitic and a non-syphilitic ulcer on the genitals, or on any other part of the body?

Answer.—This question is too vague to admit of any satisfactory answer. Which of the several primary syphilitic ulcer or ulcers is meant? and what is the affection alluded to as a non-syphilitic ulcer?

Primary syphilitic affections include excoriations, ulcerations—generally superficial—varying in size, form,

number, and other details; or superficial ulcer, accompanied by induration, varying in the degree or situation of the hardness, phagedance, and sloughing. They differ from other diseases of the same parts, not only in local characters, but also in their history and in their progress.

The nature of syphilis, as I understand it, includes, 1st.—Primary sores, occurring after an interval varying from a few days to six or seven weeks, from connexion with a diseased person who indulges in, more or less, promiscuous intercourse. There are other less frequent modes of infection, such as application of the poison to a raw surface; inoculation; or communication from a pregnant mother, labouring under constitutional symptoms, to her offspring. 2nd.—The possible communication of the disease, so contracted, to healthy persons. 3rd.—The occurrence of secondary symptoms in an uncertain and undefined number of the primary cases.

Question 2.—Can inoculation assist us in establishing a diganosis between a primary syphilitic and a non-syphilitic ulcer?

Answer.—I have never practised inoculation of syphilis, having originally felt a repugnance to the proposal, having seen or heard of very serious mischiefs from the proceeding; which seems to me, from the published of others, perfectly useless as a means of diagnosis or guidance on treatment.

Question 3.—In all cases of syphilis, is mercury the chief medicine to which you trust?

Answer.—Mercury is not only useless, but hurtful, in

the sloughing primary affection, which is easily managed by other means; and has not been followed, in my experience, by secondary symptoms. I think mercury the best general remedy in other forms, without believing it absolutely essential, or resorting to it in all cases, or under all circumstances.

Question 4.—Do you believe that syphilis, once acquired, and not radically cured by mercury, can remain dormant in the constitution, and be transmitted to the offspring?

Answer.—This question includes the subjects of radical cure; the length of time during which the disease may be said to remain dormant, with liability to reappearance or communication, and the transmission of it to offspring. It is extremely difficult to collect a sufficient quantity of clear evidence on these points to form the base of positive statements. It would be necessary to know, accurately, in each case, the state of health of two or more persons, for periods, not only of months, but of years. Again, the strong motives for concealment and misrepresentation which exists when syphilis occurs in married life, detracts seriously from the trustworthiness of accounts received from patients.

To my knowledge there is no collection of such histories; nor do I know of isolated cases in which the necessary conditions of trustworthiness was combined.

When primary syphilis has been cured, whether without the use of mercury, and no secondary symptoms has occurred, there is, in my opinion, not the slightest grounds for fearing transmission of disease to offspring:

When primary syphilis has come to an end, either under the use of mercury or without its employment, secondary symptoms may or may not ensue. I consider the probability to be greater in the latter, than in the former instance; but the evidence on this point is not sufficiently abundant and strong to have commanded the general assent of the profession.

If a female, having completely recovered from the primary symptons, should become pregnant, and remain free from disease during the full period of utero-gestation, I should not entertain the slightest apprehension on account of the offspring.

Should a person, so circumstanced, have secondary symptoms after parturition, and should the child continue free from disease, it would show that the so-called dormant state of syphilis is not dangerous to offspring; but, on this point, I have no direct evidence.

If, after the cure of primary syphilis, the person should remain perfectly well for twelve months, there is little chance of secondary symptoms, but such things may occur.

In the successive appearance of secondary symptoms, the intervals may be much longer. I have seen particular symptoms of unmistakeable syphilitic character after the patient had been from seven to ten years free from disease. Such instances are extremely rare, but their occasional occurrence renders it difficult to speak positively on the subject of radical cure.

All these instances have been in males. I cannot believe that any disease could be communicated to a female, by cohabitation, during such healthy intervals.

I have seen instances, and others are recorded, in which women, who have been affected once, and once only, with primary and secondary syphilis, have produced, in three, or even four, pregnancies, either dead infants, or others, having been affected with syphilis after birth.

Healthy children may be brought into the world after two or three unfortunate occurrences of this kind.

Lee, Henry, Esq., Senior Surgeon, Lock Hospital; Surgeon, St. George's Hospital, states,

That there are two kinds of primary syphilitic affections—

1.—That which he calls the suppurating syphilic ulcer.

2.—And that which he calls the primary syphilitic induration, with, or without, a primary ulceration, or the so-called Hunterian chancre.

In the first kind of ulcer, that which he calls the primary suppurating syphilitic ulcer, that is, he says, a local disease, and he never has known it to be followed by constitutional symptoms.

This kind of ulcer is not benefitted by mercury. It may, in the first instance, be destroyed by caustic.

But, where a variety of applications have been made to this ulcer, it is, too often, tedious to cure it. If left to nature, it goes on increasing for a time; then remains quiescent some time, and then begins to heal.

The second kind of primary syphilitic induration, with or without primary ulceration, or the so-called Hunterian chancre.

This kind of primary syphilitic indurated tubercle, or Hunterian chancre, is that kind of ulcer which is usually followed by secondary symptoms.

This kind of syphilitic infection, at its first appearance, generally, attracts but little attention. It is attended with no inconvenience, and the patient is willing to believe that it is all right. As the disease progresses, it assumes one of these forms, which are all modifications of the adhesive kind of action:—

1.—The cuticle may appear as peeled, from the upper part of the glans penis, or the prepuce, or a circumscribed patch may remain for days together, presenting a lived purple colour. The structures below are not infiltered to any extent, and, therefore, there is very limited specific induration.

The secretion consists of epithelial scales, and, lympatic globules of various sizes, and more or less fully formed, is thrown off from the surface. In women, there is, probably, a corresponding affection of some part of the mucous membrane, not accompanied by induration; but, on account of the difficulties attending the investigation of these complaints in these organs in females, such a condition has not, therefore, been described.

2.—An indurated tubercle, with or without ulceration, may form in the skin, or under the mucous membrane, and will then present all the characteristics of the specific induration, without the loss of substance.

3.—The third ordinary form of syphilitic infection, is that which has been called the indurated Hunterian chancre.

It has been stated, that, according to Mr. Lee, the first kind of syphilitic ulcer, that which is called "*The Suppurating Syphilitic Ulcer*," is a local disease; that it can be cured by the simple application of caustic, or, if left alone, can be cured by the efforts of nature; that it does not injure the constitution, and that it is not followed by constitutional symptoms.

But that the second kind, that of primary syphilitic induration, or Hunterian chancre, the time has often been so long, between the time when the patient was infected, till he presented himself to the surgeon, that it is useless to attempt to eradicate the disease by caustic, or even by excision of the past. Mercury must be had recourse to for a radical cure.

He says, that the diagnosis, between what he calls the primary suppurating syphilitic ulcer, and a non-infecting ulcer, depends on the nature of the secretion, or in the existence of induration at the seat of infection, and in the inguinal glands, and upon the inoculability of the secretion, or second time on the same patient.

He further states, that inoculation, is, as a rule, practicable on the same patient, from the secretion of a suppurating sore—never from an indurated sore.

And his opinion, as to the hereditary nature of syphilis is, that it frequently leaves some effects on the children, even when no distinct symptoms show themselves.

That, in other cases, these symptoms may show

themselves up to the period of middle life; and, that in other cases, again the hereditary effects of syphilis may distinctly be cured in the third generation.

Harriot, Dr., Late Surgeon of the 6th Dragoon Guards (Carabiniers), says,

That he was in Sicily, with his Regiment, the 61st Foot, in 1808, where he remained about one year. That at that time ulcers on the genitals were very common, and that they were all considered to be syphilitic; and that they were treated by mercury. That he has seen scores of men attacked with what was then called the "*Black Lion*," and who suffered the cruellest mutilation that man can suffer; and many men were rendered unfit for military duty, in consequence of the abuse of the mercurial treatment.

That the next year he went to Portugal with his regiment, and he served with the army in the Peninsula till the peace of 1814.

He further states that the ulcers on the genitals were as common in Portugal as he had seen them in Sicily; but as he was always in front, with the army, he had not so good an opportunity to see the result of the Medical treatment in the general Hospitals in Portugal, as he had seen in Sicily. But from the testimony of others he apprehends that the result of the Medical treatment was as deplorable in the Peninsula, as he had seen it in Sicily.

At the same time he is aware that these ulcers on the genitals were as common in the Portugese regiments, as in the English regiments; and that the Portugese Sur-

geon treated these as common ulcers, without mercury, and cured their patients without any unfavorable results.

After the peace he was for a couple of years surgeon to the 17th Foot; and, subsequently, he was appointed surgeon to the 6th Dragoon Guards (Carabiniers), in which regiment he remained twenty-five years. His yearly Medical Returns, as to the health of the 17th Foot and 6th Dragoon Guards, are at the Army Medical Department; and it will be seen by these that for seven-and-twenty years he did not administer one grain of mercury in any form, for the cure of ulcers on the genitals; and that he never had one single case of secondary symptoms, either in the 17th Foot or in the 6th Dragoon Guards.

Having had great opportunities to see and to study these ulcers on the genitals, he is not aware of any means to establish a diagnosis between a syphilitic and a non-syphilitic, ulcer, on the genitals, or on any other part of the body.

He believes that syphilis, if there is such a specific disease, is not transmissible from the parent to the offspring; at least, he has never seen such a case.

In bringing forward the opinion of the first Medical Practitioners in London, on the pathology of this so-called syphilitic disease, the name and the opinion of one whom no Medical Practitioner can pronounce with too much respect must be brought forward.

I refer to Mr. John Hunter, whose opinion on the pathology, and on the medical treatment, of this so-called

syphilitic disease is held in such high estimation in this country, and has now taken root in France.

I am aware that to have, and to express, a doubt on Mr. John Hunter's opinion on the pathology, and medical treatment, of this so-called syphilitic disease, may be considered, in this country, hazardous.

But I have imposed on myself a duty, and I shall endeavour to perform this duty, regardless of the smiles or frowns of any one.

The first question we must ask ourselves, after having read Mr. John Hunter's account of what he calls a syphilitic chancre, is this:—was he describing the rise and progress of a chancre, on the genitals, or of Herpes prœputials?

And, that every one may form his opinion and answer the question to himself, I will here place before the reader Mr. John Hunter's description of a chancre, and Dr. Bateman's description of the Herpes prœputialis.

Mr. John Hunter tells us, that the pathognomonic symptoms of a chancre are—that it begins by an itching on the part; that a small pimple, full of matter, appears, which breaks, and forms an ulcer; thickening of the parts comes on—which is of the true venerial kind; is very circumscribed, terminating rather abruptly; the ulcer has the edges a little prominent, and its base is hard; which hardness is a proof of the existence of a syphilitic virus.

See Mr. John Hunter's work on Venereal Diseases, edited by Thomas Bell, Esq., F.R.S. 1835.

Dr. Bateman says,

The attention of the patient is attracted by extreme

itching, with some heat; and on examining the prepuce he finds one, or sometimes two, red patches, about the size of a silver penny; upon which are clustered five or six minute transparent vesicles, which, from their extreme tenuity, appear of the same red hue as the base on which they stand. In the course of twenty-four or thirty hours the vesicles enlarge, and become of a milky hue, having lost their transparency; and on the third day they are coherent, and assume an almost pustular appearance. They commonly break out about the fourth or fifth day, and form a small ulceration on each patch. These have a white base with a high elevation of the edges; and by an inaccurate or inexperienced observer it may be readily mistaken for chancre, more especially if an escarotic has been applied to it, which produces such irritation as well as deep seated hardness beneath the sore such as is felt in true chancre.

This eruption is particularly worthy of attention, because it occurs in a situation where it is liable to occasion a practical mistake of serious consequence to the patient.

I leave every one acquainted with Medical Science to form their own opinion in what Mr. John Hunter's description of the pathognomonic symptoms of a chancre differs from Dr. Bateman's description of Herpes præputialis, and what grounds Mr. John Hunter has to say that the hardness at the base of an ulcer, on the prepuce, is pathognomonic of the existence of a syphilitic virus.

Every one who has seen an Herpetic eruption on the

prepuce is aware that the ulcer which takes place has a hard base; that every solution of continuity on the prepuce has a hard base—not so on the gland; and that if caustic is applied to a perfectly healthy prepuce—the ulcer which follows has a hard base—we have Mr. John Hunter's chancre.

Therefore, where are we in consequence of having trusted to Mr. John Hunter's hardness at the base of a ulcer on the prepuce as being pathognomonic of the existence of a syphilitic virus.

Partridge, Richard, Esq., F.R.S., Professor and Surgeon to King's College Hospital, &c., &c., &c., says,

That he cannot, the first day that an ulcer is remarked on the genitals, say, that that ulcer is syphilitic, or non-syphilitic.

That, in a day or two, after the ulcer has been observed on the genitals, if it has acquired a hard base, then he concludes that the ulcer is syphilitic, and he prescribes small doses of mercury.

But, he is also aware, that ulcers on the genitals, in consequence of the want of proper ablution, etc., etc., etc., may have a hard base, and, therefore, it becomes an impossibility to establish a diagnosis between a primary syphilitic and a non-syphilitic ulcer on the genitals, by the hardness at the base of the ulcer.

He doubts that we can, in all cases, establish a certain diagnostic between a primary syphilitic, and a non-syphilitic ulcer, by inoculation.

His doubts, also, extend to the secondary symptoms, indicated by eruptions on the skin, etc., etc., etc., with regard to which, it is, in some cases, difficult, if not impossible, to distinguish those which have, from those which have not, a syphilitic origin—so also Iritis.

He believes that syphilis can be transmitted from parent to offspring.

Shaw, Alexander, Esq., F.R.S., Surgeon, and Lecturer on Surgery, Middlesex Hospital.

In answer to my question—"What is the diagnosis between a primary syphilitic, and a non-syphilitic, ulcer on the genitals?" Mr. Shaw has been so kind as to address me the following letter:—

"Dear Sir,—If a young man, a patient, informs me, that five days or a week, or even longer, he had had an impure intercourse, and if I saw on his penis, a sore, circular, indurated, with a slightly moist circuitous surface, sharp edges, and red halo around, I would tell him he had got a syphilitic chancre, and that if he had connection with a female, he would give her syphilis.

"I would treat the patient himself, with mercury, subject to modifications that might arise, as the only known method of giving him any kind of protection from secondary symptoms.

"It is scarcely necessary for me to add, that all sores suspected to be syphilitic, are not truly so, and that the discrimination of them, is not always easy.

"But to enter on the subject of diagnosis, fully, would require a thick volume.

"Excuse me for this delay, and

"Believe me to be, yours truly,

(Signed) "ALEXANDER SHAW.

"London, 22a, Cavendish Square, W.

"10*th December*, 1863."

The object in view for calling attention to the pathology of the so-called syphilitic disease, is to point out that the Medical profession, neither in France nor in England, can, by ocular examination, or by the touch, or by inoculation, ascertain that an ulcer on the genitals, or any other part of the body, is syphilitic.

It has been shown above, that the French Medical Practitioners have not one single symptom by which they can, by ocular examination, or by the touch, or by inoculation, ascertain that an ulcer on the genitals, or on any other part of the body, is a syphilitic ulcer.

Above are the names of thirteen of the first English Medical Practitioners. Several of these are distinguished syphilidographers, who have devoted their mental energies and their time, to the study of the pathology, the etiology, and the Medical treatment of this so-called syphilitic disease; and, yet, not one of these thirteen English distinguished Medical Practitioners can inform us how to establish a diagnosis between a syphilitic and a non-syphilitic ulcer on the genitals, or any other part of the body.

Two of these thirteen gentlemen—the late Sir Astley Cooper, Bart.; and Dr. Harriot—both having had great

opportunities to see, and to study, this so-called syphilitic disease, have told us, that they knew of no diagnostic symptom between a so-called syphilitic, and a non-syphilitic, ulcer on the genitals, or on any other part of the body.

Eleven of the above gentlemen have informed us that there are two kinds of syphilitic ulcers—one with a soft, the other with a hard base.

Three of these gentlemen have said—1st Mr. Gascoyen, that the ulcer with a soft base, if left to itself, will often be cured by the efforts of nature; and is not, when promptly cured, followed by secondary symptoms. The 2nd, Mr. Lee, has said that the ulcer with a soft base is a local disease—that it can be destroyed by caustic; and that he never saw this ulcer, when healed, to be followed by secondary symptoms. And 3rd, Mr. Lawrance—an authority which every one respects—tells us that "*mercury is not only useless, but hurtful in the sloughing primary affection, which is easily manageable by other means, and has not been followed by secondary symptoms.*"

Therefore, since, according to the above three gentlemen, this kind of ulcer can be cured by the effort of nature; this is, without the administration of mercury, we have a right to ask them, what proofs have they that this kind of ulcer is syphilitic?

It is evident that they are satisfied that they have before them a syphilitic ulcer, but they have not the means to prove this, by the aspect of the ulcer, or by its consequences.

Consequently, we have a right to conclude that this ulcer, with a soft base, is nothing more than a common, non-syphilitic, ulcer.

Mr. John Hunter and the above gentlemen, however, insist, that the ulcer with a hard base, or which goes by the name of the Hunterian chancre, is a true syphilitic ulcer.

Yet, Professor Fergusson, one of the above gentlemen, whose opinion on this question is second to none, tells us that he has seen, ulcers on the genitals, with a hard base, which were not syphilitic.

Mr. Partridge, a no less high authority, says, that ulcers on the genitals, in consequence of the want of proper ablution, etc., may have a hard base.

Mr. Holmes Cootes informs us, that the induration at the base of the ulcer on the genitals, depends on the tissue on which this ulcer is situated; that this induration ceases when the ulcer is situated on the firm tissue of the glans penis, but is found when the ulcer is situated on the loose tissue of the prepuce.

Therefore, as three out of the above distinguished Medical Practitioners—at the same time that they call attention to the hardness at the base of an ulcer on the genitals, as being pathognomonic—that that hard-based ulcer is caused by a syphilitic virus—yet these three gentlemen warn us, that hardness at the base of the ulcer, depends on the tissue over which this ulcer is situated.

If any doubt remains in the minds of the remaining eight gentlemen, that hardness at the base of an ulcer

on the genitals is not pathognomonic or a syphilitic ulcer, let them apply, I repeat, caustic to a healthy prepuce, and they will have an ulcer with an indurated base —a perfect, so-called, Hunterian chancre, which will leave a hard tubercle that may not disappear for months.

Therefore, it follows, that an induration at the base of an ulcer on the genitals, is no proof that this ulcer is syphilitic.

And, finally, as to the question of inoculation.

It has been seen above, when examining the opinions of the French Medical Practitioners, that inoculation is no proof that an ulcer on the genitals, or on any other part of the body, is syphilitic. Nothing that the English Medical Practitioners have adduced can do away with the fact, that inoculation fails to prove, that an ulcer on the genitals, or on any other part of the body, is syphilitic; and that, consequently, inoculation is an error put forward to maintain another error.

It follows, therefore, from a careful examination of the above thirteen distinguished English Medical Practitioners, that they have no means—either by ocular examination, or by the touch, or by inoculation—to distinguish a primary syphilitic from a non-syphilitic ulcer, on the genitals, or on any other part of the body.

And as it has been also shown above that the no less distinguished seven French Medical Practitioners have no means—either by ocular examination, or by touch, or by inoculation—to distinguish a syphilitic from a non-syphilitic ulcer, on the genitals.

It consequently follows, that since we find by the

above inquiry, that in France and in England, where the Medical Professors are second to those of no other nation in the scientific study and knowledge of their profession—since, I say, the Medical Profession in France and in England have not one pathognomonic symptom by which they can point out the distinction between a primary syphilitic and a non-syphilitic ulcer, on the genitals or on any other part of the body, we must conclude either that the so-called syphilitic disease has never been scientifically studied by the Medical Profession in France or in England, or that there is no such disease as syphilis.

The conclusion to which is here arrived at is not now stated for the first time. I repeat, two-and-twenty years ago, in Paris, at a public consultation, where—after having brought Dr. Ricord to admit that he could not point out, by ocular examination, or by the touch, the diagnosis between a primary syphilitic, and a non-syphilitic ulcer on the genitals, but that he could do so by inoculation; I expressed the conviction at the moment, that I would live long enough to see it acknowledged by the profession,—that inoculation, as a test of the existence of syphilis, was an error; and at page 174-5, of the third edition of his Letters on Syphilis, he has proved that he was in error two-and-twenty years ago, when he asserted that inoculation was pathognomonic, that the ulcer from which the pus was taken was a syphilitic ulcer.

Although there is such a total want of knowledge of

the pathology of this so-called syphilitic disease, both in France and in England, yet, happily, both in France and in England, there is not, now, that abuse in the use of mercury, in the treatment of this so-called syphilitic disease, as was formerly.

We no longer hear of, or see, in the hospitals, those distressing results from the abuse of mercury. Many careful Medical Practitioners now act as the late Sir Astley Cooper, Bart., did, fifty years ago. They prescribe fractional doses of mercury, to satisfy the patient that something active is done to cure him; and, thereby, the patient is saved from falling into less scrupulous hands, time is gained, and nature cures him.

We have above the testimony of Mr. Lawrance, who informs us that mercury is injurious in the sloughing primary syphilitic ulcer.

We have the testimony of Mr. Holmes Coote, who tells us that all sores on the genitals may be cured without mercury.

And we have the authority of Dr. Harriot, who witnessed, in 1808, in Sicily, the abuse in the use of mercury in this so-called syphilitic disease, and the dreadful consequences which followed; and who says, that for five-and-twenty years that he was Surgeon to the 6th Carabinier Dragoons, he never prescribed a grain of mercury, in any form, for the cure of ulcers on the genitals; that he had, on an average, thirty patients a year with ulcers on the genitals; that he merely prescribed ablution, rest, and low diet; that he never had,

during these five-and-twenty years, one case of secondary symptoms of syphilis.

Therefore, we are led to doubt the existence of a so-called syphilitic disease, by the impossibility to point out the diagnosis between a so-called primary syphilitic and a non-syphilitic ulcer; and we are led to doubt the existence of the so-called specific syphilitic disease by the fact that Mr. Lawrance tells us that,—in one kind of syphilitic ulcer the administration of mercury is injurious; by the fact that Mr. Holmes Coote tells us, that all sores on the genitals can be cured without the administration of mercury; and by the fact that Dr. Harriot has cured his patients for the last seven-and-twenty years without the administration of mercury, and that he never had one case of secondary symptoms.

In no disease is the benefit of medical knowledge more valuable than in this so-called syphilitic disease.

How often has the Medical Practitioner in his hands—the peace, the happiness, and even the life of individuals—pure in mind and body—saved or destroyed by his word?

Nearly fifty years ago, two young friends of mine married; they left home on an excursion. About a week after marriage the wife complained of a bubo in the groin. A Medical Practitioner was called in; he pronounced this to be syphilitic.

Her father, an eminent Medical Practitioner in London, was sent for. He satisfied himself that her husband was in perfect health; and the proof that this

bubo was not syphilitic, was that, in a few days, it disappeared by rest and ablution.

But the unfortunate wife's mind gave way. She believed herself to have been deceived; and she was carried to her grave a few weeks after—believing herself to have been deceived and injured by her husband.

The unhappy husband prayed for death. He joined his regiment, in the hopes of being killed; and he fell the first time he went before the enemy.

In the case related above—also a newly married couple—where thirteen Medical Practitioners were called in consultation, Professor Marjolin, and one of the gentlemen consulted, declared, that the case before them, was not one of syphilis. The eleven others declared that this was a case of syphilis. The majority of voters were believed; and the result was the death of husband and wife, by their own hands.

I will take the liberty to mention another case, which occurred in 1829, which appeared in the public papers; and which caused a great sensation in the first class of society.

A young couple belonging to the first rank of society married. A few days after marriage the husband observed something abnormal about his genital organs. He consulted a Surgeon of distinction, who, at once, pronounced this to be syphilis.

The husband requested the Surgeon to examine carefully, stating that he never had approached a woman till he married, a few days ago, his present wife: and that, from *material facts*, he was satisfied that he was the first who had approached her.

The Surgeon maintained his opinion to be correct.

The husband returned home, told his wife what the Surgeon had said; but he did not utter one word offensive to her. He retired to his room, wrote her a heart-rending letter, and destroyed himself.

The unhappy wife submitted to every examination. She was found to be in perfect bodily health. Her mind gave way, and she died broken-hearted in a few months.

The report of such cases might be increased, as well as the report of less tragic cases, which every Medical Practitioner has met with.

The conclusion, to which it is wished to draw attention, is this: That, in our want of knowledge of the pathology of this so-called syphilitic disease, no Medical Practitioner, either in France or in England, can pronounce that an ulcer on the genitals, or on any other part of the body, is caused by a syphilitic virus; and that no Medical Practitioner, who respects himself, ought to declare that he has before him a syphilitic ulcer.

The question is put to me by a distinguished Medical Practitioner, who has a right to an answer. He says—What! Has the Medical world been labouring under a delusion for these last three hundred and fifty years, as to the existence of a syphilitic virus?

Is it probable, that so many eminent Medical Practitioners—who have devoted themselves to the study of this so-called syphilitic disease—is it probable, that none of these gentlemen have ever seen any reason to doubt the existence of a syphilitic virus?

I do not intend to enter into the question what induced the Medical Profession, in former years, to believe in the existence of a syphilitic virus.

All that I wish to contend for is, that now—in the two most distinguished nations in the world, England and France, for their Medical Professors—not one of these gentlemen can point out the diagnosis between a so-called primary syphilitic, and a non-syphilitic ulcer on the genitals, or on any other part of the body.

However, without entering into the question as to what induced the ancient Medical Practitioners to believe in the existence of a syphilitic virus, I submit the following facts; which are matters of history; and which may assist us to account, why the term, "Syphilis," crept into Medical Science.

In the fifteenth century, a cutaneous pustulous eruption was epidemic in Europe. It was said to be contagious—to be communicated by the breath, by the touch, etc.

As the eruption was pustulous—as the genital organs were as liable to be the seat of these pustules, as any other part of the body, on the 6th of March, 1496, the Parliament of Paris passed a law, setting forth that, as there were many persons ill of a certain contagious disease, called "*Great Pox*," it was ordered that such persons who had this disease, if strangers to the town, were to leave Paris in twenty-four hours on pain of death; and that, if any inhabitant of the town had the disease, he was, on pain of death, ordered to remain at home.

Thus this law was promulgated, without any previous Medical inquiry into the truth of the supposed contagious nature of the disease, entailing the miseries which has afflicted the human race for these nearly four hundred years.

It is to be hoped, that before the English Legislature is called on to enact laws relative to this so-called syphilitic disease, that careful Medical inquiry will be carried out, as to the pathology, the etiology, and the Medical treatment of this so-called syphilitic dssease, so that the Parliament of England may not perpetuate the errors of the Parliament of Paris in 1496.

But, says the syphilidographers, have we not proofs at this moment, that an individual, who has had, what is now called, syphilic ulcers on the genitals, which had not been properly cured, by mercury, and which had left an induration on the prepuce; have we not the proof, they say, that this person, in a few weeks, or in a few months, will have unmistakable secondary syphilitic symptoms—such as ulcers in the throat, cutaneous diseases, pustular eruptions on the skin, nodes, necrosis, etc., etc., etc.

The first question we must ask the syphilidographers is, are these diseases pathognomonic of a syphilitic virus? or, can they be induced by no other cause than a syphilitic virus?

It is evident that if the above diseases can be induced by any other cause than by a syphilitic virus, the syphilidographers have no right to assume that the above diseases are caused by a syphilitic virus.

Thus, every Medical Practitioner knows that males are more subject to ulcers in the throat, from birth to forty years old, than females.

That these ulcers occur in consequence of indigestion, or of costiveness, or of a cold, etc.; and that they are, in a few days, cured by a mild laxative and rest in bed.

As to cutaneous diseases, is it not known to the Medical Profession that cutaneous diseases were far more prevalent before the so-called syphilis was thought of? Did not the Arabian Physicians teach us to cure cutaneous diseases by the now-called mercurial ointment centuries before syphilis attracted attention? Hence the use of mercury for the cure of the so-called syphilitic disease.

And as to pustulous eruptions, nodes, necroses, etc., etc.

In 1775, the United States of America invaded Canada, under General Montgomery, and laid siege to Quebec for some months. The crops of wheat had failed that year in Canada, and especially at a place called "*La Baie de St. Paul*," on the eastern bank of the St. Lawrance. The presence of the American army increased the scarcity of bread.

Towards the spring of 1776, a pustulous eruption—attended with nodes, necrosis, etc.—broke out at "*La Baie de St. Paul*," and destroyed a great number of the inhabitants. It spread all over the country, and caused such alarm that the English Government sent Medical Officers from England with food and all kinds of comfort to Canada. This epidemic was supposed to be contagious; and was called by the Medical Profession

"*The New Venereal Disease of Canada.*" But it had this peculiarity, that although said to be contagious, in general the genital organs were not effected. See *Dr. Swediaur on Syphilis.*

Who does not at once see, in this epidemic outbreak of disease, the want of proper food as the cause?

That part of Portugal through which the French army advanced to the lines of Torres Vedras, in 1810, was laid waste by us, as to food for man and beast, as we retired before the French army. The French army, on its advance to, and on its retreat from, Torres Vedras, consumed and destroyed the food for man and beast which had escaped us; and the consequence was, that the inhabitants of that district were in a starving condition; although the English Government spared no expense to relieve them.

After the retreat from Burgos, 1812, parts of the English army were cantoned in that district. I then was Assistant-Surgeon of the 61st Regiment, one of the regiments forming the 6th division of the army. I was in charge of the hospital of the regiment—I devoted some hours every day to receive any poor inhabitant who wished for medical advice, and I thus saw hundreds of the poor creatures labouring under cutaneous diseases—phagedænic ulcer, nodes, necrosis, etc.

All those persons informed me, that they had been quite well previous to the entry of the French into Portugal; and they dated their illnesses from the want of sufficient food.

In 1816, the most of the crops were destroyed on the

continent of Europe, by the deluge of rain that began to fall on the 16th June, 1816, and lasted, almost incessantly, till December.

At the end of 1816, I was attached to the Head Quarters of the Cavalry Divison of the English army of occupation; and I remained with the Head Quarters of the Cavalry Division, till the army returned to England at the end of 1818.

While I was with the Head Quarters of the Cavalry Division, they were moved from Cassel to Mul, near St. Omer, to Hardengan, and to Pont de Breque.

At all these places I made myself useful to the poorer class of inhabitants; and, as a famine raged in France, from the end of 1816 to the end of 1817, and as that part of France, where the English Cavalry Division was quartered, was not excepted, I had great opportunities to see the deplorable effects of the want of sufficient food, in all kinds of cutaneous diseases, ulcers, pustules, nodes, necrosis, etc.

Therefore, I submit, that the syphilidographers are not justified to insist that the so-called syphilitic diseases alone cause ulcers in the throat, cutaneous diseases, ulcers on the body, pustules on the body, nodes, necrosis, etc.

But do we require a specific virus to account for the ravages that an ulcer on the genitals will cause to the human frame, and even to the destruction of life?

Is it not, I repeat, an almost daily occurrence that the slightest wound on the toes, or fingers, will induce buboes in the groin, or axilla; which, if neglected,

suppurate, are very tedious to cure; and, too often, injure the constitution; and, too often, destroy life?

And if such results attend the slightest wound on the toes or fingers, why should not the same consequences follow a slight wound on the genitals, without requiring the existence of a specific virus to account for any distressing result?

Were not ulcers on the genitals known to be dangerous for thousands of years before syphilis was thought of?

With every respect for the Jewish Faith, it cannot be admitted, at this time of day, that circumcision is, a divine ordinance, no more than *ablatio nympharum*.

Moses instituted circumcision, and *ablatio nympharum*, as a hygienic measure, to uncover the glans penis in man and to prevent any foreign substance being detained between the glans and prepuce, and thereby to prevent balanitis and ulceration, and their consequences—so common in warm climates to men not circumcised, and in females the *ablatio nympharum* was ordained for the same hygienic purpose. To insure the performance of these mutilations, it was declared, by Moses, to be ordered by the Divinity.

Does not Celsus, in the eighteenth chapter of his sixth book, nearly fourteen centuries before syphilis was thought of, inform us of the danger of ulcers on the genitals?

Therefore, again I repeat, it does not require the presence of a syphilitic virus, to account for the injuries to the constitution, and even for the destruction of life, which may follow ulcers on the genitals.

To resume—

1st. Since the two most celebrated nations in the world, England and France, for their pathological Professors.

2nd. Since these pathological Professors, cannot, at the bedside, demonstrate the presence of a syphilitic virus.

3rd. Since all the consequences of the presence of this supposed syphilitic virus, may be induced, and are induced, by known and natural causes, irrespective of a syphilitic virus

4th. Since all the consequences of the presence of this supposed syphilitic virus, may be, and are cured, without the administration of its supposed specific remedy—mercury.

5th. We must conclude that there is no such thing as a syphilitic virus.

There is another supposed Enthetic disease, which rages in the army—the pathology, the etiology, and the medical treatment of which is as little known to the medical world, as the pathology of syphilis.

I refer to gonorrhœa.

It is the received opinion in the medical world, that this disease is contracted by the male, only, by connection with a female labouring under gonorrhœa.

But where is the Medical Practitioner, who knows his profession, and who can demonstrate the existence of gonorrhœa in a female?

And where are we with our affirmation, that gonorrhœa can be contracted only by having connection with a female labouring under gonorrhœa? When we meet with individuals, who, previous to an attack of gout, and without having had any connection for months, are first seized with balanitis, and then, suddenly, with a severe gonorrhœa, chordee, etc., which lasts a few days; then opthalmia probably comes on, and then the balanitis and the gonorrhœa are better, then the joints are attacked, and the balanitis, the gonorrhœa, and the ophthalmia, disappear; but, if the inflammation suddenly disappears from the joints, the balanitis and the gonorrhœa reappears, and a troublesome gleet remains, which cannot be cured—but by bringing on another fit of gout in the joints; or, where are we with our diagnosis, if we find an individual attacked with gonorrhœa, in consequence of cutting a tooth? *See Hunter's Work on Venereal Diseases.*

But it is not my intention to enter into the inquiry as to the pathology, the etiology, and Medical treatment of gonorrhœa.

Finally, it has been stated above, that your lordship is in a position to render the greatest service that can be rendered to humanity in general, and to the army in particular.

It has been demonstrated above, that the first Medical Professors in England and in France, are not able to point out, at the bedside, the presence of a syphilitic virus.

As the first Medical Professors in the world cannot point out, at the bedside, the presence of a syphilitic virus, how can it be expected that the Army Medical Officers can be able to point out, at the bedside, the presence of a syphilitic virus ?

As the Army Medical Officers have their patients under their charge, and as they can watch over the health of their patients for years, they are in a better position to study, scientifically, the question, as to the existence of a syphilic virus, than any other Medical Practitioners.

The War Office have an army of upwards of 400,000 men, distributed in various parts of the globe, and a staff of about 1500 Medical Officers, also distributed in various parts of the globe.

If the attention of these 1500 Medical Officers were directed to the study of the pathology, the etiology, and Medical treatment of this so-called syphilitic disease, and if the researches of these 1500 Medical Officers were carefully and scientifically recorded; in a few months there would be an amelioration, as to this so-called syphilitic disease, in the army,—the Army Medical Officers would not go on as they are now going on—to consider every ulcer, on the genitals, as syphilitic, and to be treated only by mercury, and consequently injure their patients.

And, with submission, if from these 1500 Medical Officers, a commission were formed to visit all the Lock Hospitals in this country, to see cases, and to learn the opinions of the Medical Gentlemen in charge;

and then to visit the Lock Hospitals on the Continent —there, also, to see cases, and to learn the opinions of the Medical Gentlemen in charge; then, after their return home, to publish the opinions of the several Medical Gentlemen in charge of Lock Hospitals, whether here, or on the Continent of Europe, with the result of their own researches and observations.

I am satisfied that the result would be a total revolution, as to the pathology, the etiology, and Medical treatment of this supposed syphilitic disease, which, annually, might save thousands of men to the ranks of the army, and hundreds of lives.

I will not take the liberty to press on your Lordship's attention the result of my experience for these last forty-eight years, in the Medical treatment of this supposed syphilitic disease, without mercury.

But, with your Lordship's leave, I will take the liberty to press on your attention, the testimony of a distinguished Army-Surgeon, who has official documents to support his statement. I refer to Dr. Harriot, late Surgeon of the 6th Dragoon Guards, Carabineers, who informs us, that, for seven-and-twenty years, he treated all ulcers on the genitals without mercury—and without having had one single case of secondary symptoms; and, he adds, that your Lordship has, at the Army Medical Department, his yearly medical reports, in support of his present statement; and I will take the liberty to press on your attention Mr. Holmes Coote, Surgeon of St. Bartholmew's Hospital, who says that all ulcers on the genitals may be cured without mercury.

In conclusion, it is hoped, that your Lordship may see, in the facts that have been brought forward, that in the interest of humanity in general, and of the army in particular, that the pathology, the etiology, and the medical treatment of the so-called syphilitic disease, ought to be scientifically studied.

Before closing this letter, I hope your Lordship will further permit me to call your attention to the necessity, that wherever troops are assembled, means ought to be provided where the men can daily wash their genital organs; and that they ought to be warned, that it is the part between the glans and prepuce that requires greatest attention, and especially on both sides of the Frenum.

And, further, to carry out these hygienic measures, the men ought to be subjected to a medical examination once a week, if necessary, as is done in the continental armies. It ought to be pointed out to them that it is an act of humanity to themselves to have this Medical examination

I have the honor to be, my Lord,
Your obedient servant,
DAVID MACLOUGHLIN, M.D.
Member of the Legion of Honour.

P.S.—Since writing the above, a distinguished friend of mine, who devotes himself to the study of hygienic questions, especially connected with the public service, has put the following questions to me:—

1st.—Is the examination of the unfortunate females in Paris, condusive to prevent the spread of syphilis?
2nd.—Are men, *ceteris paribus*, less liable to be attacked with syphilis in Paris than in London?

I will alter the word "syphilis" in the above questions to the word "injury."

As to the first question.

The examination of these unfortunate females is an act of humanity towards them; and I have the testimony of one of the Surgeon-Inspectors, that the examination, so far from degrading these unfortunate females in their own estimation, tends to awaken in them a feeling of respect for themselves—gratitude for the care taken of their health; and often recalls them to a better state of existence.

And if there is such a disease as syphilis, the examination must tend to prevent its spread.

And as to the second question.

I doubt that men are less liable to be "injured" in Paris than in London.

Having a doubt as to the existence of a syphilitic virus, when consulted by a patient in Paris, with an ulcer on the genitals, if he were willing to mention the name and address of the female with whom he had had connexion. As a satisfaction to myself as to the nature of the ulcer I had before me, I spared no expense to arrive at the truth.

The Inspector of these unfortunate females, or a Surgeon, was requested to examine and to report if the female was injured or not.

I regret that I have not kept an account of these unfortunate females, who were thus examined; and how few, very few, were reported to be injured.

It has been seen above, that I was at Valenceinnes, in the spring of 1816, where the examination of these females was carefully carried out; and the very few that were found injured were immediately sent off to the hospital at Lille. Yet, the so-called syphilitic disease, was an epidemic in the garrison. The number of men injured was out of proportion to the females injured; and it was quite impossible to accuse those few unfortunate females of having injured the number of men that were found injured.

See Dr. Evans'—the Surgeon of the 57th Regiment—report, published in 1819.

In conclusion—In my opinion, from the number of men that I have found injured, where the females were found not to be injured, as a rule, it is the man who injures himself, not the female who injures him. And, in support of this opinion, I refer the medical reader to *Mr. John Hunter's Work on Syphilis*, published in 1835, by Mr. Bell; and, at page 316, it is stated—"A gentleman, in the act of copulation."

Such cases as that, I have repeatedly seen in soldiers, and in the higher grades of society; while on service with the army, and in private practice; *and I have, at this moment, a young gentleman, a patient, who has met with the same accident as Mr. John Hunter's patient.*

ROBERT KERR, PRINTER, CHANCERY LANE, W.C.

COPY

OF A

CORRESPONDENCE

WITH

THOMAS WATSON, M.D.

PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS OF ENGLAND.

SUBMITTED

TO THE MEDICAL PROFESSION

BY

Dr. MACLOUGHLIN, M.D.

MEMBER OF THE LEGION OF HONOUR

LONDON:
PRINTED BY ROBERT KERR, 81, CHANCERY LANE.
1863.

PREFACE.

To the Medical Profession.

Gentlemen,

The Royal College of Physicians of London was established for the purpose of advancing the knowledge of Medical Science, and for the purpose of securing to every individual inhabiting London, and seven miles round London, the best Medical Advice that could be obtained.

As the Royal College of Physicians of London had become *effete*, and as it has now passed away, we shall say nothing against it; but let us remember the errors into which it fell—and let us endeavour to avoid them.

The Government has been pleased to create a new College, and to confer on it the honourable denomination of "The Royal College of Physicians of England"

The object the Government had in view in giving this denomination to the College was, that not only it should labour to advance the knowledge of Medical

Science, but that it should secure for the humblest individual in the empire, the best Medical Advice that Medical Science can give.

Having witnessed on the continent of Europe the advantages to Medical Science, to the Medical Profession, and to the public, of having the doors of Imperial Institutions, and of Imperial Academies of Medicine, opened to the Medical public once a week, to hear papers on Medical questions, read, and to listen to the debates carried on amongst the members of these Imperial Institutions, and of these Imperial Academies, of medicine, on these papers, it was deemed advisable to call the attention of the Royal College of Physicians of England to the necessity there is, that the doors of the College should be opened to the Medical public once a week, or once a fortnight, or once a month, to hear papers on Medical questions read, and to listen to the debates amongst the members of the College, on these papers

The College has declined to entertain these suggestions.

Having obtained the leave of the President to publish the correspondence which has taken place on this subject, this correspondence is submitted to the Medical profession for their consideration.

The Government, it may be repeated, formed the College that it might diffuse the knowledge of Medical Science amongst the whole Medical Profession in every quarter of the Empire.

The Government did not form the College that it should shut itself up in its shell, and retain the honourable name it received, without giving proofs that it is entitled to retain this honourable denomination.

The College must not suppose that a favour is asked them to open their doors to the Medical public once a week, as stated above. It is a right that the Medical Profession is entitled to claim.

The College will be allowed some time to re-consider its decision of the 13th December, 1862.

If the College remains deaf to its duty to the Government, to the public, and to the Medical Profession, and will continue to close its doors against the Medical public, and against the advancement of Medical Science, the Medical Profession must be prepared to move the Government to relieve the College from a duty it is unwilling to perform.

We must have no more *Drones* at the head of the Medical Profession, who, like the former College of Physicians of London, might attempt to palm on the public, and on the Medical Profession, as the result of scientific Medical investigations at the bedside, the dreams of their untutored imaginations.

I have the honour to be, Gentlemen,

Your obedient Servant,

DR. MACLOUGHLIN, M.D.

Member of the Legion of Honour.

London, 12*th January*, ~~1834~~, 1863

34, Bruton Street, Berkeley Square.

COPY OF A CORRESPONDENCE

WITH

THOMAS WATSON, M.D.

Copy of a letter addressed to DR. WATSON, *President of the Royal College of Physicians of England.*

DEAR SIR,

Will you permit me to call your attention to the following suggestions? and will you also permit me, if you do not disapprove of these suggestions, to submit this letter to the notice of the Royal College of Physicians of England.

When the Royal College of Physicians of London was established, the object in view was to advance the knowledge of Medical Science, and to secure to the inhabitants of London, and those residing seven miles out of London, the best Medical Advice that Medical Science could command.

It was then composed of the best informed Medical Practitioners in the Empire, and they did much good towards advancing the knowledge of Medical Science, and they rendered much service to the public.

By the last act of Parliament the College is now the Royal College of Physicians of England, and it is now responsible to the public, that in every part of England the humblest individual in the realm shall receive the best Medical Advice that Medical Science can afford.

The College is now composed of the best medically educated, and the most experienced Medical Practitioners in the realm; but yet, as a body, as a College, has it done anything for these last sixty years to advance Medical Science?

During these last thirty years, England has been four times visited by a severe epidemic, which has destroyed hundreds of thousands of our fellow subjects.

The College, without having gone to the bedside, and there interrogated nature; and there ascertained what are the pathognomonic symptoms of this disease; accepted the statements of others, who had not themselves gone to the bedside, and who had made statements as to the pathology of the disease according to their fears, or according to their fancy; and consequently, the report of the College on this epidemic made confusion worse confounded.

Within these last sixty years Medical Science has made great progress; but this progress in this country, is confined to the higher class of the Medical Profession; it has not reached the junior class, so as to give to the public that benefit which the appointment of the Royal College was intended to afford to the less fortunate members of the community.

Therefore, with the view to fulfil the object for which the College was established, and to give the rising generation of the Medical Profession the benefit of the superior Medical knowledge, and the superior professional experience which the College possesses; would it not be useful that the doors of the College be opened

once a week, or once a fortnight, or once a month, to the Medical public, to listen to the reading of papers relative to Medical Science, and to listen to the discussion between the members of the College on these papers?

I am aware that it has been urged against having the doors of the College opened to the Medical public, that the College is a scientific body, not a debating society.

The Royal Society is a scientific body of the highest order, yet it opens its doors to the public, who listen to the papers read, and to the debates carried on amongst the members of the Society—and the consequence is that the knowledge of science is advanced, and that the respect for the Royal Society is increased.

Without going to Vienna, Berlin, or St. Petersburgh, to see what takes place in these Capitals, let us see what takes place in France.

The Imperial Institute of France is also a scientific body of the first order; the doors of the Imperial Institute of France are opened once a week to the public, to listen to the papers on scientific subjects read before them, and to listen to the debates on these papers which takes place amongst the members of the Imperial Institute.

And almost every week papers on Medical questions are read there and debated on, affording the Medical public most valuable information and securing to the Imperial Institution the gratitude and respect of the public.

The Imperial Academy of Medicine of France has also its doors open once a week to the public to listen to the reading of papers on Medical questions, and to listen to the debates carried on amongst its members on these Medical questions; and so highly is this Medical, Tribune esteemed on the Continent, and it may be said all over the Globe, that Medical Gentlemen send from all parts of the Globe papers to be read there before the Academy; and Medical Gentlemen come from all parts of the Globe to listen to the debates on some important Medical question amongst the members of the Imperial Academy of Medicine; and the result is that the knowledge of Medical Science is increased, and the Imperial Academy of Medicine commands and receives the respect and gratitude of the Medical Profession, and the esteem of the public; and, therefore, as the public debates on Medical questions have advanced the knowledge of Medical Science, and as the Royal College of Physicians of England has been appointed to advance the knowledge of Medical Science in England, with sentiments of respect, a hope may be entertained that the above suggestions will not be displeasing to you, and that my letter may be submitted to the College.

Believe me, Dear Sir, yours most truly,

D. MACLOUGHLIN, M.D.

Member of the Legion of Honor.

London, 27*th October*, 1862,
34, Bruton Street, Berkeley Square.

Dr. Watson's answer to the above letter.

16, HENRIETTA STREET, CAVENDISH SQUARE, W.
November 4th, 1862.

Dear Sir,—You ask me in the letter which you have addressed to me as President of the College of Physicians, to submit that letter to the notice of the College, *if I do not disapprove of the suggestion contained in it.*

I am obliged to say that the discussions which you suggest and counsel are already, in my opinion, amply provided for by various societies in this Town, of high repute and usefulness. The Medico-Chirurgical—the Pathological—the Epidemiological and others, and that these societies seem to me much better adapted for such discussions, than the College of Physicians would be.

If however, notwithstanding these opinions of mine, you still should desire to have your letter laid before the College, it shall be.

I must however remark, that in that paragraph of your letter—which relates to the report published by the College on the subject of cholera, you have fallen into some singular mistake.

The two physicians, who, by desire of the College, drew up that report, I say nothing about their acknowledged abilities, were both of them attached to large hospitals, were both of them daily dealing with the disease at the bedside in those hospitals, and elsewhere; and they collected trustworthy information diligently from others, who were also themselves similarly in personal contact with the epidemic.

I am, Dear Sir, faithfully yours,

(Signed) THOMAS WATSON.

To Dr. Macloughlin.

Copy of DR. MACLOUGHLIN'S *answer to* DR. WATSON'S *letter of the 4th November*, 1862.

Dear Sir,

I am much obliged by yours of the 4th instant, in answer to mine of the 27th ultimo, and in reply I beg leave to say that I am aware that there are many valuable medical societies in London.

With submission, the Parliament House in the middle Temple, has rendered, and no doubt will continue to render valuable services in ameliorating the laws of the Empire.

But the public looks up to the Parliament House at Westminster, as the highest authority on legal questions in the Empire.

There can be no doubt that the medical societies in London have rendered, and I trust will continue to render, valuable services in propagating the knowledge of medical science to all parts of the empire.

The public, however, look up to the Royal College of Physicians of England as the highest authority on medical questions in the Empire.

I need not remind you that the Royal College of England was established to advance the knowledge of Medical Science, and to secure to every suffering man in the Empire the best medical aid that medical science can give. And therefore, with your leave, since you have, by your letter of the 4th instant, permitted me to express my wish, allow me to say, that I shall deem it a favour, if you will place my letter of the 27th ultimo before the college.

As to the paragraph in my letter of the 27th ultimo. relative to the Cholera report published in 1854, by the Royal College of Physicians of London, permit me to say that I have no doubt that these gentlemen were esteemed by the College to be the best informed as to the pathology, the etiology, and the medical treatment of this disease amongst the members composing the college, yet these gentlemen can be considered only as having held the pen; the College must be considered as having dictated, and the college must be considered as responsible for this report, and if you will give me two minutes attention I will place before you the proofs.

1st. That the Cholera Report published by the Royal College of Physicians of London, in 1854, is not scientifically drawn up. 2nd. That it affords no proofs that any inquiry, at the bedside, had been undertaken to ascertain—what are the pathognomonic symptoms of cholera. 3rd. That the pathology of cholera, on which this report is based, is copied from the reports of gentlemen who had never studied the disease at the bedside, and who consequently were unacquainted with the pathology of the disease. 4th. That this report ignores the result of scientific researches carried out at the bedside, to ascertain, what is the first deviation from perfect health, which marks the first advent of cholera,—that these scientific researches, carried out publicly in England and Scotland by the whole medical profession, demonstrated this invariable pathological fact, that every individual has a warning, by a diarrhœa, for a

few hours, or for a few days, or for a few weeks, that he is about to be attacked with cholera; and that if this diarrhœal stage is promptly cured, the developed stage of cholera is prevented, and life is safe. 5th. That this report ignores this pathological fact, that where diarrhœa is epidemic, then it is dangerous to administer ½ or ⅓ or ¼ of the usual laxative medicines, lest diarrhœa is induced, too often followed by fatal cholera. 6th. That this report ignores the important practical results to be drawn from these scientific researches — that this diarrhœal stage cannot be too promptly cured—that laxative medicines are contra-indicated, and that their use cannot be too strongly censured in this disease, and 7th. That I am certain you will feel satisfied, that I was right, when I stated to you, in my letter of the 27th October last, that this report had made confusion worse confounded, and I am also certain that you will not only thank me, for having called your attention, as President of the Royal College of Physicians of England, to the unscientific manner, and to the total absence of any knowledge of the pathology of cholera, with which this report has been drawn up, but that you will feel that you were wrong, in stating in your letter of the 4th November last, "*that I had fallen into some singular mistake*"

As to the 1st point.

What would we think of our medical adviser, who, as soon as he arrived at our bedside, before he had inquired into the pathology of the disease under which we laboured, and before he knew whether the disease was in

the first stage, and amenable to medical science, or in the last stage, and beyond all human aid—began by giving us a dissertation on the etiology of our disease, and then presented a plan of medical treatment, without being aware, if this plan of medical treatment, would cure or kill us.

If you will take the trouble to look at the above report, you will see that it begins by placing before the readers, theories as to the etiology of cholera, propounded by gentlemen having given no proofs that they were acquainted with the pathology of the disease, and that the plans of medical treatment placed before the reader, are not based on the knowledge of the pathology of cholera, and are more likely to destroy than to save life.

Therefore I submit that this report on cholera is not scientifically drawn up.

As to the 2nd point.

We look in vain, in this report, for the proofs that any attempt has been made to study the pathology of cholera at the bedside, and there to ascertain what is the first deviation from perfect health, which marks the first advent of cholera, and to trace this first deviation from perfect health, till the disease terminates in the recovery or death of the patient.

Therefore this report fails to give any trustworthy information as to the pathology of cholera.

As to the 3rd point—

When cholera first attracted attention in India, in 1817, the Indian government directed that an inquiry

into the pathology, the etiology, and the most rational plan of medical treatment of cholera, should take place, and that a report should be drawn up and published, so as to be useful hereafter.

In consequence of this direction, every medical officer in India was called on to report what he had remarked as to the pathology, the etiology, and the most rational plan of medical treatment of cholera.

From these reports, Mr. James Jameson, published in 1820, his official report relative to the outbreak of cholera in India, in 1817, 1818, and 1819, and this official report is the first account, relative to the outbreak of this disease in our days, in any country.

In this report, Mr. James Jameson states, *that cholera is a disease "sui generis," "attacking persons in perfect health, suddenly, — with vomiting, spasms, and severe purging of a pale watery fluid, without taste or smell, and destroying life in a few hours."*

In 1823, the Indian government again directed that the pathology, the etiology, and the most rational plan of medical treatment should be inquired into, and again published, for the benefit of the public.

The reports on these questions having been collected from all the medical officers in India, they were placed in the hands of Mr. William Scot, to draw up the official report for the Indian government.

Mr. William Scot published this report in 1824. In this report he considers the statement of Mr. James Jameson, on the pathology of cholera, "*as leaving nothing to be desired.*"

And Mr. William Scot, adds, "*that diarrhœa and cholera are two distinct diseases, and that where diarrhœa is observed to precede an attack of cholera, then, this diarrhœa acts, only, by weakening the individual, and by making him, thereby, more liable to be acted on by the cholera poison.*"

As to the 4th point—

The official reports of Messrs. James Jameson and William Scot having been drawn up under the eyes of the Indian government, by two medical gentlemen, who enjoyed the confidence of the Indian government. These official reports commanded and received the confidence of the medical world, and in no country was any attempt made, previous to 1849, to inquire at the bedside, if these official reports were correct as to the pathology of cholera.

In 1849, cholera having broken out severely here in London, an inquiry was carried out, in nine Unions, here in London, daily, in the presence of, and assisted by about one hundred medical gentlemen, to ascertain if any individual, in perfect health, and of course not labouring under diarrhœa, had been attacked, suddenly, with vomiting, spasms, severe purging, of a pale watery fluid, without taste or smell, and life destroyed in a few hours.

During this outbreak of cholera here in London, in 1849, there occurred in these nine Unions, a total of 3,902 cases of cholera, and every one of these had a warning, by a diarrhœa, for a few hours, or for a few days, or for a few weeks, that he was about to be attacked by cholera.

And it was further ascertained during these inquiries, that if this diarrhœal stage is promptly cured, the developed state of cholera is prevented and life is safe.

See *Cholera Report of the General Board of Health published* 1850, *appendix B., page* 105.

Cholera having broken out again here in London, in 1853, the same inquiry was carried on publicly, in the presence of the whole medical profession of London, and under the Eyes and with the valuable assistance of the Registrar-General, Major Graham, and the gentlemen of his department.

And the result was, that every individual who died of cholera in London, in 1853, had had a warning by a diarrhœa, for a few hours, or for a few days, or for a few weeks, that he was about to be attacked by cholera.

See the Registrar-General's weekly return of births and deaths, for 1853.

See Dr. Macloughlin's inquiry into the invariable existence of a premonitory diarrhœa in cholera.

In 1854, cholera having again broken out in England and Scotland, the Registrar-General was so kind as again to lend his valuable assistance and that of the gentlemen of his department to carry out the same inquiry as had been carried out in 1853.

And again the result was, that every individual who died of cholera in London, in 1854, had had a warning by a diarrhœa, for a few hours, or for a few days, or for a few weeks, that he was about to be attacked with cholera.

The General Board of Health having been made

aware of the importance of the above researches, directed the medical staff belonging to every Hospital, and to every Union, in England and Scotland, to carry out, and to report the result of their researches.

It will be seen by the official reports on cholera for 1854, at the office of the late General Board of Health, from all the Hospitals and Unions in England and Scotland, that every individual admitted into these establishments, labouring under cholera, had had a warning by a diarrhœa for a few hours, or for a few days, or for a few weeks, that they were about to be attacked with cholera.

And it was also ascertained in this outbreak of cholera, that where this diarrhœal stage was promptly cured, there the developed stage of cholera was prevented, and life was safe.

Therefore you see that the researches carried out at the bedside, publicly, in 1849—1853, here in London; and in 1854, by all the medical Gentlemen in charge of hospitals and unions in England and Scotland have proved that every individual has a warning by a diarrhœa, for a few hours, or for a few days, or for a few weeks, that he is about to be attacked with cholera; and that if this diarrhœal stageis promptly cured the developed stage of cholera is prevented and life is safe.

And therefore we must conclude that Mr. James Jameson did not go to the bed side, and there interrogate nature, as to what is the first deviation from perfect health, which marks the first advent of cholera, and that he was in error when he stated that cholera is a

disease," *sui generis*" "*attacking persons in perfect health suddenly, with vomiting, spasms, and severe purging, of a pale watery fluid, without taste or smell, and destroying life in a few hours.*"

And that Mr. William Scot was in error when he stated "*that diarrhœa and cholera are two distinct diseases.*"

The errors committed by these two Gentlemen, Messrs. James Jameson and William Scot, depends on this, that they entirely overlooked the first stage, the diarrhœal stage and considers the disease to have begun only, when persons apparently in perfect health were suddenly attacked with vomiting spasms, and severe purging, of a pale watery fluid, without taste or smell.

Whereas that as every individual in perfect health has fœcal matter in his bowels, and that every medical practitioner is aware that it requires evacuations again and again from the bowels, before evacuations of a pale watery fluid—without taste or smell—can be obtained.

Therefore, it must be evident that Messrs. James Jameson, and William Scot's definition of cholera, applies to the second stage of the disease, when, too often the heart has ceased to contract, and the blood has ceased to circulate, and when, too often, the individual has passed all human aid.

Consequently, the cholera report, published in 1854, by the Royal College of Physicians of London, which has been based on the pathology of the disease as laid down by Messrs. James Jameson and William Scot, ignores the first stage of the disease, and which these

gentlemen considers the disease to begin only when too often the patient is passed all human aid.

As to the 5th point.

That this report ignores this pathological fact, that it was ascertained and published during the above researches, that not only has every individual a warning by a diarrhœa for a few hours, or for a few days, or for a few weeks, that he is about to be attacked with cholera, and that if this diarrhœal stage is promptly cured, the developed stage of the desease is prevented and life is safe; but that it was also ascertained and published for the benefit of the public, that where diarrhœa is epidemic, there it is dangerousto administer ½ or ⅓ or ¼ of the usual dose of a laxative medicine, lest diarrhœa be induced, too often followed by fatal cholera.

As to the 6th point.

That this report ignores the important practical results to be drawn from these researches. That the diarrhœal stage cannot be too quickly cured, that laxative medicines are contra-indicated in this disease, and that their use cannot be too severely censured.

And as to the 7th point.

That I am certain that you will feel satisfied that I was right, when I stated to you in my letter of the 27th October last, that this report on cholera, published by the Royal College of Physicians of London in 1854, had made confusion worse confounded, and that I am also certain that you will not only thank me for having called your attention, as President of the Royal College of Physicians of England, to the unscientific

manner, and to the total absence of any knowledge of the pathology of cholera, with which this report has been drawn up, but that you will feel that you were wrong in stating in your letter of the 4th November last, "*that I had fallen into some singular mistake.*"

And finally I am certain that you will feel grateful to me, to have called your attention to the study of the pathology of a disease to which it is evident the College has paid no attention.

Therefore to resume:—

I trust that it has been demonstrated to your satisfaction. 1st. That the cholera report published by the Royal College of Physicians of London in 1854, is not scientifically drawn up. 2nd. That it affords no proofs, that any enquiry at the bed side had been undertaken to ascertain what are the pathognomonic symptoms of cholera. 3rd. That the pathology of cholera, on which this report is based, is copied from reports of gentlemen who had never studied the disease at the bedside, and who, consequently, were unacquainted with the pathology of this disease. 4th. That this report ignores the result of scientific researches, carried out at the bed side, to ascertain what is the first deviation from perfect health, which marks the first advent of cholera; that these scientific researches carried out publicly in England and Scotland by the whole medical profession, demonstrated this invariable pathological fact, that every individual has a warning by a diarrhœa, for a few hours, or for a few days, or for a few weeks, that he is about to be attacked by cholera, and that if this diarrhœal stage is

promptly cured, the developed stage of cholera is prevented, and life is safe. 5th. That this report ignores this pathological fact, that where diarrhœa is epidemic, there it is dangerous to administer $\frac{1}{4}$ or $\frac{1}{3}$ or $\frac{1}{2}$ of the usual dose of a laxative medicine, lest diarrhœa is induced, too often followed by fatal cholera. 6th. That this report ignores the important practical result to be drawn from these scientific researches, that this diarrhœal stage cannot be too promptly cured; that laxative medicines are contra-indicated, and that their use cannot be too strongly censured in this disease. And 7th, that I am certain that you will feel satisfied that I was right when I stated to you in my letter of the 27th October last, that this report had made confusion worse confounded; and I am also certain that you will not only thank me for having called your attention, as President of the Royal College of Physicians of England, to the unscientific manner, and to the total absence of any knowledge of the pathology of Cholera, with which this report has been drawn up: but that you will feel that you were wrong in stating in your letter of the 4th November last, "*that I had fallen into some singular mistake.*"

If anything were wanted to prove the necessity to have the doors of the College opened to the Medical public, so as to enable the College to learn what is going on for the advancement of the knowledge of Medical Science, it would be found in this report on Cholera published by the Royal College of Physicians of London, 1854.

Cholera, as an epidemic, had, from 1817 to 1854, visited every quarter of the Globe, and it had destroyed millions of our fellow creatures. It had four times, during that period, visited as an epidemic this part of the British Empire, and it had destroyed hundreds of thousands of our fellow subjects.

But neither in this country or in any other had any attempt been made to study this disease scientifically, at the bedside,—till it broke out in this country as an Epidemic, in 1849,—1853, and 1854.

The result of these researches were made public, and the results were deemed of such importance by the Imperial Academy of Medicine of France, that they sent Dr. Mêlier, one of their most distinguished pathologists to London to inquire, and to report.

And the result of these researches were confirmed by researches in Calcutta, in New York, and in Quebec.

Yet, we find the Royal College of Physicians of London in 1854, unacquainted with these researches—and unaware of their importance.

But what could be expected, when we find that the College published their report on cholera without being aware what is the first symptom of the disease, and without having gone to the bedside to study the disease, adopting as the pathology of the disease, the statements of Gentlemen who had never studied the disease at the bedside—who had ignored the first stage and who had taken the last stage for the first stage of the disease !

And to crown the whole placing before the reader, plans of Medical treatment, contra-indicated by the

pathology of the disease, and which have the unenviable merit of assisting the disease in destroying life.

As it is evident from your letter of the 4th instant, that you have not had an opportunity to study cholera at the bedside, and that consequently you are not aware how baneful this report is to the public and to Medical Science.

In the interest of humanity, as cholera will re-appear here next summer, epidemically or sporadically—let me intreat you to appoint a commission of Medical Gentlemen accustomed to study pathology at the bedside, to be prepared to study this disease scientifically, and to report for the benefit of the public, and for the benefit of humanity.

Therefore as the Government has now new modelled the College and granted the College the highest honours that it was in their power to grant ; the College owes it to the Government to do what they can to carry out the humane intention of Government, this is, to secure to the humblest individual in the realm, the best Medical advice that Medical Science can give. The College owes it to the public, who looks up to the Medical Profession in the moment of physical and moral sufferings, for that relief which Medical Science alone can give. The College owes it to the junior members of the Profession who look up to them for advice in the hour of mental anguish at the bedside of an afflicted human being ; and the College owes it to themselves to open their doors and to show to the Medical world, by their superior Medical attainments, that they are entitled to be con-

sidered the head of the Medical Profession in this great empire. I remain, &c,

(Signed) Dd. MACLOUGHLIN, M.D.
Member of the Legion of Honour.

London, 10*th November*, 1862,
34, Bruton Street, Berkeley Square, W.

Copy of a letter from Dr. Pitman *to* Dr. Macloughlin.
December 15th, 1862.

Sir,

I have the honour to inform you that your communication of the 27th October, 1862, addressed to the President, was read at the meeting of the College, held on Saturday, the 13th instant.

I have, &c., &c.
(*Signed*) HENRY A. PITMAN, M.D.
Registrar.

To Dr. Macloughlin.

Copy of a letter from Dr. Macloughlin *to* Dr. Watson, *President of the Royal College of Physicians of England, dated 26th December*, 1862.

Dear Sir,

I have been favoured with Dr. Pitman's letter in answer to mine of the 27th October, addressed to you, as President of the Royal College of Physicians of England, informing me that my letter had been read before the College, but that no steps had been taken,

and that none were contemplated to carry out the suggestions which I ventured to place before you for the consideration of the College.

As the question at issue, is of the first importance to the public, to the medical profession, and to the College, I trust that you will have no objection that the letters, which have passed between us, be published, in the hope that some more influential member of the profession may be found, who viewing the question in the same light I do, will feel it his duty to press this question on the attention of the College.

I am, &c., &c.,
(Signed) Dr. MACLOUGHLIN.

To Dr. Watson,
President of the Royal College of Physicians of England.

Dr. Watson's *answer to* Dr. Macloughlin, *27th Dec.* 1862.

Dear Sir,

I can offer no objection to your publishing the letters which has passed between us.

Yours faithfully,
(Signed) THOS. WATSON.

Dr. Macloughlin.

Robert Kerr, Printer, 81, Chancery Lane, London, W.C.

PATHOLOGICAL FACTS.

RESPECTFULLY SUBMITTED

TO *THE*

COMMITTEE OF THE HOUSE OF COMMONS,

Contagious Diseases

APPOINTED TO ENQUIRE

EANS FOR THE PREVENTION OF CONTAGIOUS
CERTAIN NAVAL AND MILITARY STATIONS.

BY

DAVID MACLOUGHLIN, M.D.,

MEMBER OF THE LEGION OF HONOUR.

LONDON:

PUBLISHED BY CHURCHILL & SONS, NEW BURLINGTON STREET.

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with the Author's best wishes

MEMORANDA.

That as in every country the existence of a specific syphilitic virus has been assumed—not demonstrated by any scientific medical researches at the bedside.

That as the House of Commons has been pleased to direct that an enquiry shall be carried out to ascertain how to protect the sailors and soldiers from contagious diseases at certain Naval and Military stations.

And that as a disease rages in the navy and army, which is assumed to be propagated by a so-called syphilitic virus,

It is respectfully submitted that the 1st question to be enquired into,—

Is there such a thing as a specific syphilitic virus?

2ndly.—If so, what are the pathognomonic symptoms by which its presence can be ascertained? and

3rdly.—What are the means by which the sailors and the soldiers can be protected from this syphilitic virus.

Therefore, a hope is entertained that some pathological facts, relative to the non-existence of this so-called

syphilitic virus, will be permitted to be brought before the Committee of the House of Commons, now assembled, to inquire into the means for the prevention of contagious diseases at certain naval and military stations.

From the anatomical formation of the genital organs of the male and those of the female of the human species, they require more hygienic attention than any other part of the body.

Hence, we find that from the remotest antiquity diseases of the genital organs attracted attention, and so much so, that circumcision was performed as a hygienic measure, and then enforced as a religious ceremony.

In the latter end of the fifteenth century, an epidemic pustular eruption raged in Europe. It attacked every part of the body, and the genital organs were not excepted.

Without any scientific investigation, this disease was assumed to be contagious; and, as sexual intercourse is the most immediate contact that can take place, it was said to be propagated by sexual intercourse.

Hence, began the idea of a specific syphilitic virus.

There are three opinions now in the medical profession, as to the proofs of the existence of a specific syphilitic virus. The 1st opinion is—that all ulcers on the genitals, having a hard base, are caused by a specific syphilitic virus.—The 2nd opinion is—that no one, by the use of his eyes, or by the use of his touch, can ascertain the existence of a specific syphilitic virus, but that he can do so by inoculation—this is by taking the pus secreted by an ulcer on the genitals, during the

first fourteen days of its appearance, and, with the point of a lancet, inserting this pus under the cuticle, as is done when we perform the operation of vaccination. If this pus, introduced under the cuticle, induces a pustule, followed by an ulcer, this is considered, by the syphilidographers, to be the positive proof of the existence of a specific syphilitic virus in the ulcer from which this has been taken.—And the third opinion is—that no Medical Practitioner can, by the use of his eyes, or by the use of his touch, or by inoculation, ascertain the existence of a specific syphilitic virus.

Therefore, after nearly four hundred years, that this supposed syphilitic virus first attracted attention, we are now no better acquainted with the pathology of this virus, than we were then; unhappily, we go on now prescribing as recklessly for our patients as we did then, and we not only too often injure the constitution, and destroy the life of our patients, but too often we destroy the peace and happiness of pure and virtuous individuals.

Let us enquire what claim any one of these three opinions has, to be accepted as correct, by the medical profession.

1st. As to the hardness at the base of an ulcer on the genitals being a proof of the existence, in that ulcer, of a syphilitic virus.

This hardness depends on the part of the genitals on which the ulcer is situated. Thus, if the ulcer is situated on the gland, there is no hardness at the base

of the ulcer; but if the ulcer is situated on any part of the prepuce, this hardness at the base, *occasionally*, occurs.

In the female it is impossible to ascertain if an ulcer in the vagina, on, or in, the uterus, has a hard base.

In the absence of proper ablution, and, of course, without having had any connection, we find ulcers on the genitals occurring—especially in warm climates, and, in summer, in cooler climates—which may have, and do have, a hard base; and, therefore, this hardness cannot be said to depend on a specific syphilitic virus.

Again, the disease known under the name of Herpes prœputiales, which, in warm climates — and, in the summer season, in cooler climates—so often attacks the male and female organs of generation, and, of course, without having had connection, has, often, a hard base; and the hardness will remain for weeks after the ulcer has healed. Therefore, this hardness at the base of an ulcer caused by Herpes prœputiales cannot be referred to a specific syphilitic virus.

Again, an accidental solution of continuity—of course, without connection—has, *commonly*, a hard base, and this hard base will also remain for weeks after the solution of continuity has healed; and here, also, we cannot refer the hardness at the base of this accidental solution of continuity to a specific syphilitic virus.

And again, if we apply caustic to a perfectly sound prepuce, we induce an ulcer with a hard base—a perfectly, so-called, Hunterian chancre; therefore, here also we cannot refer this hardness to a specific syphilitic virus.

Consequently, with these facts before us, because an ulcer on the genital has a hard base, we are not justified to pronounce that this hard base is caused by a specific syphilitic virus.

2nd. Is inoculation a proof of the existence of a specific syphilitic virus?

Dr. Ricord, who has done so much to advance the knowledge of the pathology of the so-called syphilitic disease, and who is admitted, and deservedly, to be the first syphilidographer in Europe, tells us,

"*Que le chancre est a la vérole, ceque la morsure du chien enragé est a la rage.*"

This is the platform on which he stands to maintain the existence of a specific syphilitic virus.

But before going further let us see what he means by a chancre.

Dr. Ricord tells us that all ulcers on the genitals which for fourteen days after their first appearance secrete pus which is inoculable,—that ulcer from which this pus has been taken is a syphilitic ulcer.

Now, the bite of a rabid dog induces a disease that has a certain train of symptoms that cannot be referred to any other cause than that of the bite of the rabid dog.

But if we believe Dr. Ricord, the chancre secretes a pus which will induce *thirteen diseases*—which thirteen diseases may be, and are induced by other causes, than by the pus secreted by a supposed chancre.

Therefore, the comparison between the chancre, and the bite of the rabid dog, is not correct, and is no proof of the existence of a specific syphilitic virus.

But further, is not Dr. Ricord aware that every solution of continuity for fourteen days, from the first occurrence of the solution of continuity, secretes a virulent pus, which if accidently introduced into another solution of continuity, will here induce inflammation and all its consequences? And is it not well known to every surgeon, that if he has any, however slight, solution of continuity on his fingers, or on his hands, and that he does not protect this from the contact of the pus secreted by his patients wound, he has every chance to have his solution of continuity attacked by inflammation, and he may in consequence, lose his finger, or his hand, or even his life?

Again, is not Dr. Ricord aware that pus secreted by herpes prœpuciales, or by herpes labialis, is inoculable—so much so—that every surgeon takes care not to apply ointments or lotions to herpes prœpucials, as both carry the virulent pus to the health skin, which it corrodes and forms fresh herpetic eruptions?

And is not every nurse aware that if when she has washed the child's face, who is labouring under herpes labialis, that if she is not particularly careful to dry the face, and to keep the herpetic eruption perfectly dry—this secreted pus from this herpetic eruption, will be conveyed to the healthy skin, there induce herpetic eruption, and so on, till the child's face and head is one mass of scabs, and too often destroys the child's life?

Therefore with these facts before us we feel justified to conclude that Dr. Ricord is in error when he asserts that because an ulcer on the genitals secretes innoculable pus for fourteen days after its first appearance, that that ulcer from which this pus was taken is a chancre.

And again we must conclude that his comparison as to the virus of a chancre and as to the virus of the rabid dog is also an error.

And therefore we must conclude that inoculation is no proof of the existence of a specific syphilitic virus.

But exclaims Dr. Ricord now, as he did two-and-twenty years ago, when we had a public consultation with him on the pathology of syphilis,—"do not conclude so fast that I am in error as to inoculation, I will prove that I am right, and that there is a specific syphilitic virus by the secondary and the tertiary symptoms.

I am now as willing to enter the arena with him on this question, on his own terms, as I was two-and-twenty years ago; and again, I am willing to demonstrate to him—"*Cartes sur table*"—and to any medical practitioner who has a right to have, and to express, an opinion on this pathological question.

That Dr. Ricord has not one, so-called, secondary, or tertiary symptom, by which he can prove the existence of a specific syphilitic virus; and I will demonstrate—again "*Cartes sur table*,"—by the medical treatment of the so-called primary, the secondary, and the tertiary symptoms of the so-called syphilitic disease—that there is no such thing as a specific syphilitic virus.

It has been stated above that, according to Dr. Ricord, the pus secreted by a chancre induces thirteen different diseases. Thus—1st, a primary, simple, non-infecting chancre on the penis—2nd, bubos—3rd, phymosis—4th, phagedenic chancre—5th, indurated chancre, called, also, Hunterian chancre, infecting chancre, hardened sore—6th, cutaneous eruptions—7th, condylomata—8th, ulcers in the throat—9th, syphilitic iritis—10th, ecthyma—11th, rupia—12th, nodes—and, 13th, diseases of the bones.

Let us see what connection can exist between any of these thirteen diseases and the so-called specific syphilitic virus.

1st. As to the primary, simple, non-infecting chancre on the penis.

According to Dr. Ricord, an ulcer on the genitals which secretes an inoculable pus, is alone entitled to be called a chancre. Therefore, as this is a simple, non-infecting ulcer, it therefore does not secrete inoculable pus; it has no right to be classed as a chancre, or to be supposed to be induced by a specific syphilitic virus.

2nd. As to buboes

Is it not known to every surgeon that the slightest solution of continuity on the fingers or toes will induce buboes in the axilla or in the groin, followed by danger to, if not, loss of, life? And is it not also well known to every surgeon, that the slightest solution of continuity—of course without having had connection—on the genitals, if neglected, will, and does, too often, induce buboes—which also, too often, endangers, if they do not destroy,

life; and all these effects without the possibility of referring them to the effects of a specific syphilitic virus?

3rd. As to Phymosis.

Again, is it not well known to every surgeon, that in consequence of the neglect of proper attention, balanitis and phymosis follows, again, without having had connection, and consequently without being caused by a specific syphilitic virus?

4th. As to phagedenic chancre.

Again, is it not well known to every surgeon, that in the months of July, August, and September, in all countries, the slightest solution of continuity on any part of the body, too often becomes a phagedenic ulcer? And as the genital organs form no exception to this rule, therefore we find phagedenic ulcers on the genital organs where ablution has been neglected, or any solution of continuity has occurred—which may, and too often does, in a few days, cause the cruellest mutilation that can happen to a man, and too often death; and all this of course without having been exposed to be infected by the so-called specific syphilitic virus.

5th. As to the indurated chancre, or the so-called Hunterian chancre.

It has been stated above that induration at the base of an ulcer is no proof that this induration is caused by a specific syphilitic virus.

6th. As to the secondary symptoms, such as cutaneous eruptions.

If we go to the abode of the less fortunate class of society, where want and misery prevails, there we find every kind of cutaneous disease, unconnected with any exposure to be infected by a specific syphilitic virus.

7th. As to condylomata.

Do we not see the condylomata burst out from under the cutis, and not begin by corroding the cutis, as it ought to do if it depended on an enthetic disease?

Stop! stop! cries the syphilidographer, condylomata are secondary symptoms, and may not his father, or his mother, or his grandfather, or grandmother, have had syphilis, and may not this man have inherited this disease from them?

The reply to this is—that, as no Medical Practitioner can point out the diagnosis between a primary so-called syphilitic ulcer, and a non-syphilitic ulcer, on the genitals or any other part of the body, how can a Medical Practitioner point out a secondary symptom of this so-called syphilitic disease, which disease may be induced by several other causes than a syphilitic virus?

8th. As to the ulcers in the throat.

Is not the masculine sex in the human species more subject to ulcers in the throat from the age of seven to the age of forty, from fatigue, from exposure to cold, from irregularity of diet, &c., than the female sex, and this without any exposure to be infected by a specific syphilitic virus?

But, it may be permitted to ask the syphilidographers, since you cannot prove the existence of a syphilitic virus in a primary ulcer on the genitals, either by the

use of your eyes, or by the use of your touch, or by inoculation, how can you prove the presence of a syphilitic virus in an ulcer in the throat?

Therefore, ulcers in the throat are no proof of the existence of a specific syphilitic virus.

9th. As to syphilitic iritis.

Does not every Medical Practitioner know that iritis is caused by a gouty diathesis? and why, therefore, call in the aid of a supposed entity, which no one knows to account for the cause of a disease? which every one knows to be inherent, and dependant on the human constitution.

Therefore, iritis is no proof of a specific syphilitic virus.

10th. As to the so-called tertiary group of syphilitic diseases, and as to ecthyma, and as to the 11, Rupia.

Again, it may be repeated, what has been said of No. 6 above—that these are caused, too often, by want of proper food, and by want of proper hygienic attention, and that they cannot be referred to any specific syphilitic virus.

As to 12, nodes; and as to 13, diseases of the bones.

Do we not see nodes and diseases of the bones, such as necroses, &c., occurring in every bone of the body, from external violence, from fatigue, from want of proper food, &c., &c., &c.?

Therefore, again we do not require the assistance of a specific syphilitic virus to account for the existence of nodes, or for the existence of diseases of the bones.

And, in conclusion, we must say that the syphylido-

graphers have not one pathognomonic sympton by which they can prove the existence of a specific syphilitic virus.

And 3rd, as to the opinion that there is no such thing as a specific syphilitic virus.

Dr. Ricord, whom, I repeat, is the best syphilidographer now in Europe, tells us,

"*Soyez bien convaincu, qu'en dépit de l'acte le plus intime, de la fusion la plus complète et de l'orgasme le plus voluptueux, avec une peau integre et une muqueuse irriprochable on peut sortir sain, et sauf, des rapports les plus compromettants.*

"*Au contraire, soyez bien convaincu, qu'une portion de peau déchirée qu'une mugueuse éraillée, rendront funestes les attouchements les plus légers; et nous médecins, nous avons mille precautions à piendre à cet égard.*

What does this mean, but that what is supposed to be syphilitic virus, does not attack a mucous membrane or the cuticle, when perfectly free from any solution of continuity; that this virus is *per se* as perfectly innocuous, as pus is, secreted by a common solution of continuity, both this virus and this pus are the same—both require a solution of continuity to be their *nidus*, and there to act as any other foreign matter—excite inflammation, and its consequences. Therefore, by analysing Dr. Ricord's opinion we arrive at the conclusion that he has proved that there is no such thing as a specific syphilitic virus.

And it has been stated above, that I would demonstrate "*cartes sur table*," by the result of the medical treatment, that there is no such thing as a specific syphilitic virus.

In the first place I beg leave to call attention to the testimony of Dr. Hariot, late surgeon for twenty-five years of the 6th Dragoon Guards, carabiniers, because this gentleman was with the army in Sicily and in Portugal during the epidemic, which then raged in the army, under the name of the "*Black Lion*," and which inflicted the cruelest multilation that can be inflicted, on many hundreds of that army.

From the great opportunities he had to see the errors committed by the medical treatment then adopted in the army, and from his careful observations at the bedside, he was induced to treat all ulcers on the genitals as common ulcers—by rest, ablution, and attention to the general health; and speaking from memory, he believes he had, on an average, about thirty patients yearly with ulcers on the genitals, which he treated as stated above, and without a grain of mercury; and during these twenty-five years, he had not one case of the so-called secondary or tertiary symptoms of the so-called syphilitic disease.

I repeat that I particularly call attention to Dr. Hariot's testimony, not only in consequence of the opportunities he had to see this so-called syphilitic disease, and to study it, but in consequence of his monthly and half-yearly medical reports, which are, he tells me, at the Army Medical Department, to vouch for the correctness of his statement.

I will further beg leave to call also particular attention to the testimony of F. R. Skey, Esq., F.R.S., President of the Royal College of Surgeons of England, who has

promised, if called on, to go before the Committee and give his opinion on this question. Mr. Skey's professional acquirements, his position in his profession, and his standing as a valuable member of society, entitles him to have, to give, and to be heard, when he gives his opinion on this question.

Mr. Skey will inform the committee that he is prepared to admit that he has no pathognomonic symptom by which he can establish a diagnoses between a so-called primary syphilitic and a non-syphilitic ulcer on the genitals, or on any other part of the body; and that all ulcers on the genitals can be, and are, cured without the administration of mercury—by hygienic means and rest.

And that as no one can point out what are the pathognomic symptoms of the primary stage of this so-called syphilitic disease, no one can point out the pathognomonic symptoms of the so-called secondary, and the so-called tertiary stage of this so-called syphilitic disease.

Professor of Surgery, William Ferguson, Esq., F.R.S., one of the surgeons of King's College Hospital, a gentleman who stands, and deservedly so, amongst the best authorities on surgical questions, has promised that if called on he will also appear before the committee and state his opinion on this question.

Although Mr. Ferguson is not quite prepared to go so far as to deny the existence of a specific syphilitic virus, yet as he admits that he has seen ulcers on the genitals with a hard base that were not syphilitic, it is

evident that his faith in what is called the Hunterian chancre is shaken, and he doubts that inoculation can assist us to ascertain the existence of a syphilitic virus.

Mr. Ferguson is prepared to censure the use, and the abuse of mercury in this so-called primary, secondary, and tertiary stage of this so-called syphilitic disease, and, he commends, ablution, rest, and attention to diet.

Professer Partridge, F.R.S., and one of the surgeons of King's College Hospital, also a valuable authority has also promised that if called on he will appear before the committee, and give his opinion, which deserves every attention.

As he admits that ulcers on the genitals, owing to want of ablution &c, without having had connection, occasionally have a hard base, and, therefore, that it becomes an impossibility to establish a diagnoses between a primary syphilitic and a non-syphilitic ulcer on the genitals, by the hardness at the base of the ulcer.

His doubts also extend to the so-called secondary and tertiary stage of this so-called syphilitic disease, and he also commends the treatment by ablution, rest, and attention to the general health.

Holmes Coote, Esq., surgeon and lecturer on surgery at St. Bartholomew's Hospital, is likewise a valuable authority, and is also at the disposal of the committee; and is prepared to state that all ulcers on the genitals can be cured, and are cured, without the administration of mercury; and that, consequently, there is no such thing as a specific syphilitic virus, requiring a specific medical treatment.

Two distinguished surgeons, who have been for many years in charge of syphilitic wards in one of the most extensive hospitals in London, have informed me that they have been in the habit of curing all ulcers on the genitals by rest, ablution, and "*Bread Pills*," and that no secondary or tertiary symptoms have followed.

These gentlemen have authorised me to state this—but not to print their names. However, they have authorised me to give their names to the committee, if the committee wished to have their testimony.

And, finally, if I may be permitted to mention the result of my experience, and to state that for the last forty-eight years I have not prescribed one grain of mercury, either while in or out of the army—in private practice; and I can look back to 1816, when I was with the army of occupation in the north of France, and in the garrison of Valenciennes, where ulcers on the genitals were epidemic, so much so that as many as two or three hundred men in some regiments were labouring under ulcers of the genitals.

Friends and patients of mine were also attacked; they were cured without the use of mercury. I still occasionally have the pleasure to see them; they, their children, and their grandchildren, are perfectly healthy.

For seven and twenty years I was in private practice in Paris. I had my share of private practice. I must have seen, on an average, ten persons per month, labouring under ulcers on the genitals. I have spared no trouble or expense to arrive at the knowledge of the etiology of these ulcers—as has already been stated in

my letter to the Secretary of State for War. I repeat, I prescribed no mercury—ablution, rest, and attention to the general health, was the only plan of treatment, and I have not had to lament the occurrence of any secondary or tertiary symptoms in any of my patients.

Therefore, in conclusion, it has been demonstrated above, that the syphilidographers have not one pathognomonic symptom to prove the existence of a specific syphilitic virus; and it has been demonstrated, also above, that all the so-called syphilitic symptoms can be, and are, cured without the use of mercury.

And, therefore, we conclude that there is no such thing as a specific syphilitic virus.

And 3rdly, what are the means by which the men in the navy and army can be protected from attacks of ulcers on the genitals?

In the first place, means ought to be provided by which the men could daily perform ablution of the genital organs.

Secondly, that the men should be informed that the prepuce requires to be fully drawn back, so as to completely uncover the gland, and then to wash off all the mucus they find there most carefully—and especially on both sides of the frenum.

It must not be forgotten that the sailor and soldier generally, comes from a class of society where such hygienic means are not attended to, and they are not of course aware of their importance.

Thirdly, that a medical inspection should take place once a week, during the summer months, and once a

fortnight during the winter months; and that it ought to be the duty of the surgeon to point out, again and again, to the men, the necessity for daily, and the manner to perform, ablution, of the genitals.

In the navy these inspections ought to be carried out even when the ships are at sea, and every man who has had leave on shore should be inspected on returning to his ship.

And, finally, if men are discovered with ulcers on the genitals—if they admit that they have had connection with women of the town, they ought to give their names and address. These women ought to be examined, their cases—whether they have, or have not, ulcers in the genitals—should be taken down, as also the men's cases, and filed by the medical attendant, so as to be referred to hereafter.

DAVID MACLOUGHIN, M.D.,
Member of the Legion of Honour.

June 28, 1864;
34, Bruton Street,
Berkeley Square, W., London.

P.S.—Since the above was printed I have been informed that the Committee will not enquire whether there is, or there is not, a specific syphilitic virus, but that they will assume that it exists; therefore they endorse the decision of the Parliament of Paris in 1496, who assumed that a specific syhpilitic virus existed, and ordered everyone labouring under this disease to be hung if they were seen in the streets, and every

foreigner labouring under this disease to be hung if they remained in Paris twenty-four hours after the promulgation of this Act of Parliament.

Although the Committee does not endorse the hanging portion of the Act of Parliament of Paris of 1496, yet if my information is correct, the Committee leaves the pathological question where it was, and they doom the sailor and soldier to be destroyed by a medical treatment for an imaginary specific disease, as the soldier and sailor is now doomed to be destroyed by cholera—assisted by the medical treatment—because the Government refuses to see that the soldier and sailor receives the best medical assistance that medical science can give.

ROBERT KERR, PRINTER, CHANCERY LANE, LONDON, W.C.

LETTER

TO

HIS GRACE THE DUKE OF SOMERSET,

First Lord of the Admiralty,

RELATIVE TO THE QUESTION

IS THERE A SYPHILITIC VIRUS?

BY

DAVID MACLOUGHLIN, M.D.,

MEMBER OF THE LEGION OF HONOUR.

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PREFACE.

The Admiralty and the War Office having been pleased to give way to the eloquence of facts, and to appoint a Medical Commission, composed of scientific medical practitioners, to study and to report, whether there is, or whether there is not, a syphilitic virus: therefore it is to be hoped that these two departments will see that every assistance be given to this Commission, so that it may be enabled to perform their duty efficiently.

The Commission need not be reminded that they are the first scientific medical commission that has been appointed, in any country, to study, and to report if there is such an Entity as a syphilitic virus; and every one is certain that they will discharge their duty with benefit to the public, and with credit to themselves.

Since this medical commission has been appointed to investigate the above question, a hope may be expressed that other medical commissions will be, hereafter, appointed to study, and to report, relative to the pathology, the etiology, and the medical treatment of other diseases, to which the sailor and the soldier are liable.

And it cannot be too often repeated to the above departments, that medical science has not pronounced its final decision as to the pathology, the etiology, and the medical treatment of any disease, to which the sailor and soldier are liable; and that these two departments have greater means, than any other departments of state, to study these diseases, and thereby to promote the advancement of medical science, and thereby to benefit the public and humanity.

They have, as a rule, well educated medical officers—young, active, zealous—and their only wish is to be useful. The medical officers have their patients under strict discipline—they have them under their observation in sickness, and in health, for years; consequently they are in a position to study the progress, and the result of disease, better than the civilian medical practitioner.

Let the attention of the above departments be called to these favourable circumstances; and, no doubt, they will take advantage of them, and again and again appoint medical commissions—not only to study and to report on the pathology, the etiology, and the medical treatment of every disease to which the sailor and soldier are liable—but when, and wherever, the deaths exceed the usual ratio of mortality.

The above departments may, also, be reminded that medical science is not an oligarchy, but a democracy, where all men are equal.

And it may be permitted to the individual, who first gave the idea, and who first began to form the museum at Fort Pitt, to say that when he began this museum in

1814, his object was to benefit the medical officers of the public service, and not to reserve the advantage to only one branch of the public service.

Therefore, it is with regret, he finds, that the medical officers of the navy are not admitted to profit by the advantages which this museum—now transferred to the Royal Hospital at Netley, and the valuable lectures given there—undoubtedly possess for the advance of medical science.

The museum, and the lectures given there, are the basis of an institution which has rendered, and which will render, valuable service to the public and to the human race, and ought to be opened to the naval medical officers.

And, therefore, the attention of the above departments has, no doubt, never been called to this subject. It is now felt, that it is sufficient to mention this, and the medical officers of the navy will be admitted to all the advantages which the Royal Medical Establishment at Netley possesses.

To His Grace the Duke of Somerse.
First Lord of the Admiralty.

My Lord Duke,

As the Secretary of State for War, has referred my pamphlet, entitled "*Proofs of the Non-Existence of a Specific Enthetic Disease*," to the Admiralty, that I might be sent for, to ascertain what I would advise to be done, relative to the question of the so-called syphilitic disease in the Navy and Army.

As the Admiralty sent for me, on the 4th March last, sought for, and accepted, my advice; and appointed a medical commission to study and to report if there is, or there is not, a syphilitic virus—and if there is a syphilitic virus, what are its pathognomonic symptoms?

And as this is the first scientific medical commission appointed in any country, to study, and to report, if there is or there is not a syphilitic virus; and as this inquiry will not only be beneficial to our country—but to humanity.

Therefore, it is of the utmost importance, that everything should be done by the above two departments, and by every member of the medical profession, who has studied, and who has practised his profession as a science, not as a trade, to assist this medical commission to discharge the duty entrusted to them with benefit to the human race and with credit to themselves.

Consequently, the individual who first suggested the necessity of appointing this Commission, and who, by the evidence of facts, induced the above two departments to appoint this medical commission, will, it is hoped, be permitted to submit to the two above departments, what it is necessary they should do to assist this Commission to do their duty.

And this medical commission will, it is, also, hoped, forgive the individual if he takes the liberty to place before them what he would do, if he were charged to perform the duty entrusted to them.

The above two departments are not aware, that if the English army had not gone to Portugal fifty-seven years ago, the English surgeons would not have had the opportunity to see the humble, but intelligent, Portugese surgeons, cure all ulcers on the genitals, by ablution, rest, and attention to the general health; and cure these ulcers quicker than those attended to by the English surgeons—and without any secondary symptoms.

Whereas, the English surgeons treated all these ulcers, on the genitals, by the administration of mercury, which, not only injured their patient's constitution, but too often inflicted in their patients, the cruellest mutilation that man can suffer, and too often destroyed their life.

Consequently, I say, had the English army not gone to Portugal fifty-seven years ago, in all probability, the Government would not now be called upon to appoint a medical commission to study and to report if there is or if there is not a syphilitic virus.

Had not Mr. Cooke accidentally seen in Germany an experiment on electricity—known to everyone—appreciated by none, but himself—the electric telegraph would not now be established.

As such important results have followed two apparently unimportant facts, observed abroad, one in medical, the other in physical, science the necessity that this medical commission should not only study what can be learnt of the pathology, &c., of this disease, here in London, but in other countries, will be, it is hoped, apparent to the above two departments.

Consequently, after the Commission have satisfied themselves with the information they will receive from the syphilidographers in London, they ought to go to Dublin, to Edinburgh, to Paris, to Vienna, and to Berlin, and satisfy themselves if any syphilidographers in any of these localities, can point out a symptom, or a train of symptoms– pathognomonic of a primary syphilitic ulcer on the genitals, or on any part of the body—or if they can point out a so-called secondary symptom, or a so-called train of symptoms, pathognomonic of the existence of a syphilitic virus; and that, consequently, the so-called secondary symptoms can be induced by no other cause than by a syphilitic virus.

In such an inquiry as this, so beneficial to our country, and to the human race, neither time, or expense should be spared.

When the Commission returns to this country it ought to be placed in charge of the so-called syphilitic wards of the Navy or Army Hospitals, there to pre-

scribe only, ablution, rest, and attention to the general health; and watch for the result of this plan of treatment for at least two years—watching over the men so treated, whether in or out of hospital, during this time, and carefully noting and reporting the results.

It need not be stated that it is expected that the meetings, and that the proceedings of this Commission, should be public; that every thing said, by a witness under examination, or by the Commission itself, should be taken down by an experienced short-hand writer.

And that when the Commission pronounces its decision, it ought to be instructed that it must give the facts on which it bases its decision.

The Commission does not require to be informed what are their duties, and how they ought to proceed to carry out their duties; yet, I entertain the hope that they will permit me to place before them what I would do were I in charge of this commission.

I would feel that the problem I had to solve would be this:—To ascertain if there is a symptom, or a train of symptoms, pathognomonic, of a syphilitic virus.

And, of course, every witness appearing before this Commission should clearly state what are, according to him, the symptoms, or the proofs of symptoms, pathognomonic, of a syphilitic virus.

The Commission need not be told that in our present state of pathological knowledge, there is only one, out of four ways, to prove the existence of a syphilitic virus.

1st—By demonstration, that an ulcer on the genitals having a hard base, the so-called Hunterian chancre;

that this hardness at the basis of the ulcer, is pathognomonic of a syphilitic virus.

2nd—By demonstrating that Dr. Ricard's inoculation test is pathognomonic of a syphilitic virus.

3rd—By demonstrating by accurate pathological facts, collected by the Commission themselves, at the bedside, the existence of a syphilitic virus.

4th—Or by going to the bedside—prescribing only ablution, rest, and attention to the general health—then interrogating nature, and watching, the result of this treatment, and ascertaining if any so-called secondary symptoms or so-called tertiary symptoms follow this plan of treating ulcers on the genitals, and which cannot be referred to any other cause than that of a syphilitic virus.

First, as to the induration at the base of an ulcer on the genitals being a proof of the existence of a syphilitic virus, as stated by Mr. John Hunter.

Every medical practitioner acquainted with his profession, who has read Mr. Hunter's description of a syphilitic chancre, and compared this description with what he finds at the bedside, is aware, that Mr. John Hunter has described the ulcer which takes place in Herpes præputialis* and which commonly has a hard base, as a true syphilitic ulcer.

Consequently, Mr. John Hunter mistook Herpes præputialis for syphilis, and his great name has, therefore, misled the medical profession, on this most important point.

Further, every practitioner is aware that Herpes

* See Bateman on Cutaneous diseases.

præputiales occurs, without having had sexual intercourse, from error in diet, &c., &c.

Further, that no ulcer on the genitals but Herpes præputiales, begins "*by an itching on the part.*" And every one knows that the ulcer which occurs in Herpes præputiales commonly has a hard base; that this ulcer is very tedious to cure; and that when cured the hardness remains for weeks after.

Further, if a perfectly sound prepuce is touched with caustic, the ulcer which follows has a hard base, such as Mr. John Hunter describes to be pathognomonic of a syphilitic virus.*

Further, if a solution of continuity is caused by a cutting instrument, the base of that ulcer which follows is generally hard.

Further, if a musket ball tips the prepuce, the ulcer that follows has a hard base.†

Further, if the part at the junction of the glans with the prepuce is torn, generally, an ulcer, with a hard base, is the consequence ‡

* Two medical officers tried this experiment on themselves, in my presence, at Lisbon, in 1811, and such was the result.

† In the four-and-forty affairs I have been in, I have seen this again and again.

‡ A gentleman in the act of having connexion with his wife—some one came to the door where they were. His wife threw him away violently from her. The glans was torn from the prepuce for about the length of half-an-inch. I was called to see this gentleman immediately. I heard the statement of the case from the husband and the wife. Four days after the injury the hardness at the base of the ulcer began to manifest itself. On the eighth day it wasa perfect Hunterian chancre; and with every care it took some weeks to cure this ulcer, and the hardness at the base remained for weeks after.

And further, the most rabid syphilidographers cannot deny that no ulcer on the glans has an indurated basis. Therefore, the induration at the basis of an ulcer on the genitals is confined only to ulcers on the prepuce.

Where, therefore, is the scientific medical practitioner, worthy of that appellation, who does not see that the hardness at the base of an ulcer depends on the locality, and the tissue of this locality where the ulcer is situated, and the degree of active inflammation which has occurred.

Consequently, induration at the basis of an ulcer, on the genitals, is no proof of the existence of a syphilitic virus; and, consequently, Mr. John Hunter was in error, when he stated that hardness at the basis of an ulcer, on the genitals, is a proof of the existence of a syphilitic virus.

Secondly, as to Dr. Ricord's inoculation test being a proof of the existence of a syphilitic virus.

Every surgeon is aware, that every solution of continuity on the human body, while in a state of active inflammation, secretes an inoculable pus, for ten or twelve days after the solution of continuity has occurred.

Every surgeon is also aware, that, if he has no solution of continuity on his fingers or hands, that he may handle his patients solution of continuity in any way he pleases—with impunity.

But if he has the slightest solution of continuity on his fingers or hands, and if he does not protect this solution of continuity from the contact of the pus,

secreted by his patient's solution of continuity, he may lose his fingers, his hand, or his life.

Is it not known to the medical profession, that a man having no solution of continuity on his genitals, may have, with impunity, sexual intercourse with a woman having ulcers on the genitals.

And is it not known to the medical profession that a man having the slightest solution of continuity on the genitals, cannot, with impunity to himself, have connection with a woman, even perfectly healthy.*

These facts cannot be controverted.

And since it cannot be controverted that active inflammation persists in a solution of continuity for ten or twelve days, that during these ten or twelve days, the pus, secreted by this solution of continuity is inoculable; after that time it is not inoculable.

Is not Dr. Ricord aware of this, that when he tells us that the supposed syphilitic ulcer secretes inoculable pus, only, during the period of active inflammation, that he is telling us, only, what happens in a non-syphilitic ulcer; that he is giving us no proofs of the existence of a syphilitic virus?

Therefore, I must here repeat, what I stated to Dr.

* It is well known to every syphilidographer that "*dans les maisons de tolerance, bien organisée, l'inspection de l'homme est de rigueur*," and if found to have the slightest solution of continuity on the genitals, he is refused admission into the houses. This female inspector gave him a perfectly pathological reason for this refusal—that he would injure himself—that he would conclude that he was injured in the house—"*et la reputation de notre maison serait compromise.*"

Ricord, at a public consultation, two and twenty years ago, on this question as to the proofs of the existence of a syphilitic virus—

I said—"You have displaced Mr. John Hunter's error, and you *have placed your error in its place; you have not advanced, you have retarded, the advance of medical science*, and I shall live long enough to see every scientific medical practitioner acknowledge that you are in error."

Thirdly—It will remain with the Commission to demonstrate, by accurate pathological facts, collected by the commission themselves at the bedside, and by the examination of the facts of well-informed and trustworthy witnesses, that there is, or there is, not, a syphilitic virus.

And *Fourthly*—Therefore, when the Commission have failed—as fail they must—to point out a primary, ulcer on the genitals, pathognomonic of the existence of a syphilitic virus—they will feel it their duty to go to the bedside, and there, having prescribed—ablution, rest, and attention to the general health—for all ulcers on the genitals, they will then watch and see what nature does, and note carefully the result of this experience for at least two years.

The Commission is aware, that it is believed by the great majority of the medical profession in Great Britain and in France, that ulcers on the genitals, which are cured without the use of mercury, are followed, in the individual himself, or in his children, or in his grandchildren, &c., &c., by so-called secondary or tertiary symptoms of syphilis.

Now, it is here of the first importance to remind the Commission that here, also, the problem they have to solve, is this—to find a so-called secondary or tertiary symptom, or groups of symptoms, which can be induced, only, to a syphilitic virus.

The virus of a rabid animal, inoculated by the bite of the animal, induces symptoms that cannot be induced by any other cause than this virus.

The virus of small pox, introduced into the animal œconomy, by inoculation or otherwise, induces symptoms that cannot be induced by any other virus.

And so with the vaccine lymph.

Therefore, it follows, that, if there is a syphilitic virus, it ought to induce symptoms that cannot be induced by any other virus.

But, if we believe the English syphilidograpers, the syphilitic virus induces thirteen diseases, which may be, and are, induced by other causes than a syphilitic virus.

And if we are to believe Dr. Ricord and the French syphilidographers, we must add eleven more diseases to the English thirteen—all of which may be, and are induced by other causes than a syphilitic virus.

Consequently, what proofs are there that one of these twenty-four diseases is caused only by a so-called syphilitic virus?

In conclusion, when the Commission have failed—as fail they must—to point out a primary ulcer, or a group of primary ulcers, on the genitals, or on any other part of the body, pathognomonic of a syphilitic virus.

And when the Commission have failed—as fail they

must—to point out a so-called secondary, or a so-called tertiary symptom, or disease, that cannot be induced by any other cause than by a syphilitic virus,

The Commission will then pronounce its decision—that there is no such thing as a syphilitic virus; and the human race will have reason to be grateful to this medical commision.

In taking leave of the question as to ulcers on the genitals being caused by a syphilitic virus, let me advert to a cause of ulcers on the genitals in the man or in the woman, which, although well-known to the Commission, is not sufficiently attended to by the medical profession.

Everyone knows that females are more liable to spasms than males, and that these spasms attack every part of the body, and too often when they attack the extremities they remain fixed for days, for weeks, for months, or for years, when suddenly they go off, and the person who was just now possibly a cripple, and has been a cripple for years, is in a moment perfectly well.

It is well-known also to gentlemen who particularly attend to female diseases, that the menses may be retained for months by a spasm in the vagina. The uterus secretes the menses regularly, but in consequence of the spasms on the vagina, they are retained in the vagina.

These spasms, I say, are common to the female; we find them in the most virtuous, and in the most abandoned.

And no one, who has not had such cases under his care, can be aware how difficult it is [illegible]

by justifiable mechanical force the spasms on the vagina.*

Where is the medical practitioner who has not been consulted by a perfectly moral couple. The husband will probably show him an ulcer on his genitals, and tell him that every time he has sexual intercourse with his wife, he is certain to have some abrasion on his genitals, which he cures in a few days by ablution.

The wife now informs the medical adviser, that the approach of her husband gives her excrutiating pain, so much so, as to cause her to have an aversion for the husband she loved and respected.

Have this wife examined by an accoucheur, and she will be found to have a spasm on the Vagina, remove this, the husband has no more ulcers on the genitals – the wife's affection for her husband returns, and peace and happiness is restored to this couple.

When a young and vigorous man has sexual inter-

* A lady, the mother of six children, believed herself in the family-way. Her stomach was distended, but her bosom was not enlarged. I saw her for the first time in consequence of an attack of flatulence, when I gave her a dose of æther and laudanum. She passed a great quantity of wind. In an hour the enlargement of her abdomen was gone—it was impossible she could be in the family-way.

Dr. Moreau, the accoucheur, was sent for and requested to examine. There was a strong spasm on the vagina. Anti-spasmodics were administered in large doses, warm baths, &c., and compressed sponges were introduced into the vagina; and retained there, in the hope that the sponge, as it became distended by the moisture of the vagina, would overcome the spasm. It was only after above a month's attendance that the spasm was overcome, and the retained menses were evacuted. —*See Professor Moreau's first volume, "Maladies des Femmes."*

course with a female having a spasm in the vagina, he, too often, uses force. He injures himself. The next day, or the day after, he rushes to his medical adviser, who, if he is a prudent man, will have the female examined before he gives an opinion.

And ten to one the accoucheur will find that the female has a spasm in the vagina, but is otherwise perfectly healthy.

Therefore, when the Commission goes to the bedside and are consulted for an ulcer on the genitals of a man, before they give an opinion as to the cause of this ulcer, they ought, if possible, to have the woman examined; and ninty-nine times out of a hundred she will be found to have a spasm in the vagina, but to be perfectly healthy otherwise.*

There is another point, which, no doubt will not escape the commission, which is this—when a man appears before them with an ulcer in his genitals. If the question is put by them—if this individual is even in the first class of society—do you wash your genitals every morning? instantly, probably, will be the answer, "I use my cold bath every morning." Press him a little farther, and he at last tells you that he never heard of putting back the prepuce, and washing the glans and prepuce every day, and especially on both sides of the frenum.

* I have stated elsewhere that when consulted by an individual having an ulcer on his genitals—supposed to be contracted by sexual intercourse, if he were willing to name the female and give her address, if she were "*une femme soumise*," a surgeon was sent to examine and to report, and there usually the spasm in the vagina was found.

If this person is still further questioned, he will tell you that he felt some pain on Erection, and at last you arrive at the certainty that this man had a slight solution of continuity before he had sexual intercourse.

How often are medical practitioners consulted by individuals who have not had sexual intercourse for many weeks, or for many months, but who now have ulcers on the genitals, which they attribute to be caused, by sexual intercourse, even with their virtuous wife.

Yet the fault is commonly theirs. It is the neglect of proper daily ablution, and of the importance of this daily ablution *of the genitals* very few men are aware.

There is another disease which, no doubt, the commission will feel it their duty to investigate—I refer to gonorrhœa.

Here, also, the commission need not be told that the problem they have to solve is this: To demonstrate that there is, or that there is not, a gonorrhœal virus; and if there is, what are the pathognomonic symptoms of this virus?

Every medical practitioner, who has attended to this disease, is aware that it is impossible to point out, in a female, a symptom, or a train of symptoms, pathognomonic of a gonorrhœal virus.

Therefore, we can study this disease only in the male.

It is known to the medical profession, that a strong, and long-continued, Priapism—without having had any sexual intercourse—is often followed by symptoms

which, to the untutored, are pathognomonic of gonorrhœa.

Again, with men having a gouty diathesis, they will be suddenly attacked, and without having had sexual intercourse, with what again the untutored will pronounce to be true gonorrhœa.

Yet, I repeat, the individual has had no sexual intercourse, possibly for months; nor is he aware that he is gouty, or that his father or mother or any member of his family are gouty.

But, in a week or more, if the supposed gonorrhœa is not interfered with, it will suddenly disappear; and now the person has an attack of ophthalmia. Here, again, the untutored will say, that this person has accidentally inoculated his eyes with the gonorrhœa matter, or that he has caught cold, &c., &c.

This ophthalmia may follow the course of all inflammations, and continue active for ten or twelve days; when, at between two and five o'clock in the morning, this person is suddenly awoke by a cramp in the ball of his great toe. This cramp lasts a few moments.

When the cramp has passed off, he still feels pain in the articulation, on examining, he finds the articulation swollen, the skin red, and exquisitively painful to the touch. He is unable to put his foot to the ground without the greatest pain. He has a regular attack of gout.

But his eyes are free from pain and inflammation, and he has no longer any symptoms of what was supposed to be gonorrhœa.

The attack of gout may follow its usual course, passing from the lower to the upper extremities, for a few weeks, and gradually this person expects to be well in a few days.

But when he thought himself going on quite well, without having had any sexual intercourse, the gout has returned to the urethra, the discharge, &c., is as great as ever, but the gout in the extremities is gone.

The attack of gout in the urethra may again disappear suddenly from the urethra, and again attack the extremities or eyes, then return to the urethra, and after a time it may become a gleet, which cannot be cured, but by bringing an attack of gout to the extremities.

Again, how often are medical practitioners consulted by men, who admit that they are not aware that they have anything serious the matter with them. But they are nervous about themselves; they are annoyed with everything; they are disagreeable to their family and friends, and a plague to their medical adviser.

On placing the finger on their pulse, it is found to intermit; on placing the ear to the chest, the contractions of the heart are also irregular; but there is no blowing sound. He says he never had gout, or had his father or mother, or any of his family.

Yet this person, after having tormented himself, his family, his friends, and his medical adviser for some weeks, is suddenly attacked with, again to the untutored, a regular gonorrhœa; although he has not had any sexual intercourse for many weeks, or many months.

It is such cases as these, which are well known to the scientific medical practitioner, and which induces every medical practitioner acquainted with his profession, to pause, before he pronounces that a discharge from the urethra having this or that colour, being thick, or watery, is caused by gonorrhœal virus.

I repeat, what I have said elsewhere, the scientific medical practitioner has not one symptom, by which he can establish the diagnosis between the discharge caused by an attack of gout, in the urethra, and the so-called gonorrhœal discharge.

Therefore, the medical practitioner ought never to forget, that when consulted for a discharge from the urethra, that he has no right to pronounce this to be a case of gonorrhœa. Too often, at that moment, he has the peace of mind, the happiness, the life possibly, of two virtuous persons—destroyed, or saved, by his word.

But I have gone, on this subject, farther than I have a right to do; and I must apologise to the Commission for having anticipated their decision.

I have no doubt that their decision, on this question, will be also worthy of their scientific medical acquirements, and also of the scientifical medical acquirements of this country.

As the Commission is appointed, by Government, to study and to report, relative to diseases of the genitals, to which sailors and soldiers are liable, it is possible that the Commission will feel it their duty, to place

before the Government some Hygienic advice—how to protect the sailor and the soldier from diseases of the genitals.

The Commission is well aware that, from the remotest antiquity, the diseases to which the organs of generation are liable, attracted attention—hence circumcision in the male and *ablatio nympharum* in the female, which mutilations are practised to this day. The intention, in the male, is to uncover the glans, so as to prevent foreign bodies being collected between the glans and prepuce, and, in the female, also to prevent the collection of foreign bodies.

Therefore, the Commission, no doubt, will see the necessity to recommend that proper places be established where the sailor and the soldier can, every morning, wash their genitals.

And the necessity cannot be too strongly stated, that the genitals of the men should be inspected every week by a medical officer, and that at such inspections it should be again and again repeated to the men, that it is necessary to draw back the prepuce as much as possible, so as to uncover fully the glans at its junction with the prepuce. The men should also be told, at every inspection, that the most essential parts of the genitals to be washed are, at the junction of the glans, and prepuce, and on both sides of the frenum.

Every medical practitioner knows, that when a patient comes to him with an ulcer on his genitals, and that he says he has not had sexual intercourse for, possibly, two or more months—the ulcer is found, nine

times out of ten, on one side of the frenum, and the medical practitioner is then certain that his patient is one of those who never uncovers and washes the glans, the prepuce or the frenum.

However simple these Hygienic means may appear, yet they are of the first importance. If they were carried out, as they ought to be, in the army and navy, we should not hear of 300 or 400 men, out of 1000, being laid up with disease of the genitals in the two services.

I am aware that it is said that I have brought forward nothing new: that all I have written and spoken were well known before.

I will answer to this what I answered on the 26th February, 1840, at a public consultation at La Charité in Paris, where I stood single-handed, before six of the first anatomists, physiologists, and pathologists in Europe, and where after they had demonstrated, to their satisfaction—and to the satisfaction of about two hundred medical practitioners present, that the individual in the bed before them was completely paralysed of the seven-tenths of her body, and that she would die in three days.

They stated, that what I urged to prove that the person in bed before them had not one system of paralysis—that she was in perfect health—that she was an Imposter—that she would not die in three days, to please them, and to annoy me, was nothing new; and that what I said only proved that I was in error.

My reply was—"*Keep this individual in your hospital, one, two, or three months, surround her with every care,*

I shall be the first to thank you. During this time, use the unquestionable pathological knowledge you have, scientifically; you will discover that you are imposed on—that your patient is an impostor—that you are in error. You are honourable men, you will acknowledge your error." *

Therefore, to those who assert that I have brought forward nothing new to prove the non-existence of a syphilitic virus, I say, go to the bedside, use the pathological knowledge you say you have, scientifically,

* It is now above four-and-twenty years since this public consultation took place. This woman is alive and in perfect health—having long since been proved to be the most consummate imposter on record. *See Consultation Medico-legale, sur quelques signes de Paralysies ovaies, et de leur valeur relative, par le Docteur Maclaughlin; Paris*, 1841.

As a tribute of respect, to the above professors, and to the medical practitioners present at the above consultation, I must state, that when it was my turn to speak, I was listened to, with an attention—and with a respect—that I can never forget.

And after I had demonstrated that her right eye—her lower jaw—her tongue—her right arm and hand were perfectly healthy. As she was stated to be completely paralysed of the lower extremities. I said if it is so, the sphincter of the rectum, and that of the neck of the bladder must be paralysed, and her bed must be soiled, and her urine must be alkaline. Her bed was not soiled, and her urine was acid.

I pronounced her an imposter.

The late celebrated professor of physiology, Dr. Gerdy—the moment I had spoken—said—"*These pathological facts are new to us, not one of us has studied such minute points of pathology, we considered them beneath us; but I now see their importance, and we must all thank you for having brought them under our notice.*

Subsequently, four of the above professors, after having satisfied themselves that I was right—sought opportunities to thank me publicly.

and you will arrive at the same conclusion I have—that there is no such thing as a syphilitic virus.

To resume,

First—That the essential question the Commission have to decide is this—Is there a syphilitic virus? and can it be recognised by the sight, or by the touch, or by any other means, in a primary ulcer on the genitals, or on any other part of the body?

Secondly—That the essential question the Commission have to decide here also, is this—To find a so-called secondary symptom, or a so-called secondary disease of the skin, of the muscles, or of the bones, which can be induced, only, by a syphilitic virus.

Thirdly—That any decision to which the Commission arrives at, the pathological facts on which they rest their decision, must be stated.

I have the honour to be,
My Lord Duke,
Your Grace's obedient servant,
DAVID MACLOUGHLIN, M.D.,
Member of the Legion of Honour.

P.S.—I have been favoured with a letter from the Admiralty, copy of which is herewith inserted.

Admiralty, *September* 2, 1864.

Sir,

I am directed by the Duke of Somerset to acknowledge your letter of the 1st inst., and to inform

you, in reply, that the Board of Admiralty and the War Office have decided to appoint a joint committee to inquire into the question of syphilis in the navy and army, which course was urged upon the board by yourself, in connection with the pamphlet addressed by you to the Secretary of State for War.

His Grace desires me to add, that you are at liberty to make any use you think proper of this communication.

I am Sir, your obedient servant,

(Signed) A. BUCKLEY.

To Dr. Macloughlin.

I beg publicly, to express my grateful acknowledgement to the Admiralty, and to the War Office, for having accepted, and for having acted on my suggestion in this matter.

The report of the medical commission, which they have appointed, will inform them that they must, and they will, receive, the gratitude of the human race.

DAVID MACLOUGHLIN, M.D.

ROBERT KERR, PRINTER, CHANCERY LANE, LONDON.

PROPOSITIONS

CONCERNING

THE LEUS VENERA:

WITH

A COMMENTARY.

BY

MATTHEW COMBE, M.D.,

ROYAL ARTILLERY.

EDINBURGH: PRINTED BY MURRAY AND GIBB.

MDCCCLVIII.

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PROPOSITIONS CONCERNING THE LEUS VENERA.

We have violated law upon law, until we stand amidst ruins; and when by chance we espy a coincidence between reason and the phenomena, we are surprised. Beauty should be the dowry of every man and woman, as invariably as sensation; but it is rare. Health or sound organisation should be universal. . . . Esteem Nature a perpetual counsellor, and her perfections the exact measure of our deviations.—*Emerson.*

Non occides, is the commandment of God, yet scarce observed by any man; for I perceive every man is his own Atropos, and lends a hand to cut the thread of his own days. Cain was not therefore the first murderer, but Adam, who brought in death.—*Religio Medici.*

It has been attempted to state the probable number of the population afflicted with rupture, by guessing the proportion of ruptured persons among those who pass under Temple Bar at any given time. If we essayed to guess the number of persons so passing, who at one time or another had suffered from venereal disease, what figures would we employ? There has been lately much said about what modern euphuism calls the Social Evil, and the moral aspects of that question have had much attention bestowed on them. Its dire physical results are little known to any but the surgeon and the statist. Its influence on the momentous questions of the enlisting, efficiency, invaliding, and mortality of soldiers is perhaps only appreciated to the full extent by the army surgeon. What if the "oldest fighting institution" be not so perfect as it seems,—be, in fact, to a lamentable extent, an "empty semblance or clothes-suit," much admired on parade, but when you look a little closer, so tainted to an appreciable degree, as to be little fit for the rough work of soldiering? It is a very serious matter indeed. No eloquence is required to declare the importance of it. Our common conversation in clubs, drawing-rooms, and market-places—wherever

men do congregate,—is prophetic of thick-coming national troubles. We cannot now say whether in the dark day that we feel to be approaching, the army will be called on to face to the east or to face to the west; but of this we are all deeply convinced, that it must be able to show a good front,—or it will be worse for us. Now, if at no other time, must we accept, and think over, and realise the truth of Turenne's maxim,—*Le bien le plus précieux est le sang du soldat*; and we must remember, too, the saying of another great soldier, forgetting its profanity for the sake of the truth it expresses,—Providence is on the side of the strong battalions. When any one has a word to say—though it be but a foolish word—that may help the general good, it is his business and his duty to speak it. As my poor offering, I propose to say a word or two about a cause of widespread physical deterioration, a fruitful source of preventible disease and preventible death, which is not the less important because its existence, which, when once ascertained, has so important a bearing on efficiency, may chance to escape a first observation. I shall address myself chiefly to those to whom, as to myself, this subject of syphilis is presented as perhaps the most prominent feature of their daily routine. Before doing so, it is necessary to fix on certain standard opinions, from which, as a basis, to start. How is that to be done?

We may, as one plan, simply note the opinions of eminent authorities. In every region of thought, there are the two distinct classes, whose differences will last as long as the mind of man,—the class of those who take the first view presented to them, without inquiry, and anchor themselves on it as on a fixed, indisputable certainty,—and the class of those who refuse any opinion until they have satisfied themselves of its truth, and thus remain adrift from all moorings and afloat. Now, to make the history of medical opinions on the subject of syphilis a test of the value of authority in medical matters, is to apply a crucial test. For the better half of a century, the great name, *clarum et venerabile*, of John Hunter has overridden and influenced all that has been done, it has cramped all independent thought on this subject. Its career has been like that of some great and popular conqueror, accompanied with abject submission, loud jubilations—and a very holocaust of victims. We need not go very far—no further than to what Sir Astley Cooper and Mr Samuel Cooper have told us—to know what fearful injuries have been inflicted on mankind by the authoritative teaching of John Hunter on the treatment of the venereal diseases. But still the authority is always appealed to; and if we take up any modern essay on these diseases, we are likely to find an intolerable deal of compilation about the siege of Naples and Columbus, John Hunter and Mr Benjamin Bell; and but a poor halfpenny worth of original matter, chiefly in the shape of reports of cases which no one can possibly be expected to read. Now, "we, the heirs of all the ages," know all that John Hunter knew, because we possess all that he had to tell us, and we possess a great deal more. The best use we can make of our inheritance, is to employ towards it that all-inquiring scepticism, searching but candid, which is the main characteristic of the manner in which, in this our day, criticism is conducted. For many years, surgeons, scarcely conscious of the profanity, departed more and more from the teaching of John Hunter; I incline to think, that within late few years, there has been a gradual, hesitating, and modified return to it. It is surely time for us to consider the matter, and, with full consciousness and open proclamation, either to replace the idol on its old pedestal of infallibility, or utterly reject and cast it down. Sufficient for my present purpose that no authority—and John Hunter's is the greatest—can be here safely followed with blind obedience.

The method by authority being set aside, there is the statistical method. We all distrust statistics, and we all allow ourselves to be influenced by them. We are all persuaded that they are radically fallacious, but we cannot resist their fascination. They present results so startling, and in so striking a manner; the whole process is placed before the eye so simply, and it so entirely dispenses with any occasion for troublesome reflection, that the numerical plan of ascertaining facts comes more and more into vogue. It has been lately pleasantly said, that "of all evils under the sun, except the Thames when the sun gives 117 degrees of heat, a mass of crude statistics, to a person who does not know how to employ them logically, is the most pestilential." The statistician would make brave work of this subject. Unfortunately, he could only mislead us. For instance, a few years ago, an army was poisoned by food ill-adapted, ill-assorted, and deficient in quantity; and the statist spoke to us of diarrhœa, dysentery, purpura, and other symptoms of the one disease scurvy, just as one or other presented itself most prominently before the eye of the first recorder. So, on this subject, amid cunningly devised tables about rheumatismus, cynanche tonsillaris, iritis, lichen, lepra, ecthyma, and what not, we may never be permitted to know that these should all be comprised under one head,—Syphilis. Manifestly, statistics cannot help us.

The method by authority and the numerical method being found wanting, it humbly appears to me that there would be a greater chance of attaining accurate results, if each qualified observer were to generalise his own individual experience. If ancient saws cannot be trusted, we must see what we can do by an accumulation of modern instances. In making such an attempt, the observer must divest himself altogether of what he has heard or read. What he brings must be a part of himself, not a part of any other man. Above all, he must speak from his memory, owe nothing to his imagination. As to the grounds on which I, for one, venture to speak, I may say that, for more than twelve years, I have lived among soldiers; that a not inconsiderable part of that time has been passed in garrison towns, Portsmouth, Dublin, Chatham, Woolwich; and that

the regimental hospital at the last-named station affords the largest field in the empire for the observation of venereal diseases. It is right to add, that my observation has been almost limited to one particular regiment; but that is one which is not supposed to present, as compared with others, an inferior physical development, and, in point of fact, it does not do so, but rather the reverse.

If, in the following propositions, phrases are employed which are not warranted by the present state of knowledge, they must be taken as mere vehicles of expression, not as an attempt to declare precision where it is not.

I.

There are two distinct venereal poisons,—the poisons of gonorrhœa and of chancre, both induced by actual contact, however effected. Each reproduces itself. One does not produce the other.

A.

1. Gonorrhœa is a strictly local affection, limited to certain defined parts.

2. When, in the course of it, certain similar affections are, without contact, established elsewhere, it is by extension or by metastasis to neighbouring or sympathetic parts.

3. When general symptoms attend its appearance, or present themselves in the course of it, they indicate only febrile disturbance, caused by a local affection.

4. In gonorrhœa, the tendency is to spontaneous cure; and that we should endeavour to promote by rest, diluents, milk diet, and astringent applications.

So much for the gonorrhœa, and it need not be again alluded to.

B.

1. Chancre is a local disease.

2. It is possible, by the means usual for such a purpose, to destroy that local disease.

3. If it be not so destroyed, and, of course, if the attempt be made ineffectually or too late, the system is poisoned, and the external manifestations of syphilis are to be looked for.

4. The character of the chancre, and its progress, depend altogether on the physical condition of the patient at the time of inoculation, and on his surroundings subsequently.[1]

[1] Let whoso pleases accept the theories based on the recent "confrontations" at Lyons and Paris. The gentleman who first instituted these confrontations has gone so far as to assert that the poison of syphilis first became "dual" at the siege of Naples; and that while the "soft chancre," not followed by constitutional taint, is, literally, as old as sin, the "hard chancre," apt to be followed by constitutional taint, was first seen in 1495!

5. The degree of receptivity of the poison is altogether determined by the same circumstances.

6. The physical condition of the individual may be so good as to be able to resist the poisoning of the system, or to throw off the poison before it has manifested itself.

7. Buboes occurring after a chancre are caused by the local irritation, just as bubo is caused by a scratch of the foot.

8. Suppuration of the buboes neither proves that the system has been poisoned nor the reverse. It gives ground for a suspicion that it has been so, by showing that it is so much "below par" as to be unable to resist the tendency to suppuration.

9. Indurated base, with glazed or excavated surface, indicates the strumous taint, and, *pro tanto*, predicts syphilis.

10. Syphilis, like the other zymotics, is a disease of exhaustion or diminished powers.

Before proceeding to submit some propositions on the characters of the disease, as they seem to me to be presented among soldiers at the present time, I must ask assent to a preliminary series, and then request that what is declared in them be considered in connection with what follows. As the expressions "a few years ago," and "formerly," may seem to be too vague, I fix on the year 1854 as separating the two periods which I wish to compare, one with the other.

II.

1. There is at present a larger proportion of young soldiers in the ranks of the army than was the case a few years ago.

2. The physical condition of young soldiers is now inferior to what was presented a few years ago.

3. They are consequently less able to resist the incursion of disease, and suffer more when it is once excited.

4. This inferior physical status has occurred cotemporaneously with a greater strain on the service generally, which has imposed a greater degree of physical labour on the individual; and this latter influence has still further diminished the power of resisting disease.

I fancy that the truth of these assertions will be freely admitted by any one who remembers the history of the last four years, or who has visited a barrack, or, indeed, met soldiers in the High Street of any garrison town. If, however, it be necessary to quote official authority, I refer to Dr Lyons' *Report on the Pathology of the Army in the East*. In that Report, which was published by the War Office, there are some admirable remarks on the physiological objections to the employment, as soldiers, of "immature youths," of which class Dr Lyons encountered so large a proportion in the army of 1855, and among whom, as he so justly remarks, "disease finds a rich and easy harvest."

I now proceed to the influence of syphilis on the class by whom the above conditions of the system are exhibited.

III.

1. There is now a larger proportion of cases of chancre than formerly.

2. Bubo follows chancre more frequently and more rapidly than formerly.

3. Syphilis follows chancre in larger proportion than formerly.

These statements involve very serious considerations. I have no statistical tables, no deftly "cooked" columns of figures to support them with. I can only say that they have gradually forced themselves on my own attention during the last two years; that the more I think over them, the more I am convinced that they contain a very large element of truth; and, moreover, that I confidently appeal for their verification to the candid and deliberate judgment of qualified observers. It may be right to state here, what should perhaps have been stated previously, that, as far as I can give an opinion on a subject of only one part of which I have a personal knowledge, the disease presents different characters, and runs a somewhat different course, in civil than in military practice.

There are three more propositions which may be conveniently arranged under this third head:—

4. The circumstances of a soldier's life in barracks, at home, are such as to render the system more apt to take up the poison of syphilis when inoculation has once been effected.

5. Of the four conditions, personal or external, enumerated here and above—one being constant and universal, the other three existing to a great extent, and now to a greater extent than formerly (viz., 1, the circumstances of barrack life, mainly, deficient air-space, and propinquity to sewer atmosphere; 2, defective original constitution—scrofula, to use a specific term; 3, greater exertion; 4, saturation, greater or less, with syphilis)—each one separately predisposes to phthisis, *the* grand cause of excessive mortality in the army. When two or more act together, the predisposition is proportionately greater. When two or more forces act in a parallel direction, the result can be stated with mathematical precision.

6. When, to the above influences, the mercurial poison is added, there is added another predisposing cause of phthisis.

I am not aware that any of the authorities on phthisis have traced a connection between that disease and syphilis. Louis does not do so; but, in his statistical pedantry, he scarcely admits among predisposing causes, "respiration of impure air, habitation of confined places, into which the light of the sun scarcely penetrates, and in which the air is imperfectly renewed,"—influences, to establish the important bearing of which, many words are not required now-a-days. That the syphilitic and strumous cachexies are absolutely identical, a difference of the objective symptoms depending only on the number of generations through which the original poison may have been transmitted, is indeed broadly asserted by some who

speak with weight on all that relates to syphilis; and if that position were admitted, it would not be necessary to say more. What I have advanced on this head may perhaps meet with more ready acceptance if the argument is put in the strict form, thus:—All unfavourable hygienic conditions, personal and external, are provocative of phthisis; syphilis is an unfavourable personal hygienic condition; syphilis is provocative of, predisposes to, phthisis. The major premiss, or rather the influence of all external unfavourable hygienic conditions, has received much enforcement in the recent Report of the Army Sanitary Commissioners.—As to this vast subject of syphilis, we derive from the Commissioners, strange to say, no facts, and, I might almost add, no opinions. In a Report which enters so largely into most of the other circumstances of a soldier's life, that subject is dismissed in exactly half-a-dozen lines. What I propose is, that greater prominence be given to it in estimating the predisposing causes of phthisis. It may well supplant that wonderful monotonous-boiled-beef theory of disease which, through newspaper misconceptions, by no fault of the Commissioners, seems to have taken such hold of the public mind. Few persons who know much about soldiers are likely to admit that they live for twenty-one years, exclusively and continuously, on boiled meat, while all know that syphilis prevails extensively. On the other hand, men have died ere this of syphilis, and where there was no other cause apparent; but it would be difficult to find that a man had ever died of *toujours*-boiled-beef.

In anticipation of criticism, I add one or two further remarks to these propositions. The chancre is, in most cases, easily and speedily converted into a healthy granulating ulcer by escharotics. Excepting in rare instances—so rare that they may be left out of count—we do not now see the phagedenic or even the irritable chancre; still more rare is it to see what, by an elegant periphrasis, used to be called "the most melancholy of all mutilations." As to the manifestations of syphilis, again, we do not now see the hideous ulcerations, or the unsightly deformities from mercurio-syphilis, that seem to have been so frequent in the "foul" wards of hospitals thirty or forty years ago. What we do see most commonly is;—Pains of the bones, chiefly of the shoulder-blades and shins, with nocturnal exacerbations, and a scattered, ill-defined, papular eruption, chiefly on the face and chest, and about the lower part of the shins and the ankles. Eruptions presenting characters other than the papular are comparatively rare; ulcerated sore throat is more rare; iritis is most rare. Pains of the bones and scattered papulæ are not the disease; they are only indications of it, outward and visible signs of a diffused poison, the pathognomonic expression of which is the syphilitic physiognomy;—colourless, pasty-looking cheeks; a dull, weary-looking, anxious eye; premature wrinkles about the orbit, and a general look of having rapidly aged.

The career of too many a young soldier may be thus broadly

sketched. He has not worn the Queen's livery for many days when he falls before allurements that encounter him just outside all barracks; and in that, his first campaign, "to serve bravely," as Falstaff told Doll Tearsheet, "is to come halting off, to come off the breach with his pike bent bravely, and to surgery bravely."[1] He comes out of hospital with the chancre "cured," and not by any means so much colour in his cheeks as when the peril was first incurred. Before very long, he presents himself again with pain in his bones, the syphilitic papulæ and the syphilitic physiognomy more or less strongly developed. After a certain quantity of hydriodate of potass has been swallowed, and after a few hot baths, —laboriously accomplished by such rudimentary contrivances as buckets, the kitchen-boiler, and a portable vessel,—he is a second time discharged "cured." Syphilis may, however, be still read in his face. He is thin and feeble, he does not know why. Soon there is pain of the chest, and his knapsack is too heavy for him. He thinks that, once relieved of that, he would be all right and well again. But he goes to hospital. The next discharge is a final one. Tainted at his birth through the sanitary sins of his progenitors, —tainted by the circumstances of his childhood and youth, poisoned by syphilis, poisoned by vitiated air,—he has become a text from which all who have eyes to see may read the old, old lesson,—that the unalterable laws of life cannot be violated with impunity. The poor unit has gone to swell the terrible statistics about which we heard so much a few months ago, over which it would be well for all of us to ponder more and more.

I must now proceed to speak more closely on the subject of treatment. We are pretty well agreed that the first step is to attempt to destroy the chancre by the chemical action of escharotics, and then to bring the resulting ulcer to a state of healthy granulating surface by applications, about the comparative merits of which there need not be much controversy. I have already hinted a suspicion, that a "mild mercurial treatment" is now more commonly adopted than was the case a few years ago. Hazlitt tells the story of a bigoted anti-vegetarian, who, when a follower of the new faith was exhibited to him, plump and rosy, after years of cabbage and turnips, could only reply;—Depend upon it, he eats meat on the sly.[1] In the same way, it may, perhaps not uncharitably, be said that some loud anti-mercurialists give blue pill and Plummer's pill "on the

[1] Falstaff grumbles about his symptoms of constitutional syphilis, and threatens to turn "diseases to commodity" shortly after the battle of Shrewsbury (1403); and allusions to the same disease are scattered not only through this play, but through others which are laid at a much earlier period, as, for instance, *Timon of Athens*. Now if, as some suppose, the disease first appeared in the world, and was propagated by a frightful epidemic, all over Europe, during the two years 1494–6, Shakspeare must have known so great a fact, occurring as it did so shortly before his own time, and would not have been guilty of a flagrant anachronism.

sly," chiefly in cases of indurated base, which exhibit, or are supposed to exhibit, an identity with the peculiar form of chancre which John Hunter declared to be so frequent, but which Mr Lawrence, Mr Carmichael, and others, say that they have scarcely ever seen. So far as one can speak from a solitary and isolated experience, I may say that I have certainly seen the induration discussed after a mercurial course. I have seen the same result, in the same time, after a course of cod-liver oil; and I can say the same of the topical application of camphor mixture, and of the topical application of cold water. What appears to me to be the best treatment for indurated base, as well as for tedious buboes, and for troublesome sinuses of the groin with ragged edges, is removal, as speedily as possible, from the "hospital atmosphere." If I am right in thinking that the indurated base sometimes met with indicates the strumous taint, I need not add that mercury is, even by the admission of mercurialists, contra-indicated. When there is no induration, and mercury is still exhibited in the course of chancre, it is, I apprehend, a misuse of terms to say that it is directed against the primary disease. It should rather be said that systemic syphilis is assumed to have taken place, and that the drug is given in the hope of averting the external evidences of it. In our hurry to prevent, not the disease, but only the signs of it, we rush to produce an abnormal state of the system, as to which it is difficult to say whether it or the disease, which we hope to cure, but have not yet seen, is the most pregnant with subsequent disaster.

It is in constitutional syphilis that mercury is most frequently employed. Even ardent anti-mercurialists do not seem to hesitate about its employment when the general symptoms show themselves, and they have now fine names to gild their inconsistency withal,— iodurets, cyanurets, and what not,—forgetting that if mercury be a poison, a poison it remains under what name soever it be exhibited. If it be the proper means wherewith to treat the disease, let us have it in its integrity, the old inunctions and the full course; let us swallow the entire animal, snout, bristles, and all. But we ought surely to have something stronger than mere tradition and authoritative teaching for our warrant, before we can justifiably prescribe in this exhausting cachexy a drug which, according to the experiments of Dr Samuel Wright, renders the blood "more watery, more prone to putrefaction, less charged with albumen, colouring globules, and fibrin." We must not speak of it as a specific. That phrase is not now heard so much as formerly. We do not call sulphur a specific in itch, since we have found that brick-dust, and sand-paper, and perhaps a rough towel, have just as much specific action on the acarus, and that the old sulphur-charged blankets propagated the disease by harbouring the acarus. We do not speak of bark as a specific in ague; we say that it arrests ague by virtue of its anti-periodic properties,—not a very precise phrase, perhaps, but still better than to cover our ignorance with the cloak

of an unintelligible word. Copaiba is a bland application to the inflamed mucous membrane, and is no further a specific in gonorrhœa. In learning the chemistry of gout, we have learnt to say less of colchicum as a specific. The idea under which we are told to prescribe mercury in syphilis is this:—that the system being possessed by one baneful poison, we should introduce another poison, admitted to be also baneful, and that the latter will neutralise and extinguish the former. One devil having entered in, another is introduced to cast it out. What if the second devil be the worst of the two, and take possession? What if the two harmoniously combine? What if the latter end of the patient be worse than the first? Both these poisons—one due to the patient, the other to the doctor—are pretty certain to "bring down rose-cheeked youth to the tub fast and the diet." A member of the "comfortable classes" has it in his power to adopt the means of ultimate recovery from both, but in considering the medical treatment of soldiers, the influence of their environments must be taken into account. It will be freely admitted that the tendency of the disease is to exhaust itself, just as we may also admit that apparent recovery frequently takes place after a mercurial course. The mercury may not do permanent evil to patients who possess all modern appliances of comfort, and who can go to Malvern or the Nassau springs. What seems to be objectionable, and what is here objected to, is, that the same treatment should be adopted with those who may not have a larger airspace than four hundred cubic feet, and who have no command of personal or dietetic luxuries. Before prescribing this admittedly dangerous drug to the latter class, we should be quite sure that, between the physiological effects of its use and the expulsion of syphilis from the system, there is some closer relation of cause and effect than there is, for instance, between Tenterden Steeple and the Goodwin Sands. We frequently read or hear of cases in which the surgeon, while expressing distrust of the anti-syphilitic virtues of mercury, prescribes it either as a matter of routine, or because the doing so seems to be something akin to a forbidden pleasure; and the narrative seldom ends without showing that it has been quite useless, or worse than useless. If useless *quoad* the disease, it must be injurious *quoad* the patient. Is it too much to ask the surgeon to stay his hand, when treating the class of patients of whom only I wish to speak, to try if, by a very different line of treatment, he cannot put his patient into what may be called a better position of antagonism to the disease?

When Pope Adrian VI. died, the grateful Romans crowned his physician's door-posts with garlands, and placed on it the inscription,—To the saviour of his country. It is only within late years that the point of this and similar old jokes has been taken away. When the old belief in witchcraft and demoniacal possession, as causes of disease, was lost, people were slow to search for more reasonable influences. To speak of late times, the dead eighteenth

century was content to look on little more than what its eyes saw straight before them, looking neither before nor after. It is chiefly owing to the labours of surgeons in the two services—labours which are almost coeval with the army and navy themselves—labours that have been added to and generalised by distinguished observers and thinkers of a time that is not very remote from the present,—it is chiefly owing to these labours that a quite new direction has been given to medical thought and research, and the result has combined with others to place medicine on its present pedestal of eminence. The physician is not now content to consider a disease only from the point of its appearance. He goes back to its external causes, and he feels, more and more, that as he ascertains these and proves their influence and direction, so far does he help to raise his art above mere empiricism. He places his chief glory in the prevention of disease. He thus finds that he has two functions to perform: on one side, the prophylactic and the synteritic, and on the other, the analeptic. These two diverge at certain points, but have so much intercommunication at others, that they cannot be divorced without injury and loss to both. There is a narrow bridge between them which the true practitioner is constantly passing and re-passing over. Such prominence is now given to the new function, however, that it has been proposed—and proposed in the name of "Science," too,[1]—to separate the two altogether. It has been proposed to have one department for the prevention, and another for what is called the "cure of disease,"—a phrase as *un*scientific, by the way, as was ever employed by a surgeon. The lower view of hygiene, which regards it as only concerning itself with the discovery of local nuisances, seems to be the one adopted; a forced analogy is drawn between army medical officers and the medical inspectors of nuisances in towns and villages; and the former class is invited to abandon the dignified attitude which the profession now occupies, by right of the labours of their immediate predecessors, and to descend to the mere office of prescribing and drug-giving. Military organisation requires, above all things, unity of action; but it is when an attempt is made to remodel the medical part of it by the light of the progress that has been made in knowledge, to take a new departure, as it were, and to give the medical element the means of doing all its part to the good of the whole,—it is at that very time that this cumbrous complication is attempted to be introduced! We hear a good deal about the retrogression of ideas, of ideas reaching a high elevation and then being driven back to the point from which they started; and we have seen instances of the religious idea, for example, after soaring through all the regions of space, returning back to the primal fetish worship. It

[1] "The time has arrived when the department for the prevention of disease and that for the cure of disease must be separated."—*Army Sanitary Commissioners' Report*, page 105; Ans. 3360.

cannot be difficult to predict what would follow if the idea which is at the bottom of this proposal were carried out, which, indeed, it cannot be. The sanitary section, as soon as permitted to rise above cess-pits and *cloacæ*, would rise higher and higher, and the other would go backwards and still backwards, until all claim to respect, all hope of usefulness, all sympathy with progress, and all share in it, would be lost. Professor Owen told the British Association at Leeds, the other day, that at that particular stage of progress which hygiene at the present moment occupies, the work is for the engineer, not for the physician or the chemist. The physician gave a grand impulse to that progress when he elaborated a principle which comprehends nearly all that, in the transactions of the moment, we seem to think of as hygiene, and which can be expressed in a very few words, as thus:—That which is dead, and that which has been thrown off as effete by the living organism, should be removed from the neighbourhood of the living. There the chemist stept in, and demonstrated the wonderful changes to which the dead or effete matter is subject, its reproductive power, and that to waste it is to waste force and necessary means. The problem that the engineer has to solve, is how to carry out these two principles; and, to all appearance, the problem is a difficult one. It is one with which the physician has no concern. He did a great work when he was the architect of an idea, which, small as familiarity and nearness may make it seem, is broad and massive from the point of remoteness. The rest is for the bricklayer and the hodman. It is for the architect to pass to other fields and higher flights. The daughter of Æsculapius was a beautiful, bountiful, gift-bearing goddess; and so, too, was the Venus Cloacina, typifying the outward purification which her worship represented. To the imagination of some modern sanitary lights, these two divinities are dirty, haggard, and hideous, and it is before that representation that they prostrate themselves. An open sewer is *their* Mumbo-jumbo. This, however, is a digression. As one natural result of the extended domain of the medical art, and of the first set of opinions alluded to, there has come another set of opinions, in speaking of which the names of Sir John Forbes and the late Dr James Johnson should always be gratefully remembered: I mean the opinion, that much misery has resulted from violent interference with disease, that the drugs employed in treatment have frequently inflicted serious injury. Now, in Sir Astley Cooper's lectures, he declared that a man who gives mercury in gonorrhœa "really deserves to be flogged out of his profession," pointing straight, when he said so, at the surgeons of St Thomas' Hospital, who at that time, as it appears, considered that their victims, when so affected, should be kept under a course of mercury for five or six weeks, and should spit at least three pints full a day. Some of Sir Astley's further remarks cannot be too often quoted. "It is lamentable to reflect on the number of lives which must have been destroyed by phthisis and

otherwise, in consequence of the imprudent exhibition of mercury for a disease which does not require it. At the present time, a surgeon must be either grossly ignorant, or shamefully negligent of the duty which he owes to the character of his profession, and to the common dictates of humanity, if he persists in giving mercury for this disease. Let those persons who suppose that gonorrhœa can be cured by mercury, go round our wards, and see whether mercury has any effect on that disease." These lectures were delivered not thirty years ago. Compare with what has been quoted Sir Astley's own directions as to the treatment of chancre and syphilis;—a three weeks' course for a chancre; a month for chancre and bubo; and six weeks for secondary symptoms. Consider how much modification that mode of treatment has undergone, and may we not say that, before another thirty years have elapsed, another great teacher may pass on the use of mercury in any form of syphilis, the same censure that Sir Astley Cooper bestowed on his colleagues of the "other hospital," for their treatment of gonorrhœa?

When mercury is not used,—and I fancy that, thanks perhaps to Mr Rose, army surgeons have a greater dread of mercury than others,—hydriodate of potass seems to be almost universally employed. With the most simple and unfaltering faith, for no apparent reason but because others do the same, we go on, case after case, prescribing a salt which almost immediately passes out of the system unchanged, and the only certain and appreciable effects of which are headache, loss of appetite, and rapid emaciation. Of sarsaparilla I can say nothing. Some well-remembered denunciations have been too strong on me to permit the use of it once. We may take for granted that it is quite harmless, that its reputation is chiefly due to its high price, and that there may be ground for the scandal which ascribes the superior merits of "Dr Townsend's" article to the flavour of the West India rum casks in which it is said to be preserved.

The propositions on the general subject of treatment may be comprehended under the two following heads:—

IV.

1. After inoculation, the chancre being treated by local appliances only, the true and correct indication is to prevent the poisoning of the system; and, in case that is not successful, to place it in the most favourable position to throw off the poison with as little as possible concomitant injury. This indication is best fulfilled by generous diet, bark, air, light, and moderate exercise.

2. When the system does become saturated, the correct and true indication is to aid the recuperative efforts of nature by promoting depuration.[1] This is best done by generous diet, bark, acids, light, air, moderate exercise, change of scene, hot baths, and sea-bathing.

[1] To mention a detached case is most frequently an impertinence, but I am

If the reader is with me so far, I may safely ask his assent to the following:—

V.

1. All the considerations submitted add force to the opinion, that evidence of scrofula should be held to disqualify a recruit.

sorely tempted to mention here, in outline, one from which I have recently derived some useful lessons. It may serve to illustrate the general line of treatment advocated above; it may illustrate one of the texts borrowed from Mr Emerson; and it may have something to say to a recent controversy in which, on one side, was maintained the opinion, as old as Sir Thomas Browne, "that the smoothest way unto the grave is made by bleeding." The patient, a robust, well-conditioned soldier, of ripe youth, had a succession of at least three apparently distinct acute attacks, no one of which had any seeming connection with any other, and the interval between each was just long enough to sufficiently mark it. First, there was extensive diphtheritic inflammation of the throat and fauces, with marked constitutional disturbance. Immediately after that had disappeared, there was pneumonia with serious symptoms, the most prominent of which was a somewhat active delirium. Just as the pneumonia subsided, phlegmonous erysipelas of the left front and side of chest appeared, with its own set of general symptoms; and the erysipelas was immediately followed by the most intense and profuse suppuration. For several weeks, pus was poured out of openings of the parietes of the chest, and latterly, from secondary abscesses of the neck. Viewing these singular phases of disease as a whole, may we not be tempted to extend the zymotic idea, and say that acute diseases—pneumonia and erysipelas, for instance—are not the distinct and independent existences that we are in the habit of considering them, but that, in such a case as this, a poison which we can neither see nor handle has, by means which we cannot describe, entered the system; that, in a manner of which we know very little, it has there diffused itself, and that the altered condition of the tissues which we call disease, indicates only the points at which it has elected to manifest itself; that in this case, instead of fixing, as is most usual, on only one point, it attacked first one and then another, until the whole sequence of phenomena which I have attempted to describe had been produced. An over strict logic may say, that to this idea there are wanting such important preliminaries as a knowledge of the nature of the poison and its mode of action; but to spin theories without any process of induction whatever, is a privilege so long asserted and practised by medical writers, that it has become quite a prescriptive right. However that may be, it struck me, in this case, that it was open to the medical attendant to take one of two sides in the struggle between life and death which was maintained for some weeks, during which the chances of victory seemed to be very evenly balanced. It was open to him to side with the poison, the *materies morbi* which was giving such heavy successive blows, or to side with the patient. Had the former been his choice, he would, I apprehend, have depleted in the first instance, then depleted for the pneumonia, and after that, had the patient survived so long, he would have done what we have been lately told to do by no mean authority—depleted for the erysipelas. Fortunately for the patient, his own side of the question was the one adopted. He was, from the first, simply placed in that position which seemed to be the most likely to enable him to withstand the assaults, present and impending. His vital strength was, by every means, sedulously husbanded, and when the severe drain of most profuse suppuration occurred, it was vigorously assisted. As I write, convalescence is completely established, and there is every reason to hope that I shall soon be able to congratulate myself on having, by abstinence from rude interference, preserved a stout gunner to her Majesty's service. What puny whipsters we are before the grand doings of Nature! How much do modesty and silence become us in that august presence!

2. A recruit who has passed through syphilis is, *cæteris paribus*, more eligible than one who has not.

3. All the considerations submitted add great force to the urgent demand for increased air-space, and the removal of nuisances. No one has ventured to controvert the reasoning on which that demand is based in the Report of the recent Royal Commission.[1]

4. Every military hospital should possess a complete service of permanent bath-chambers.

5. "In every regimental hospital there should be an apartment appropriated to convalescents, whose diet and mode of living are to remain under the direction of the surgeon."—(*Queen's Regulations*, page 223.) A niggard allotment of space too frequently prevents the fulfilment of this excellent opinion.

6. A sea-side sanitarium should be established for selected cases likely to be benefited by change and sea-bathing.

7. Carriage exercise should be provided.

A sea-side sanitarium and carriage exercise may seem to savour of hyper-philanthropy. Some three years ago, the public seemed disposed to treat soldiers much in the way that a foolish, over-fond nurse gives sugar-plums to children. I would be sorry to find these proposals identified with such a hysterical proceeding. The only aspect in which I wish to speak of soldiers, in this place, is as human machines whose business it is to fight, as pawns in the high chess-game that is played by statesmen. It is manifestly of first necessity that their condition should as nearly as possible approach to the athletic status; and with that the presence of the syphilitic or the mercurial cachexy is quite inconsistent. A well-equipped, well-drilled soldier

[1] I do not mean to say that all the opinions are incontrovertible. For instance, in Appendix 72, which has been printed in a separate form, and circulated among military and medical officers, there occurs the following astounding statement, which, although stated to be "what sanitary experience teaches as to the causation of the diseases from which the soldier suffers," is not likely, I imagine, to be assented to by all etiologists:—

"Consumption and diseases of that class are the result of breathing foul air, contaminated by the breath of other persons."

The author of this same Appendix, whose name does not appear, speaks of the "excessively defective state of sanitary science and practice in the army." Those who are concerned with sanitary practice in the army may defend themselves; but it may be well to compare the first part of this anonymous aspersion with what was stated to the Commissioners by one of themselves, who is, at the same time, a distinguished practical sanitarian. "We owe the beginnings and first lights, and some of the greatest lights that we ever obtained, to medical officers of the British army, and also to medical officers of the British navy. The army has furnished men of the greatest intelligence, ... and it is to a very considerable extent owing to the labour of these men that the sanitary cause has taken root and flourished." Further, in reply to questions, Dr Sutherland assented to the position that, in establishing a knowledge of the external causes of disease, the medical officers of the army took the lead, "and that they have, up to the present moment, continued to do so;"—"that the sanitary measures established within a few years in England and Wales, are but the carrying out of measures long known to the surgeons of our fleets and armies."—*Evidence, Answers* 6589-91.

is a very expensive article; and when he falls into bad health, the question whether, in a pecuniary sense, it is better to endeavour to restore him or to return him to the outside population, is one for the financier to answer. Our business is simply to devise the best means of restoring health, in case the attempt is permitted to be made. A sea-bathing station would be no novelty, as a reference to the now obsolete Ordnance Medical Regulations would show; and in these days of cheap and rapid locomotion, it could be much more easily effected than formerly. As to carriage exercise, a surgeon in Mayfair may consider it a valuable means of treatment for *his* patients; and with regard to its adoption for soldiers, the means are at hand in several garrisons without the slightest expense being necessary; and it is within my own knowledge that it has been adopted, and with benefit. What is possible in one place, must be also practicable in another.

A survey of this subject, however cursory, would be incomplete without some reference to the general means of repression, to the steps which may be adopted by medical police with a view to circumscribing the area of infection, and to the means, if there be any, by which the individual can be protected from it. The nature and scope of these means are well known, and little that is new can be said about them; but as the mere mention of them is apt to shock some highly respectable prejudices, it may be well to say that with the public morals, and the public conscience, the sanitarian has nothing whatever to do. He may have the happiness of thinking that a higher morality and a greater diffusion of general happiness must result from the fulfilment of his endeavours, but these are to him secondary and accidental, not primary or necessary objects. His business only is to discover the causes of disease, and to declare the means of averting it; to bring all facts, theories, and speculations to the one task of minimising human suffering, looking forward to the day, which he is permitted to see in dreams, when beauty, and health, and sound organisation shall be universal, and when death shall no more approach but through the portal of a natural and necessary decay.

VI.

(Syphilization is so recent a proposal, and all about it is, as yet, so much in the region of the doubtful, that, under that head, we can say no more than this:)

1. *If* a few weeks' seclusion and a few hundred inoculations provide immunity, with no subsequent bad results whatever, and *if* the number of soldiers who become subjects of syphilis were so great, that to every recruit the expectation of becoming so affected is greater than the expectation of escaping, we should syphilize just as we now vaccinate. To have the body covered with the scars of many chancres should, these two *ifs* admitted, be considered as necessary a part of the soldier's initiation as the goose-step.

2. Public prostitutes should be subject to inspection, registration, and general police supervision. To the mere sanitary view, an infected woman must be looked on in the same light as a cess-pool—as a focus of disease, and should, like it, be removed and deprived of the power of generating disease.

3. Lock hospitals for women, and the lock wards of hospitals in garrison towns, should be subsidised by the public.

The inquiry is not a very inviting one, and I do not profess to know very much about it; but I have more than once had reason to think that an hospital has been filled, and the most serious temporary non-effectiveness thereby caused, from only two or three points of infection. Dr Ferguson's well-known story of the Lisbon opera-dancer, and some stories told by Mr Porter and Dr Hennen, could, I fancy, be paralleled from the neighbourhood of any barrack in the kingdom. To the poor women themselves, a shelter, and the means of recovery, when labouring under disease, must be the greatest possible boon. In the case of other zymotics, their causes may be easy to find, but before a remedy on a large scale can be applied, much forethought is required, conflicting interests must be considered, and, most important of all, much money must be expended. In this case, both the evil and the remedy are straight in front of us. All that is required is discretion and courage. It is not the part of a wise man to think of avoiding or escaping by a side-path any difficulty that he may encounter on his line of march; and the least wise thing he can do, is to sit down before it, resolutely close his eyes, and wring his hands. It is the duty of good citizens to take measures that future generations shall be sturdy and stout of limb, a support and a crown of honour to the commonwealth. There is a proud inheritance to guard, an inheritance won by the thews and sinews of Englishmen; and it is for the public to take care that future enemies shall have reason to say of the future manhood of England, what a great and stout Englishman put into the mouth of a French king—

> "This is a stem
> Of that victorious stock; and let us fear
> The native mightiness and fate of it."

Here is a disease which blasts infancy, stunts youth, and renders manhood wretched and brief. The remedy is in our own hands. The ostrich is not considered a wise biped; and when he buries his head in the sand, he does not escape danger, he only avoids seeing it.

Should it seem that this paper has been cast in too didactic a form, the courteous reader is requested to understand that this form has been purposely adopted, to avoid redundancy. All statements and opinions must be weighed according to their intrinsic merits, without either enhancement or diminution on account of the person who puts them forward,—a comforting reflection, truly, for any one who, while bold enough to express his opinions, cannot, at the same

time, protect them with the strong arm of authority, or the buckler of reputation.

Postscript.—One assertion made above must be modified, as no less an authority than Mr Neison has, very recently, published a paper, which he read before the British Association at Leeds, in which he endeavours to detract from the degree of influence which the Sanitary Commissioners have assigned to "Crowding and insufficient ventilation," in the order of causation of phthisis. I take the liberty of saying that, to my mind, Dr Guy has, in his reply, altogether proved the fallacy of Mr Neison's method, as, indeed, he had anticipated that gentleman's objections, in a lecture which he delivered before the United Service Institution, and which has been published in the Institution Journal. If one were asked to point to a specific instance, illustrating the evils that must result from this and similar questions being handed over to pure statists, no better could, perhaps, be exhibited than this paper, in which, by a confusion of primary data, and such immense subsequent elaboration, so eminent a statist as Mr Neison has contrived to obscure and embarrass a conclusion which is simple and obvious to all who do not choose to abandon reason and judgment at the dictation of columns of figures.

MURRAY AND GIBB, PRINTERS, EDINBURGH.

AN

IMPROVED MODE

OF

EMPLOYING MERCURY

BY

FUMIGATION

TO THE WHOLE BODY,

EXEMPLIFIED BY CASES OF ITS SUCCESS.

TO BE ADVISED IN VARIOUS

OBSTINATE DISEASES OF THE SKIN,

AND ESPECIALLY IN

Syphilitic Affections.

By JONATHAN GREEN, M. D., &c., &c.,
FORMERLY SURGEON, ROYAL NAVY.

LONDON:
HIPPOLYTE BAILLIERE, 219, REGENT STREET, AND
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Syphilitic Virus

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An improved mode of applying Mercurial Fumigations to the whole body cannot be otherwise than interesting to the medical profession. This improved mode, I believe, has its origin in myself. It deserves alike the consideration of the medical profession and persons suffering from disease; and it is to be advised particularly in all phases of syphilitic complaints, and for various other ailments where mercury is needed, inasmuch as it is abundantly safe, easy of application, and can be resorted to without exposure to the surmises of friends, or the impertinent and inquisitive remarks of persons less interested. Add to this its value as a remedial means, and the reader is in possession of the substance of the matter, which the writer hopes to elucidate in the few following pages.

The reader, be he medical or otherwise, is requested to yield his confidence to what may be brought before him, free from prejudice or antagonism. The writer asks for this concession in fairness to his own character and long professional labours.

Mercury.

If there be a medicine that can be truly called a *specific* for any disease, I believe it is allowed that that medicine is mercury for the treatment of Syphilis. Notwithstanding its many advantages, unfortunately, in the hands of incompetent persons, very much mischief has been done; and oftentimes, even with the careful prudent prescriber of mercury, the whole animal system suffers from its internal administration to a lasting and fearful extent. Not so with the judiciously-applied mercurial fumigation in a proper apparatus for the purpose; and herein rests and depends all the advantages to be obtained from the administration of mercurial fumigations. They must be properly and scientifically managed. In such an apparatus duly managed, you have this important medicine and its effects at perfect control, and without distress to any individual organ, or the system at large. Yet if the mercurial fumigation is too much pushed in degree, either as regards the time of being in the apparatus, or as regards the quantity of the dose of mercury employed, you have all the prostrating effects, the salivation, and the sad results so often consequent on the evil mal-administration of mercury.

Nothing short of negligence and ignorance can produce these ill consequences from mercurial fumigations; but with care, that long practice has shown to be requisite, we may obtain from their proper administration all the good to be

derived from so important a medicine as mercury under a nicety of control which renders the process most desirable, and the results are free from the frequent evils that attend the internal administration of the medicine.

The Fumigating Apparatus.

In the happy construction of this apparatus and its correct management rest all the benefits to be arrived at from the use of mercurial or other important medical fumigations.

The apparatus consists of a box large enough to contain a person sitting, with the exception of the face or head. Under this is the duly built iron, brick, stone and flue work, sustaining a fire placed beneath the whole arrangement, and by which the apparatus is heated at pleasure from blood-heat to 160 or 170 degrees of Farenheit, to constitute simply a hot-air bath. Into this box vapour can be at pleasure admitted, constituting the hot-air vapour bath, and which is the best kind of vapour bath that can be administered, inasmuch as the feet are always kept the hottest, and the patient's face is excluded from either the hot air, vapour or medical gas, which latter constitutes what is known as a *fumigation*. This method is not only desirable, but of great advantage, where there is determination of blood to the head. Yet it is sometimes desirable to have the head and face included in the apparatus when those parts are the seat of ailment, or when it may be desired from other circumstances.

Sulphur, mercury, chlorine or other medicines, by being placed on a plate over the fire, become volatilized, and rise into the box as gas, surrounding the patient's body, together with the heated air and vapour, when the latter is required. Aided by the heat and moisture, the patient becomes influenced by the medicine employed, according to the strength of the dose, the time of staying in the apparatus, or the scientific management of the process, to which the patient is subjected for about twenty minutes. The process is never otherwise than agreeable, and is termed a *fumigating* or *gaseous* bath.

Mercurial Fumigation.

A mercurial fumigation requires a somewhat different arrangement in order to volatilize the mercury in the short period of twenty minutes. An additional sort of small furnace is now essential, otherwise the oxides of mercury cannot be volatilized, as they require a temperature of the common fire, say from 1000° to 1200°, on which the mercury is placed, and thus the object is attained, viz., that of volatilizing the mer-

cury, and converting it into gas, to surround the patient's body. After this method we arrive at the beneficial results commonly obtained from the use of that medicine, but freed from the disagreeable or distressing effects sometimes produced by its internal administration, and from all the needful confinement and restraints which are enjoined when the medicine is given in the customary way to influence the system through the stomach. In the majority of cases it is desirable that the dry gases, as the gas from mercury, should be rendered moist by the admixture of vapour, which is provided for in the construction of the apparatus just described.

According to the process thus briefly brought forward, I assume to call it "AN IMPROVED MODE OF APPLYING MERCURIAL FUMIGATIONS TO THE WHOLE BODY." I am quite aware that more than half a century gone by mercurial fumigations were extolled for their efficiency in the treatment of Syphilis by medical authorities of high repute in this and other countries.* But the practice was never firmly based, owing to the imperfect way in which the apparatus was constructed at various times and places, and the trouble attending its use. Those drawbacks are now overcome.

It was in the year 1822 that I first began to practise in London with the aid of a fumigatory establishment, and which I was encouraged to adopt by several of the leading members of the medical profession. I soon became surprised at the amount of good I was doing, even unaided by the assistance of medicine. This was more particularly shown in chronic pains, intractable swellings, blotches and ulcerations of a suspicious character, at that time known under the strange term Pseudo-Syphilis.

The amendment in such cases soon fixed my attention, and also the attention of numerous medical practitioners at the west end of London. In order to further test the value of fumigatory treatment, I threw open the establishment to the medical gentlemen of St. George's Hospital, to send any patients whose cases were judged suitable for the trial. This led to my being requested to superintend the erection of a similar fumigatory arrangement to my own at that hospital; since then at the Middlesex and at some other hospitals and infirmaries; and afterwards I had to put up a double series of fumigating baths at St. George's Hospital.

After the lapse of more than ten years' experience, needful to warrant publishing, I published my PRACTICAL COMPENDIUM OF THE DISEASES OF THE SKIN, in which I was induced to insert two cases of severe syphilitic disease, exemplifying

* Refer to the works of Lalonette, Paris, 1776, of Abernethy, Pearson, Wallace, Bacot, Cazenove, Schedel, Parker, &c.

the results produced by the fumigatory mode of treatment. As they will be sufficiently inductive for my purpose on the present occasion, I here transcribe them, observing that in these two cases the benefit obtained was mainly to be attributed to the SULPHUR FUMIGATIONS, not the mercurial fumigations.

CASES OF CONSTITUTIONAL SYPHILIS, ACCOMPANIED WITH CUTANEOUS ERUPTION, ULCERATION, &c.

In the autum of 1831 Captain T. contracted syphilis. The primary sore spread till it occupied nearly two-thirds of the inner surface of the prepuce. Mercury was prescribed internally as well as by external inunction, but without any restriction in regard to diet, mode of life, or otherwise, and the patient apparently got well.

About five months after this, his general health became much deranged, and innumerable blotches appeared on the surface of the body and limbs; for these, and on account of his bad state of health, he was advised to leave Ireland, and proceed to Harrowgate, that he might have the benefit of the baths at that place, and undergo other appropriate treatment.

He had scarcely commenced the baths, however, when the blotches became open ulcerations, from the size of a sixpence to that of a common playing card. The irritability of the patient became excessive, and his health daily worse; he, notwithstanding, persevered in the treatment advised for eleven weeks, but only with the effect of aggravating all the symptoms. His physician then recommended Captain T. to make the best of his way to London, and try the sulphur fume baths under my direction.

On his arrival, I found he had an ulcer in the throat; a fetid discharge from one ear; his forehead, nose and cheeks were covered with one continuous scab, whilst a copper coloured red blush extended round it and the other ulcerations; he had fetid discharge from the nostrils, indicative of disease of the nasal passages, snuffling speech, and nodes on each shin, the pains of which occasioned his nights to be sleepless. The original chancre was further open to its former extent. The patient was in a very weak state, and the case seemed formidable; nevertheless the sulphur fumigations were commenced on the 26th of September, one being taken daily. Captain T.'s improvement, under this mode of treatment, was rapid. In the short space of a week, more than one hundred of the ulcers had healed, the throat was better, and the general health seemed improved; but the night pains seemed rather to be increased. No internal medicinal treatment had

as yet been resorted to; and although the amendment thus far was manifest, yet the leading characteristics of the case being considered, my knowledge of the sulphur fumigations did not allow me to calculate on the progressive improvement of the patient, nor on the permanency of the benefit which he had already received, without the conjoint aid of mercury; I therefore felt it my duty to urge my doubts to Captain T. He consulted Sir B. C. Brodie, who was also of opinion that mercury was necessary to establish a cure; and, there being no continuous surface free from ulcers, on which the mercurial ointment could be rubbed, he was ordered fifteen grains of blue pill every twenty-four hours, with decoction of sarsaparilla, and to continue the fumigations. He commenced the mercury on the 6th of October. On the 9th he was under the influence of the medicine, which was diminished to ten grains. On the 10th it was further diminished to five grains in the twenty-four hours. On the 12th it was needful to discontinue the medicine altogether; he, however, went on with the sarsaparilla and the fumigations. The rapid progress now made will perhaps be most readily conceived when I state that by the 17th every ulcer had healed; that the pains in the shins and the nodes had gone; and that the coppery redness had left the face, and was disappearing from all the healed patches on the surface of the body and limbs.

From this date the patient's recovery proceeded with the same celerity as from the first of the treatment. He soon left London convalescent, and only taking the sarsaparilla. In all, he took but thirty-four fume baths between the 26th of September and the 6th of November. This was the whole of the treatment resorted to, with the exception of one dose of castor oil, which was directed with a view of abating salivation.

It may be said from the speedy recovery in this case, that there was a favourable idiosyncrasy, which disposed the system to be readily influenced by the treatment. It might be so; but I have treated many similar cases with like success. No relapse occurred, and years have now gone by since Captain T. has felt as well as ever he did.

I have often had to observe the beneficial influence of the sulphur fume baths, not only in venereal, but in other obstinate ulcerations. The stimulus of the sulphur in a state of vapour certainly agrees well with indolent sores generally, and even disposes venereal ulcers to heal, as is instanced in the above case; yet I cannot conceive that the sulphur fumigation alone would have done permanent good in such a case; the aid of mercury was further necessary. It is the combination of the two remedies in cases of constitutional Syphilis, which deserves the attention of the profession. The next is a case of a precisely similar kind, upon which reflections of the same nature might be made.

Case 2. Captain A. B., of the Guards, placed himself under the care of Mr. Earle, when already reduced to extremities by the united influence of secondary Syphilis, and the constitutional disturbance induced by the ill-timed use of too much mercury. The forehead and limbs were covered with numerous foul superficial sores, and the parietes of the abdomen and thorax with ulcers of such depth, that several of them seemed to penetrate to the peritoneum and pleura. One side of the scrotum and one testicle had sloughed away before I saw the patient; the other was naked, hanging by the spermatic cord, when he first visited me. There was also extensive superficial ulceration of the throat, and the shins were occupied with several nodes. The patient complained of severe suffering from nocturnal pains, and was greatly reduced in strength and spirits, and much emaciated, although in the prime of life.

All that unwearied attention and the best advice could do in this case was done, but no decided improvement took place, and the state of the general health was such, that Mr. Earle felt it impossible again to have recourse to mercury. As a last measure, therefore, and with a view of arousing the drooping powers, he recommended a trial to be made of the sulphur fume bath.

The first three exposures in the fumigating apparatus occasioned a good deal of smarting of the open sores, and seemed even to increase the restlessness and general distress endured in the night: on this account opiates were prescribed, and with the best effects. After the fourth fume bath had been taken, an evident amendment was visible. The patient felt stronger, and generally better; his appetite began to return; several of the smaller sores had healed, and others were in progress of cicatrization; his spirits also rose, and his hopes of ultimate recovery revived. The baths were left off after the fifteenth, for ten days, in consequence of an attack of diarrhœa, which, however, did not interfere with the patient's improvement; for on his return, almost the whole even of the very deepest ulcers had cicatrized. The remaining testis was nearly surrounded with a new integument; and Captain A. B. was gaining flesh and strength so rapidly, that he very speedily declared himself quite recovered. As a measure of precaution, small doses of the hydrarg. bichlor. were continued for about six weeks afterwards; and as several years have now elapsed without any return of syphilitic symptoms, it

seems probable that the poison was completely eradicated from the system.*

From the time of publishing the second edition of my *Practical Compendium of the Diseases of the Skin* in 1837 my attention became more particularly directed to the curative effects of the MERCURIAL FUMIGATIONS in syphilitic cases until their utility remained no longer a doubt, but a certainty. I feel it a duty alike to the Profession and to sufferers afflicted with the disease, to promulgate and make known, that I am most usefully employed in the treatment of syphilitic diseases, and mainly by the curative results produced by the mercurial fumigations.

In many instances, the conjoint use of the usual medicines and applications is desirable, and there can be no reason why they should not be conjoined; but in such cases the mildest forms of mercurial medicines and in small doses are sufficient for the object in view, viz. the cure of the disease, which might otherwise be months, nay years, under treatment after the ordinary mode of treating Syphilis; and in the end the patient may only live on with little or no enjoyment of life, and with a shattered constitution to the end of the chapter.

If the reader has proceeded with me thus far, he will be ready to infer the pretensions I have still to bring before him relative to mercurial fumigations for syphilitic diseases. I will not detain him nor occupy his time in reading numerous cases; that would involve great repetition, and occupy his time worthlessly and my space also.

Suffice it to say, that syphilitic symptoms and appearances are ever on the change; with that we have little to do—they are all produced by the same cause, Syphilis; and it is with the latter we have to contend. Ever since 1837, as said before, I have been in the custom of treating every variety of Syphilis and its complications by means for the most part of mercurial fumigations, and with that success which I believe is not attainable by any of the ordinary means of treatment. The cases of Syphilis and its complications need only to be named; the medical practitioner will at once conceive the nature of the complications and their attendant miseries, and the sufferers themselves will have no difficulty in comparing how far such symptoms involve sequences and bear comparison with their own cases. I am thus saved much

* It is now more than twenty years since these two cases were under treatment, and there has been no relapse in either case. The subject of the former, Captain T., is now serving in India, and I suppose is well. The subject of the latter, Captain A. B., I lately met in the street, and a more athletic or finer looking man is seldom seen in London. He is married, and the father of four healthy children.

needless repetition of the detail of cases too well known to practitioners to need detail. To them I hold out an important additional source of relief, which does not exclude the more usual means resorted to, but which may be superadded with immense advantage, not only to the patient, but likewise to himself, and no doubt many an anxious practitioner of medicine will feel this a boon brought before him.

In Syphilis there is no single organ of the body, externally or internally, but what may be particularly assailed with Syphilis, from mere alteration to degeneration or utter destruction of the parts involved, and hence follows the endless variety of appearances assumed by Syphilis.

As establishing this point, I need only bring forward symptoms attendant on common gonorrhœa, of chancre and its varieties, of bubo, of secondary spots, and blotches, eruptions, rashes, pustules, warts, elevations, scales, ulcerations, swellings, nodes, pains, &c. &c., any or all of which may be consequent developments of Syphilis. To enumerate more particularly or enter into a description of each would necessarily occupy a volume of no inconsiderable size; I therefore give up description of such cases, and content myself with saying, I have a remedy of unknown value to most practitioners to combat with the various symptoms above brought forward, all of which may be consequent on Syphilis.

It may be recollected that the two cases already quoted are of very anterior date, no matter! So much the better for my purpose, as it shows the years of experience I have since had to guide me—but it must be recollected that those two cases were treated with *sulphur fumigations;* neither of them my own patients, and occurring near or soon after the time, that my mind had become fixedly impressed with the superiority of the *mercurial fumigations* in such cases; yet in those cases it was no part of my duty to deviate from or advise; I had only to follow out the directions given to me. Had it been otherwise, I should at that early period, 1837, have advised the mercurial fumigations.

As I may not have to remark again on *sulphur fumigations,* I at once declare their value in old indolent ulcerations, as shown in those cases;—the general stimulus given to the whole system, and the great exudation from the pores of the skin, and particularly from the sores themselves, seem to be the causes of great good to such ulcerations. The sulphur fumigations are good too, for preparing the system for the mercurial fumigations, and for ridding the system of an *excess of mercury,* or as an antidote to mercury.

But in syphilitic cases, and in many complicated combi-

nations of that disease, when the practitioner is at a loss to determine whether the ailment is consequent on syphilitic taint of the system or not, or when the case resists his best efforts to relieve, in such cases a trial of a few mercurial fumigations will often determine the matter by the unexpected cure of the patient.

I frequently find this to be the case, and name it as a guide, that my experience warrants me in recommending in some obstinate questionable complaints, often of the skin, as in cases of intractable Psoriasis and Lepra, which have gone the round of the medical profession, and resisted all usual means of cure; where the patients have declared there could be no syphilitic taint, and where there were no sufficient data that would lead to such conclusion; yet a few mercurial fumigations would seem to tell more *correctly* by the yielding of the complaint. In short, I believe, that most of the obstinate cases of Lepra and Psoriasis, and ailments of that class, have latent Syphilis for their cause, or their obstinate continuance. Again, I think I have reason to conclude that sometimes a gorged state of unhealthy bile in the liver and biliary vessels is a frequent cause of the obstinacy of these complaints; the means of remedy points out itself in dietary regulation, appropriate medicine, and the mercurial fumigations.

The mercurial fumigations are, without doubt, to be advised in Syphilis and syphilitic ulcerations, whether primary, secondary, or constitutional, with and without the aid of the internal administration of the medicine, and the usual external applications, as they may be indicated. They are to be recommended in painful nodes, whether of the shins, scalp, or elsewhere, and in enlargement of parts; in spots, blotches, or scaliness on the body, or parts of the body; in cases of Psoriasis and cracks, mostly on the hands, which commonly resist the best known means of treatment, including the sulphur fumigations. I have known one and all of these obstinate deviations from health yield to a well-advised course of mercurial fumigations, leading to the conclusion that such cases have often for their cause and continuance latent or hidden Syphilis in the system, although the patient himself may be unconscious of such taint, or that it has anything to do with the matter.

In ulceration, or tendency to ulceration, in the nasal passages, throat, fauces, palate, fissures of the tongue, lips, hands or other parts, (for syphilis will insiduously attack one or all parts,) the mercurial fumigations taken advisedly are more to be relied on as a means of cure than any other means that I know of.

In such cases I not only give the general mercurial fumigation to the whole body, but also have the head included in the apparatus for a few minutes each time of using it; by which means the mercurial gas is made to come in contact with the parts immediately implicated, and all the usual evidences of beneficial mercurialization are thus produced; the same as when mercury has been used in the ordinary way to good effect. The patient is thus saved much expense, time, exposure, and many disagreeables.

If the mercurialization of the system is slow in showing itself, which is sometimes the case, I then call in the aid of pill hydr:, pill hydr. chlor. comp:, hydr. c. cretâ, or other mild preparation of mercury; and I am often agreeably surprised at the small doses of these mild medicines which are sufficient for the end in view—the cure of the patient.

I will adduce two cases of *recent* occurrence, embracing most, if not all, the points I have herein put forward. The knowledge of the whole of the attendant circumstances of these two cases is not confined to myself; for the correctness of the statement I hold myself responsible. These two cases will be as good as a hundred to the far-seeing and reflecting practitioner. I will also put before the reader the preparation of mercury I have always preferred for the fumigation, and which I still use, and the method I practise in using the apparatus. On its proper construction and management all good from its use depends, and I again say, that none other than a medical man of average acquirements, at least, ought ever to be intrusted with the management of a fumigating apparatus.

MERCURIAL FUMIGATIONS, *and the Method of using the Apparatus, as shown in the Treatment of Two late Cases, published in the Medical Circular. They may serve as a Type how the Fumigations may be best used in other Cases.**

"MERCURIAL FUMIGATIONS TO THE WHOLE BODY,
By JONATHAN GREEN, Esq. M.D.

(From the Medical Circular, March 24th, 1852.)

"SIR,—I would again solicit the attention of medical practioners to the advantages of mercurial fumigations to the whole body in the treatment of syphilitic disease, in addition to, or in preference to, the more customary means of treatment.

"It is not my wish to encroach on your space, or to enter on nice-drawn distinctions of primary, secondary or tertiary affections of syphilis, so called; but simply to bring under notice a remedial means alike too little practised and too little known. It embraces much superiority over the more usual modes of treating syphilis, and is to be advocated in all stages of the disease itself, and in most of its serious complications.

"Hence, on this occasion, and apart from all disputative inquiry, I shall briefly bring forward the advantages of general mercurial fumigations for the relief or cure of Syphilis and its complications; a knowledge of which is alike desirable to the medical practitioner and the public. This I hope to do by a short detail of two cases lately submitted to my care.

"The first is the case of a medical gentleman sent to me by high medical authority at the west end of the town. The patient was affected with secondary syphilitic blotches on the

* Mr. Abernethy, in his Surgical Works, Vol. I. pp. 15, 16, speaking of the mercurial fumigations introduced by him at St. Bartholomew's Hospital almost after the same method that had been before practised by the Chevalier Lalonette, says, "I have witnessed so much comfort as well as benefit arise from it, that I think if the peculiar advantages were generally known to practitioners, they would be much more frequently employed. I beg leave, however, to observe, that the term mercurial fumigation is apt to excite wrong ideas of this method in the minds of surgeons. The effects are produced in a much shorter time than by giving medicine internally or otherwise, and will affect the constitution when other means have failed." With regard to the process, he further observes, "that the feelings of the patient during its administration are not at all unpleasant; on the contrary, they are pleasant, provided the heat is properly regulated; that there is nothing uncleanly or disagreeable in it; and that all who have had an opportunity of comparing it with the usual method of employing that medicine, have been highly pleased with the superior advantages attending it. I have heard it objected, that fumigation cannot be depended upon, but I never knew it fail; and, under proper management, I have no doubt but mercury employed in this manner will be found adequate to the cure of every variety of the disease."

limbs and trunk; ulcerations of the velum and mucous linings of the throat, and inside the cheeks; also inside and outside the lips, the chin and lower part of the face, and inside the nostrils. The nasal bones were so tender that he was afraid to have the nose touched, and the whole of the scalp was covered with scaly blotches, or superficial ulcerations.

"The patient had been ill for nearly three years, and from his first primary attack (chancre) had been under the kind guidance of numerous of his medical friends. No means resorted to for the last eighteen months had arrested the complaint, which went on variously developing itself until it became in the aggravated state I have just detailed.

"After the second fumigation, with three drams of the grey oxide of mercury, I was induced to have the patient's head included in the fumigating apparatus for the last three minutes previous to his leaving the apparatus, the time occupied in taking the fumigation being twenty minutes. The head was also inclosed in the apparatus for about the same time, three or four minutes, on taking the three succeeding fumigations, each with the three drams of the grey oxide, and thus I had the advantage of applying the mercurial fumes to the parts more essentially affected.

"After the fourth fumigation with the head thus inclosed in the apparatus, his gums, mouth and teeth were sufficiently influenced with mercury, and the inclosure of the head was then discontinued; but he went on with the general fumigation to the whole of the body, excluding only the face.

"In all he took seventeen mercurial fumigations, occasionally having the head enclosed in the apparatus or not, as his mouth became better or worse from the influence of the mercury.

"These seventeen fumigations were taken within the period of three weeks. From the end of the first week the improvement was manifest, and such as I believe no other mode of treatment could have produced; nor would practitioners, not familiar with the effects of mercurial fumigations, readily give credence to it, nevertheless, such advantages are common enough to my observation, and are well known to those conversant with the effects of mercurial fumigations.

"The second case is also that of a medical gentleman, who had been ill for three years.

"He had been under the care of various medical gentlemen of acknowledged repute in one of our largest commercial towns. A fair trial of the mercurial fumigations was suggested and essayed in this case, also with success, as will appear.

"He, the patient, was numerously covered with syphilitic blotches, varying in size on the limbs and trunk; the whole

of the forehead, the whole of the left side of the face, and chin and nose, were covered with one continuous, elevated, tuberculous blotch, and the right side of the face was covered with the same in part.

"He had been so reduced by unsuccessful mercurial treatment, and other causes, that his life was considered in jeopardy in consequence of his great weakness and emaciation. He was advised to leave off all medical treatment and try a sojourn on the continent for a time, in hopes of some renovation from the change. It was on his return that he was advised to come to me; his holiday had done him much good, but the disease appeared as I have just stated.

"The details of treatment in this case are so similar to the last, that it would be little short of a repetition to particularize. Suffice it to say, that he commenced the mercurial fumigations of the grey oxide, sometimes with the head inclosed in the apparatus, and sometimes not so included, according to the more or less mercurial influence, as indicated by the state of the mouth and constitutional depression. He had two attacks of painful diarrhœa, lasting a day or two each, occasioning some interruption of treatment. He had in all twenty-one mercurial fumigations, sometimes with the head included, and sometimes not so included, as before stated; the regular progressive amendment was so evident and satisfactory, that the patient (himself a medical man) frequently said 'he was astonished; that it seemed little short of miraculous to him, having been so long ill, and that nothing before had seemed to touch his complaint, except mischievously.'

"On leaving me, to again show himself to the gentleman who had recommended him to try the fumigations, he had become so strong as to walk about half the day without fatigue, his spirits had become joyous, the blotches on the limbs and trunk had merely left brownish stains in process of disappearance; the forehead and face had become so well, that when warm a stranger would not have known that anything had so lately been the matter with him.

"These twenty-one mercurial fumigations were taken between the 23rd of August and the 16th of September, with little interruption, and not a month under the treatment altogether.

"In the foregoing cases, I would have it remembered that they were both sent to me as test cases, for the trial of mercurial fumigations alone. They were both sufficiently bad, as will be acknowledged, and not a particle of mercury was given internally in either case, or otherwise, save than by the fumigations.

"THE SUCCESS ATTENDING THE TREATMENT IS MAINLY TO BE ATTRIBUTED TO THE PERFECTNESS OF THE APPARATUS, AND TO ITS DUE MANAGEMENT.

"It will be observed, that contrary to the more usual custom, I use the grey oxide of mercury, the hydrarg. y. oxid. cinerum. I have used it for thirty years in preference to the hydrarg. binoxidum; hydrarg. bi sulphuretum, or any other preparation of mercury. I prefer it, as it does not make the patient cough, which the latter preparations usually do, and on account of the grey oxide being easily volatilized—not so with the other oxides of mereury, which require the heat of a common fire, say 1000° to 1200°.

"It will be observed, too, that in the two cases brought forward salivation was produced, although in both cases after various attempts, and ample time for trial, mercury could not in any form be made to take hold of the system, as it is called. Salivation is not usual from the use of mercurial fumigations; from their use we can arrive at the beneficial influence of the medicine, without any of the distressing or often injurious effects of mercury, so commonly witnessed from the ordinary way of introducing the medicine. A tumid, swollen and red state of the gums, and tenderness at the roots of the teeth, and that kept up for a proper time, is all the inconvenience that I find needful to submit the patient to, to produce the desired effect. If after these symptoms are produced, and the mercurial fumigations are continued, the flow of saliva, the prostration, and all the other symptoms of the full use of mercury are sequences, as from the routine administration of the medicine, I question whether it is ever desirable to produce the distressing and prostrating effects of mercury, as shown when a patient is in a full state of salivation; as I find that all the beneficial influence sought or expected is arrived at by merely keeping the mouth gently affected for a due time by the mercurial fumigations. And that the mercurial fumigations influence or pervade the whole system, I think there can remain no doubt; for relapses must be very rare, after a due course of mercurial fumigations, if they ever do take place, for, as far as my own practice has gone, I am not aware of a single case of relapse.

"It should be recollected that in the two cases brought under notice, salivation to some extent was produced, more so than, I believe, was necessary. But it should be borne in mind that these were two *test* cases for the fair trial of mercurial fumigations alone, and no other medicine during the trial, in either case, was to be resorted to. This was stringently observed in either case, and the result was as herein put forth.

"These were also two face cases, with the nasal and throat

passages ready to run into destructive ulceration, which induced me to have the head included in the apparatus, in order to get the mercurial fumes in contact with the parts affected.

"The conveniences also arising from the use of mercurial fumigations deserve to be considered. There is no fear of taking cold; even the patients themselves, after they have had one or two fumigations, lose all fear of taking cold, as it is called, so much heat has been absorbed and retained as to dispel all such apprehension.

"There is no occasion for patients to go to bed after the mercurial fumigations; my own patients never have done so. It is not necessary, and can only tend to exude from the system what it has been the object to put into the system, and influence it beneficially. There needs no confinement to the room or the house whilst taking mercurial fumigations, and the patient can proceed with his cure in secret, that is, without the knowledge or exposure to servants, observing-friends or talking washerwomen, as in cases when we influence the system by rubbing in blue ointment, &c.

"Much might be added, but that I fear to trespass. The subject is of much practical importance, and my object in this paper is to bring before the profession the little-known advantages of mercurial fumigations, which are to be advised in all stages, and in many complications of Syphilis.

"I am, Sir, yours, &c.
"JONATHAN GREEN, M. D., &c.

"40, Great Marlborough Street."

CONCLUSION.

I am aware that some members of the profession will be inclined to question the remedial powers which have thus been brought before them. I therefore court their investigation and testing of the means, lest they may think I have been extolling the fumigations unwarrantably.

To all such surmises I must submit I hold the means as highly curative for most diseases, but not as an infallible cure, even for a toothache; and would assure all such practitioners that I have practised the profession too long to be so misled; so long, indeed, as to be painfully alive to the insufficiency of remedies for most ailments, until I became familiar with the fumigatory treatment. Instead of overrating that treatment, I am conscious of my inability to do it justice, and would ask any physiologist or pathologist what means he can bring for the relief of disease that equals increased temporary heat and moisture?—to which add, that all-important medicine, mercury, at perfect control, and freed from the objections, uncertainties and disagreeables that more or less always attend its internal use.

J. G.

For the Library at the Royal Victoria Hospital from the Author

Recd Sep. 22/66.

THE

CONCLUSIONS

ARRIVED AT BY

THE MEDICAL COMMITTEE,

APPOINTED BY THE ADMIRALTY AND THE WAR OFFICE,

TO INQUIRE

IF THERE IS A SYPHILITIC VIRUS,

ARE

NOT BASED ON PATHOLOGICAL FACTS.

BY

DAVID MACLOUGHLIN, M.D.,
MEMBER OF THE LEGION OF HONOUR.

LONDON:
CHURCHILL AND SONS, NEW BURLINGTON STREET.
1866.

PREFACE.

It is now above eighteen months since the Admiralty and the War Office, on my suggestion, appointed a Medical Committee to study and to report if a syphilitic virus exists; and if it does exist, what are its pathognomonic symptoms on the reproductive organs, or on any other parts of the body; what is its method of cure; and what prophylactic means are to be employed against this virus.

This Committee have published their report, and they have concluded "*that there is a syphilitic virus.*" But they have given no proofs—as it was their duty to do—either that they themselves had gone to the bedside, and there scientifically interrogated nature; or that by the scientific pathological researches of others, whom they called before them, they had discovered the existence of a syphilitic virus.

Still worse, they have gone so far as actually to mutilate and to suppress the testimony of witnesses opposed to their preconceived views. Consequently this report is an imposition practised on the Admiralty, the War Office, and on the public.

It is, moreover, a libel on the professional acquirements possessed by the Medical profession of this country.

May 24, 1866.

question, "Is there a syphilitic virus, and if so, what are its pathognomonic symptoms?" the writer of this letter stood single-handed before Dr. Ricord and some dozens of his friends and admirers, and brought the doctor to admit that neither by the use of his eyes, nor by the use of his fingers, could he point out the existence of a syphilitic virus on the genitals, or on any other part of the body. But Dr. Ricord maintained that he could prove the fact by inoculation. To this he still adheres.

In his eighth letter on syphilis, lately published, he says:—"Le diagnostic absolu-univoque, irréfragable, ne peut être obtenus que par l'inoculation artificielle." Dr. Ricord and Mr. Hunter are here completely in antagonism.

According to Dr. Ricord, the hardness at the base of an ulcer on the prepuce is not a pathognomonic symptom proving the existence of a syphilitic virus.

But what right has Dr. Ricord to conclude that inoculation proves the existence of a syphilitic virus? He tells us that all ulcers on the genitals or on any other parts of the body which secrete inoculable pus are syphilitic, and this is his proof of the existence of a syphilitic virus.

Dr. Ricord is not aware that the ulcers of herpes prepucialis, a disease so named when it occurs in men, and herpes pudendalis when it occurs in women, and both arising spontaneously; that is, without "coitus", when in a state of active inflammation, secrete an inoculable pus. (See *Dr. Evans, on Ulcerations of the Genitals*, page 20.) And further, Dr. Ricord is not aware that this inoculability of pus depends on the state of active inflammation, in which the ulcer is at the time, and not on a specific virus.

Thus Mr. Henry Lee, Surgeon to St. George's Hospital, attempted to inoculate with the pus, taken from a hard based ulcer on the prepuce, in a state of chronic inflammation, but failed. He then irritated this ulcer, and when it was brought into a state of active inflammation, the pus then became inoculable. (See Mr. Henry Lee's report of his experiment published in the *Lancet*, 31st March, 1866.) (See also Professor Wilhelm Boeck, of Christiana, statement to the same effect as Mr. Lee's experiment, reported in page 348 of the Medical Committee's Report.)

Therefore Dr. Ricord's inoculation, as a proof of the existence of a syphilitic virus, is a myth, placed in the room of Mr. John Hunter's myth; for no medical practitioner, in this country or in France, can point out one symptom pathognomonic of a syphilitic virus.

2. That this Committee did not know how to proceed and inquire scientifically into the pathology, the etiology, and the medical treatment of this so-called syphilitic disease, I now proceed to show.

Everyone knows that when a scientific medical practitioner is called to the bedside of his patient, his first duty is to inquire what were the first symptoms which marked the first deviation from perfect health—then to trace their effects on the body or mind, or on both—then to endeavour to ascertain the cause or causes of these symptoms, and then to prescribe.

When the impostor, on the contrary, is called to the bedside, he neither inquires as to the symptoms, nor the cause or causes of these symptoms. Simply, he assumes that his patient is labouring under such or such a disease, and he prescribes his nostrum.

This Medical Committee began their inquiry by assuming that there is a syphilitic virus—they assumed also that this virus resides in the hard base of an ulcer on the prepuce—and they further assumed that this syphilitic virus can be absorbed into the body of the individual; there remain dormant for years; and then manifest its presence on his offspring by symptoms which they call secondary symptoms of syphilis!!!

The writer of this letter was the first witness this Committee called before them. Having denied the existence of a syphilitic virus, and knowing that this Committee knew that they were assembled at his suggestion, to study and to endeavour to ascertain if there is a syphilitic virus, he naturally expected that this Committee—who were said to be a most scientific Medical Committee—would, as scientific medical practitioners, begin this inquiry by ascertaining the symptoms which marked the first deviation from perfect health in this so-called syphilitic disease. But they did no such thing.

On the contrary, the first question they asked him was relative to the so-called secondary symptoms of this so-called

syphilitic disease. Thus beginning their examination at the "Omega," instead of the "Alpha," of the question before them. (See Dr. Macloughlin's examination before this Committee, page 1 of this Report.)

The first question they put to their second witness they called before them was this:—"Do you concur in Dr. Macloughlin's views on the subject of syphilis?" His answer was:—"Certainly not, nor have I any confidence in that statement."

Since Dr. Macloughlin's name and opinions were thought worthy to be mentioned, this Committee ought to have known that it was their duty to ask this witness on what pathological facts he based his opinion that there is a syphilitic virus, and how he arrived at the conclusion that he ought not to have any confidence in Dr. Macloughlin's statement.

The Committee pursued the same line of examination with the third witness. They did not ask him a question about the first symptoms of a so-called primary syphilitic ulcer on the genitals, or on any other part of the body. They assumed that this third witness, like the witness who preceded him, could at once point out the diagnosis between a so-called syphilitic and a non-syphilitic ulcer on the genitals, or on any other part of the body. Their first question to him was: "Have you seen the pamphlet of Dr. Macloughlin on the subject of syphilis?" "I have," was the answer; "Dr. Macloughlin sent me his pamphlets successively."

"You are familiar with his opinions on syphilis, and I may ask you, do you approve them and adopt them?" "Certainly not", was the answer. Why or wherefore he disapproved of Dr. Macloughlin's opinions, they did not think it necessary to ask.

Their next question was this: "Do you approve the division of sores into infecting and non-infecting?" "Yes; I approve of the division of sores into infecting and non-infecting," was the answer. Did they ask him why? They did not.

Now, as neither this Committee nor this witness had given any pathological proofs that there exists a syphilitic virus, what right had this Committee or this witness to assume that there is a syphilitic virus, and that one kind of ulcer on the genitals is infecting, and another kind is non-infecting?

"Do you limit the infecting sores to such as are accompanied by thickening or induration?" was the next question. "As a rule I do," was the answer.

With every respect for this witness, I submit that, as he had neither proved by his pathological researches that there is such a thing as a syphilitic virus, nor that a syphilitic virus resides in the thickened or indurated base of an ulcer on the prepuce. The answer he gave was the mere echo of the preconceived opinion of his interrogators.*

Is it necessary to demonstrate further that this Committee had accepted a duty they did not know how to perform; that, being unacquainted with the law of evidence, they did not know how to examine the witnesses they called before them. Their so-called Medical Report is before the medical world; and every one who knows his profession, and who has a right to have a medical opinion, can judge the value of this Report.

3. That this Committee have not attempted to ascertain, as they were bound to do, if there are any symptoms on the

* I beg to call attention to Dr. Balfour's questions, from 94 to 105. He took exceptions to what I had stated in my pamphlet, relative to the abuse of mercury for the cure of syphilis in the army. A great part of what was said by Dr. Balfour and myself is suppressed; and thus, at 104, he promised to show me the proofs that the administration of mercury for the cure of syphilis was, as a rule, given up in the army; and it was agreed that I should call on him the next day at his office, to see his proofs. I did call. He refused to see me; and I was requested to write what I had to say to him. I insisted on a personal interview; that he was to name the day and the hour. He named three days after, at half-past 3 P.M. I recalled to him that I was come, according to agreement with him before the Committee, to see his proofs that mercury for the cure of syphilis, as a rule, was given up in the army. His reply was that, as I was in no official employ, he must decline to give me the proof; that he would do so to the Committee. And, at No. 105, I am made to answer, "My retraction *is* sufficient"; whereas my answer ought to have been reported thus: "My retraction *will be* sufficient." And I leave the reader to decide if Dr. Balfour has redeemed his promise to bring before the Committee the proofs that, as a rule, the use of mercury is given up in the army.

But the question at issue, it must not be forgotten, was, "*Is there a syphilic virus?*" and not "What is the treatment of syphilis?" And Dr. Balfour had no more proofs than the other members of that Committee, that such a virus exists. He, like his associates, wanders from the question before him.

genitals, or on any other parts of the body, pathognomonic of a so-called syphilitic virus, and, if so, what are its pathognomonic symptoms?

Had this Committee known anything of the literature of their profession, they must have been aware that they were the first medical committee appointed in any country to inquire scientifically if there is a so-called syphilitic virus; and, if there is, to determine its pathognomonic symptoms. We have seen how they have acquitted themselves of the duty intrusted to them.

We look in vain in this Report for any scientific researches, either on the part of this Committee or on the part of the witnesses they examined, as to the existence or non-existence of a syphilitic virus, its pathognomonic symptoms, or its method of cure. Like the empirics, the impostors, and the Parliament of Paris of the sixteenth and seventeenth centuries, they have, without a particle of proof, assumed that there is a syphilitic virus!!!

4. That this Committee have not attempted to ascertain, as it was their duty to do, if the witnesses whom they called before them had personally made any researches as to the pathology, &c., of this so-called syphilitic disease, or if they spoke according to the researches of others.

I have shown how this Committee examined the three first witnesses. Here are specimens how they proceeded to examine other witnesses:—"Have you any doubt of the existence of a specific disease known as syphilis?" "I have no doubt about it," was the answer. With this answer the Committee were perfectly satisfied. It never entered their heads to ask, What do you consider are the pathognomonic symptoms of a so-called syphilitic ulcer on the genitals, or on any other part of the body? But, no; he is asked, "Do you include under that term all venereal sores caused by promiscuous sexual intercourse, or do you divide the sores into a simple one, and a specific one?" "According to my experience," the witness replied, "there are several distinguishable sores resulting from infection obtained in sexual intercourse. I do not consider syphilitic sores in the same light as a small-pox or cow-pox pustule; they have not the regular character and progress which these have; there are several sorts." "I wish," says

the Chairman, "at present to confine my inquiry entirely to every sore that is called a syphilitic sore." "I term," says the witness, "all sores syphilitic that come from infection in sexual intercourse, the appellation is just as applicable to one sore as to another."!!!

The examination of another distinguished surgeon commenced thus:—"You have taken a great deal of interest in the subject of syphilis?" "Yes." "You have made it a study for many years of your professional life?" "Yes." "Have you had any opportunities of treating the primary stages of syphilis?" "A great many." But they did not ask him, What are the pathognomonic symptoms of a so-called syphilitic ulcer on the genitals or on any other part of the body?!!

Knowing by inspiration that there is a syphilitic virus, the Committee would have thought it discourteous to ask this eminent surgeon if he knew the A, B, C, of this so-called syphilitic disease. Their next question was: "What proportion of the cases which you at first deemed to be soft sores have been followed by secondary disease, and is that a common occurrence?" Answer: "It is not a very infrequent one; I should *guess* that about once in thirty times a sore, which I had supposed to be a soft sore, was followed by secondary symptoms; I give that just as a *guess*, and not as the result of any calculation."

Of a third distinguished surgeon they asked, "Do you apply the term 'syphilis' indiscriminately to all forms of venereal disease?" "No." "To what do you restrict its application?" "Setting aside gonorrhœa, to all forms of venereal disease." "All sores?" "Yes, all other sores." Not a question is asked if all sores on the genitals have, or have not, the same appearances.

The above three surgeons, of whose examination I have given a specimen, are amongst the most distinguished members of the medical profession; and their testimony proves the want of knowledge of the pathology of this so-called syphilitic disease by the medical profession in this country.*

* To those readers of this pamphlet, who have not read the Report published by the Committee, I must inform them that I have stated what the witnesses considered the strongest facts in support of the opinion they gave.

5. That this Committee have endorsed as facts the errors of their predecessors, and the dreams of the empirics and impostors of the sixteenth and of the seventeenth centuries as to the pathology of this disease. It is seen that throughout their Report this Committee consider Mr. Hunter's opinion, that a hardness at the base of an ulcer on the prepuce is the pathognomonic symptom of the existence of a syphilitic virus. Are they not told by the greatest syphilographer of the present age, Dr. Ricord, that the hardness at the base of an ulcer on the prepuce is no proof of the existence of a syphilitic? And since they had been appointed to inquire scientifically if there is, or not, a syphilitic virus, was it not, I repeat, their duty to inquire if Mr. Hunter or Dr. Ricord is right?

But is it not on record that other pathologists have informed them that if caustic is applied to a healthy prepuce, that the ulcer which follows this application of caustic has a hard base. Thus demonstrating Mr. Hunter's error. Has not the ulcer caused by herpes prepucialis a hard base, especially when any irritating application is placed on the ulcer? (See *Bateman on Cutaneous Diseases.*) And is it not known to every scientific medical practitioner, that this hardness at the base of an ulcer on the prepuce depends on the degree of active inflammation which has existed, and on the loose cellular texture on which it is placed? But is it not also on record that Mr. Hunter described the symptoms of herpes prepucialis as the true symptoms of syphilitic disease, and thereby misled the medical profession?

I repeat, as they had these facts before them, had they known their profession, and had they known their duty, they ought to have inquired into them, and ascertained if they were justified to place any confidence in Mr. Hunter's statement. But, not content with assuming as facts the errors of Mr. Hunter as to the pathology of this so-called syphilitic disease, they assume the dreams of the empirics and impostors, that the syphilitic virus can lay dormant for years in the body of the parent, and then is conveyed, with the semen, into the body of the offspring, and manifest itself in the offspring *even "thirty years after his birth"!!!* And, to prove this, they called before them specialists, and they get from each the stereotyped answer, of nothing like leather.

They called before them a great authority on the question of hereditary syphilis, and he assures the Committee "that he finds no difficulty in discovering hereditary syphilis in a person thirty years after birth, for the bridge of the nose is sunken or flat, and the upper central incisor teeth present vertical notches." Did they ask him how he could trace the connection between a so-called syphilitic ulcer on the genitals and the sunken and depressed bridge of the nose, and the vertical notches on the upper central incisor teeth? They did not.

The zoologists inform us that there is a species of animal which where one goes all follow. Is it the same with the specialists? Another distinguished practitioner whom the Committee call before them also affirms "that he knows that syphilis is hereditary in consequence of the offspring having these vertical notches on the upper central incisor teeth." But the Committee forgot to ask him how he arrived at that knowledge, and if he knew what are the pathognomonic symptoms of a so-called syphilitic ulcer on the genitals!!!

They also called before them a dentist: he knows that syphilis is hereditary, "because there is a great amount of irregularity in the form of the teeth individually, especially in the front teeth." Did they ask this gentleman if he knew what are the pathognomonic symptoms of a primary so-called syphilitic ulcer on the genitals? They did not.

They called another witness before them who affirms that syphilis is a hereditary disease "because he has seen necrosis of the upper jaw bone," the consequence of hereditary syphilis. Did they ask this gentleman if he knew what are the pathognomonic symptoms of a so-called primary syphilitic ulcer on the genitals, or on any other part of the body, and how he could trace the connection between a primary syphilitic ulcer and this necrosis of the bone of the upper jaw? They did not. They, of course, knew as well as this witness that necrosis of the upper jaw bone can be caused only by hereditary syphilis!!!

They call before them a distinguished dermatologist [*Anglicè*, skin doctor], and they begin to examine him, in their usual way, by an assumption. Thus, they ask him: "You are very familiar with diseases of the skin, and amongst other varieties

of disease have you had opportunities to see varieties of syphilitic diseases, whether in children or in adults?" "Yes." "In the form of eruption chiefly?" "Yes; eruptions and affection of the mucous membrane of the mouth." Did they ask him for evidence of facts to account for this belief? They did not.

It is possible that this gentleman entertains the same opinions on cutaneous eruptions as a late celebrated dermatologist, Dr. Alibert, who believed that any eruption on the skin, and every ulcer on the body which could be cured by mercury, was syphilitic. When told that his patient never having had "*coitus*," could not have contracted the disease, Alibert would reply, "His father or mother, or his grandfather or grandmother, or some of his ancestors, must have contracted the disease, and it now appears in the individual before me. Consequently, according to Dr. Alibert, any virtuous descendant of Adam might have contracted this disease from any virtuous descendant of Eve, for anything he, she, or they, might know to the contrary!!!

This is the dogma of the French, and it is the dogma accepted by the English dermatologist as a demonstrated fact, that syphilis is hereditary, and accepted by this Committee as a pathological fact that cannot be doubted!!! And as this Committee, throughout their inquiry, allowed the witnesses before them to consider that the symptoms of scrofula and those of hereditary syphilis are the same, it follows that, according to this Committee, and according to the testimony of the witnesses that came before them, that almost the whole population of the world are labouring under hereditary syphilis. And, as a proof of the correctness of what I am stating, I refer to the case of Mr. M., who appeared before the Committee. (See p. 365 in the Report of this Committee; see also pp. 467, 468; see also pp. 475, 476.)

Apparently knocking at every door for information as to this so-called syphilitic virus being transmitted from the parent to the offspring, this Committee called before them a distinguished accoucheur. What was their first question to this gentleman? They would not have been true to themselves if they had not begun by their usual assumption, thus: "You are familiar with the various aspects presented by children at

their birth, and you are, doubtless, familiar with the appearance presented by infants born of syphilitic parents?" "I am quite familiar with them." "Will you be so good as to describe the appearance presented by a syphilitic infant?" "If I were to point to local symptoms that mark the existence of hereditary syphilis, I would say that the *alæ nasi* are depressed in almost every syphilitic child, and it is a very marked feature," &c. But they forgot to ask him this most important question, How do you know that syphilis is the cause of this depression of the *alæ nasi?*

They called before them another distinguished accoucheur, and they began as usual by asking him, "You are familiar with the appearances which are presented by new-born children who are afflicted with syphilis?" "Yes." "Will you be so good as to describe, as briefly as you please, the appearance which a child presents at birth, and which induces you to say that the child is syphilitic?" "The children are very much emaciated; they have a sort of monkey face in appearance; and they commonly have a rash either at the time, or which breaks out afterwards, extending over the nates, the thighs, and the genital organs, of a light copper colour; very often the skin easily peels off the feet and exfoliates in that way."

Where is the medical practitioner, acquainted with his profession, who does not see that that gentleman describes a case of strumous disease, and assumes it to be a case of hereditary syphilis? He himself admits this, for he says a little farther, "If the child survives it is apt to go into struma." He also tells us, "That there is no difficulty to establish the diagnosis between hereditary syphilis and struma"!!! But the Committee forgot to ask him what were his proofs of the existence of a syphilitic virus? and how he could trace the eruption on the child to the ulcer on the parents' genitals? and what are the diagnosis between syphilis and struma? Therefore this gentleman's evidence can afford us no proofs of the existence of a hereditary syphilis.

That all the specialists might be represented in their Report, the Committee call before them also a distinguished oculist. He affirms that he knows that syphilis is hereditary by the inflammation of the cornea and by iritis. Of course the Committee were satisfied with this information, as this gentleman has affirmed it; and of course they are well aware that inflammation of the cornea and iritis can only occur from hereditary syphilis!!!

It must not be lost sight of, that the above specialists are esteemed amongst the best informed medical practitioners (as specialists) in this country; that they are believed on their oaths, on medical questions, in courts of law. But we must not altogether blame these specialists for their shortcomings. Did not this Committee begin, I repeat, their inquiry by assuming the existence of a so-called syphilitic virus? while they had been appointed to study and to ascertain if such a virus existed. And have they not, during this inquiry, done all in their power to bring us back to the days when the empirics and impostors alarmed the Parliament of Paris, by assuming the contagious nature of syphilis—that it was communicated from an infected to a healthy person by breathing the same air, by sitting on a seat where an infected person had sat, etc., which caused the Parliament of Paris to decree that any foreigner, who laboured under this disease, and did not leave France in twenty-four hours, should be hung; that every Frenchman who laboured under this disease, if out of his house and in the street, should be hung?

Although this Committee have had before them some of the best medical practitioners in this country, have they examined one of these scientifically? Their Report is there, to answer —certainly not.

6. That this Committee have acted, throughout this inquiry, disingenuously.

When I appeared before this Committee as a witness, on the 6th of October, 1864, and when I found that, instead of beginning, as it was their duty to do, to ask me on what grounds I doubted the existence of a syphilitic virus, and when I found that they had assumed that there is a syphilitic virus, I immediately protested against this unscientific manner of carrying out this inquiry. I sat on the left of the President; the shorthand writer sat on my left. The President, while I formulated my protest, told the shorthand writer not to take down what I was saying; as it was merely conversation, that

he would tell him when to take notes. This protest does not appear in their report of my examination before them. They have suppressed it.

But there is a more important part of my evidence suppressed. It is seen above that Dr. Ricord maintains that inoculation is the only proof of the existence of a syphilitic virus. Dr. Donnet, while examining me, said that inoculation was a proof of the existence of a syphilitic virus. Upon which I turned to Dr. Evans's work on Venereal Disease, and I requested the President to read to the Committee an account which Dr. Evans gives of an experiment practised at Valenciennes in 1816 by my late friend, Inspector-General Dr. Murray. Dr. Murray inoculated a man with the pus from an herpetic ulcer on the prepuce in a state of active inflammation, and a pustule was the result, showing at once that Dr. Ricord is in error when he asserts that only syphilitic ulcers secrete inoculable pus; therefore that Dr. Ricord has no proofs of the existence of a syphilitic virus; and that, therefore, I repeat, no medical practitioner in this country or in France can point out one symptom pathognomonic of a syphilitic virus.

This quotation from Dr. Evans was an important one, and especially as I was at Valenciennes at the time, and that I was cognisant of the fact; consequently this quotation from Dr. Evans, which the President read out to the Committee, and what I had stated after the President had read the quotation, I submit ought to have appeared in the Report of the Committee, as it demonstrates, I repeat, that there is no proof of the existence of a syphilitic virus.

I say I sat on the left of the President, and the short-hand writer sat on my left. He was going on taking down Dr. Donnet's questions and my answers. But when I had put Dr. Evans's work into the President's hand, and after I had requested him to read the above quotation relative to Dr. Murray's experiment, the President told the short-hand writer that he would give him the quotation to copy. Whether the President accidentally or intentionally omitted to give the above quotation and my protest to the short-hand writer to be inserted in his notes of my examination I leave others to decide. But it is not only in my evidence that important

as to the fatal effects of syphilis on the human offspring. They testify to its prevalence amongst all classes of society; its insidious nature; the frequent failure of all but men of great experience to recognise it; and, moreover, to this most important fact, that the poisoned *fœtus in utero* is no infrequent cause of miscarriage."

Consequently, we are authorised to say, that the conclusions which this Committee have arrived at are based on assumptions instead of being based on well established pathological facts; that they are the productions of untutored imaginations; that they are a deception practised on the Admiralty, the War Office, and the public; and that they are repugnant to the present medical acquirements of the medical profession in this country.

I have the honour to be, my Lords,
Your Lordships' obedient servant,

DAVID MACLOUGHLIN, M.D.,
Member of the Legion of Honour.

London, 24th May, 1866.
36, Bruton Street, Berkeley Square, W.

P.S. Since the above was written, I have received the copy of the Instructions, given by the Admiralty and the War Office to the Medical Committee.

The Admiralty and the War Office will permit me to say, that every sailor is not a scientific nautical man; consequently that when a scientific nautical question is sought to be solved, the question ought to be put in scientific nautical terms, and then referred for an answer to scientific nautical men. The same thing holds good in the medical profession. That every medical man is not a scientific medical man; that when a scientific medical question is sought to be solved, the question ought to be put in precise scientific medical terms, and then referred for an answer to scientific medical men.

The instructions given to the above Medical Committee have been, it is evident, drawn up by persons unacquainted with medical science; who did not know what information

they ought to ask for, and who sought for information on a medical question from persons, like themselves, unacquainted with medical science.

No person need be told that to study any question scientifically we must begin at what is known, and thereby endeavour to arrive at what we do not know; consequently, that we must not begin by *assuming* as a demonstrated fact, that which we have not demonstrated to be a fact.

The above instructions begin by assuming "that there is a syphilitic virus," hence a so-called syphilitic disease; and requires the Medical Committee "to consider the pathology of this disease, only to such an extent as they may deem absolutely necessary, to enable them to deal with the main object of the inquiry, namely, the attainment of a sound rule of treatment."

Had such instructions been given to a committee composed of scientific medical men, they would have seen the error which had crept into their instructions; they would have seen that they were called on to act the tragedy of "Hamlet" with the part of Hamlet left out; they would have corrected this error; they would have gone to the bedside and there interrogated nature; they would then have sought for information from persons who they believed could give them information, and they would have ascertained, by a careful inquiry, if these persons were acquainted with medical science, and entitled to be heard as witnesses; and having done all that medical science dictates to arrive at a knowledge of the disease, they would have pronounced their views as to the pathology, etc., etc., of this so-called syphilitic disease.

But unfortunately this Committee, to which the above instructions were given, was composed of persons unacquainted with medical science, and unacquainted with the duty they were called on to perform. They did not go to the bedside and there interrogate nature; and when they had before them scientific medical men well acquainted with their profession, and competent to give, and to be heard when they give, an opinion on a medical question, they did not examine them in such a manner as to give them an opportunity to show that the testimony they gave was based on well ascertained pathological facts. They refused to listen to pathological facts; they suppressed pathological facts; they mutilated and suppressed evidence to suit their preconceived opinions; "they assumed the existence of a syphilitic virus."

They have put before the Admiralty, the War Office and the public, the creation of their untutored brains, as a demonstrated pathological fact.

But this Committee have not completed their romance; they have not published the medical treatment they recommend for their bantling. Out of respect for the medical profession it is hoped that it will never be brought to light. Based as their report is on the creation of their untutored brains, the medical treatment they will recommend, for this so-called syphilitic disease, will rest on imagination. It cannot be useful to the public. It will entail scorn and contempt on the medical profession of this country.

From the above facts it is evident, that the Admiralty and that the War Office have fallen into incompetent and unfaithful hands; that their confidence has been abused; that they have been imposed upon; and that the pathology, the etiology, and the medical treatment of this so-called syphilitic disease, is where it was, still requiring to be scientifically studied.

As the Admiralty and the War Office adopted my suggestions two years ago, and appointed this Medical Committee to have this disease scientifically studied, with every sentiment of respect, and in the interest of the Navy, in the interest of the Army, and in the interest of the public, it may be permitted to hope, that the above two great departments of state will not be deterred from further inquiry into the pathology, etc., of this disease, by the failure of this first attempt.

They will please remember that the art of gunnery has not arrived at its present state of improvement but by slow and repeated investigations, that therefore they cannot expect that a medical question, which has heretofore been in all countries chiefly in the hands of quacks and impostors; which has, heretofore, never been scientifically studied, in any country; by scientific medical practitioners, or by any scientific medical authorities; and which, heretofore, every government, in

every country, have deemed it derogatory to themselves to take cognisance of such a disease and to have it studied.

I say, with sentiments of respect, that it may be hoped that, from motives of duty towards their subordinates, from motives of duty towards the public, and from motives of humanity towards the human race, that the Admiralty and the War Office will give the medical profession the same opportunity to be useful that they have given the gunners, and that they will appoint another medical committee to study scientifically if there is a syphilitic virus? if so, what are its pathognomonic symptoms on the genitals and on other parts of the body, and its medical treatment, and the hygienic means they recommend to prevent the occurrence of this disease in the Navy and Army.

June 16th, 1866.

T. RICHARDS, PRINTER, 37, GREAT QUEEN STREET.

NO MEDICAL PRACTITIONER,

IN ENGLAND OR FRANCE,

COULD OR CAN POINT OUT

ONE SYMPTOM PATHOGNOMONIC

OF A

SYPHILITIC VIRUS.

BY

DAVID MACLOUGHLEN, M.D.,

MEMBER OF THE LEGION OF HONOUR.

LONDON:
JOHN CHURCHILL AND SONS, NEW BURLINGTON STREET.
1867.

DR. MACLOUGHLEN ON THE NON-EXISTENCE OF A SYPHILITIC VIRUS.

[Extract from the *Medical Times and Gazette*, January 26th, 1867.

TO THE EDITOR.

36, *Bruton Street, Berkeley Square, W.*

Sir, London, 31*st Dec.*, 1866.

I have before me the Army Sanitary and Medical Report for 1864, and the Naval Medical Report of the Health of the Navy for 1863. From these two reports, it appears that the loss of service yearly, by the so-called Syphilitic Disease, is equal to the loss of the whole force of the Army and Naval Service in this country for eleven days. Permit me to ask, if there is such an entity as a syphilitic virus? In other words, is there such a disease as a specific syphilitic disease?

At this moment two opinions divide the Medical world as to what are the pathognomonic symptoms of this syphilitic virus. The first is that of Mr. Hunter, and the second is that of Dr. Record, of Paris.

Mr. Hunter maintains "*that the pathognomonic symptoms of a syphilitic ulcer are, that the specific inflammation is confined to the base of the ulcer on the reproductive organs; that the base is hard; and that the edges of the ulcers are a little inverted.*"

Dr. Record maintains that no one, by his eyesight or by his touch, can ascertain the existence of syphilitic virus in an ulcer on the reproductive organs, but he asserts that every ulcer on the reproductive organs which secretes an inoculable pus contains the syphilitic virus.

Is either of these opinions correct?

Herpes præputialis in the male, and herpes pudentialis in the

female, is a disease which occurs spontaneously in both sexes, and without coitus. The ulcer on the prepuce of the male has most commonly a hard base. If we read Mr. Hunter's observations on the rise and progress of what he calls the true chancre on the reproductive organs, we remain satisfied that Mr. Hunter mistook the Herpes præputialis ulcer for a true chancre. Besides, if the hardness at the base of an ulcer on the reproductive organs is the only proof of the existence of a syphilitic virus, why have we not that hardness at the base of an ulcer affecting the glans penis?—no finger ever yet detected such hardness at the base of an ulcer on the glans penis.

Fifty-six years ago, at Lisbon, to prove that the hardness at the base of an ulcer on the reproductive organs is not pathognomonic of a syphilitic virus, I saw two medical officers apply caustic to their healthy prepuce,—two hard-based ulcers were the consequence.

Moreover, is it not at this moment known to every scientific medical practitioner, that hardness at the base of an ulcer on the reproductive organs, depends on the tissue in which the ulcer is situated, and on the degree of inflammation which accompanies it? See *Bateman on Cutaneous Diseases.*

Therefore Mr. Hunter's test of the existence of a syphilitic virus is an error.

Dr. Record, the great syphilielographer of the age, says that every ulcer on the reproductive organs which secretes inoculable pus contains the syphilitic virus.

Fifty years ago, I was present at Valenciennes, in the north of France, when my late friend Dr. Murray, Inspector-General of Army Hospitals, took pus from an herpetic preputialis ulcer in a state of active inflammation, inoculated with it, and with perfect success.—See *Dr. Evans on Syphilis.*

Very recently, the distinguished scientific Surgeon of St. George's Hospital, Mr. Henry Lee, attempted to inoculate with pus from an ulcer in a state of chronic inflammation, but failed. He, however, irritated that ulcer, excited active inflammation, then this ulcer secreted inoculable pus.

Therefore, inoculable pus depends on the state of active inflammation in which the ulcer is, and not on a specific syphilitic virus.

Of this fact Dr. Record is himself aware; for he recommends that the pus for inoculation be taken from an ulcer before that ulcer

has existed fourteen days. After fourteen days, he says, the ulcer becomes chronic, and secretes no more inoculable pus.

Therefore, Dr. Record's test of the existence of a syphilitic virus is also an error.

Consequently, no medical practitioner, in this country or in France, is justified to state that an ulcer on the reproductive organs, or on another part of the body is caused by a syphilitic virus.

Hence, I conclude, as the result of my experience during these last fifty years, that all ulcers on the reproductive organs, the consequence of "Coitus," can be radically cured by ablution, rest, and attention to the general health.

Two years and a half ago, when there was such an outcry about this so-called syphilitic disease in the Army and Navy, I addressed a pamphlet to the Secretary of State for War, pointing out to him that no medical practitioner, in this country or in France, could or can demonstrate the existence of a syphilitic virus, and I suggested the appointment of a Scientific Medical Committee to inquire into its truth.

In consequence of the publication of that pamphlet, I was sent for to the Admiralty, for my advice what could be done to protect the sailors and the soldiers from this so-called syphilitic disease.

My advice was to appoint a Scientific Medical Committee, to carry out the inquiry suggested in the above pamphlet.

Subsequently, *the* Lord Clarence Paget, then Secretary to the Navy, informed the House of Commons, on the 19th July, 1864, that the Government had decided on appointing a Scientific Medical Committee to study and to report on this so-called syphilitic disease.

On the 3rd September, 1864, I received a letter from the Admiralty, addressed to me by order of the then First Lord of the Admiralty, his Grace the Duke of Somerset, informing me that a Medical Committee had been appointed, as I had suggested.—See Appendix, No. I.

That committee have now published the instructions under which they acted, and they have published their Report.

It is evident that the instructions given to that committee were drawn up by persons unacquainted with medical science, and unacquainted with the object for which this committee was appointed.

Thus, these instructions assume that there is a syphilitic virus —the very thing which is more than doubtful—and to ascertain its existence this committee was appointed.

And the instructions go on telling the committee "*that they are specially to direct what is the best medical treatment for this so-called syphilitic disease, without inquiring particularly into its pathology;*" thus calling on this committee to prescribe for a disease, the pathology of which they had not ascertained, and treating this committee as quacks and impostors.

The committee accepted this unenviable position; and, true to their instructions, they also assumed the existence of a syphilitic virus; they again and again refused to hear proofs of the non-existence of a syphilitic virus; they have not examined one witness scientifically; they have suppressed and they have mutilated the testimony of witnesses to meet their preconceived opinions; they have made confusion worse confounded; their Report is a disgrace to the medical acquirements of this country, and is a deception practised on the public.

In the interest of the Army—in the interest of the Navy—and in the interest of humanity, I again took the liberty to suggest to the War Office, and to the Admiralty, to appoint another more carefully instructed and more carefully selected medical committee to carry out this important investigation. The War Office have answered my letter that they did not intend to appoint another medical committee, and I have been unofficially informed that the Admiralty have also decided to have no further inquiry.

It rests, therefore, with the War Office, and with the Admiralty, to refuse inquiry into the cause which deprives the country, yearly, of its whole military and naval strength for eleven days.

And to doom yearly thousands of men of both services to have their constitution injured—themselves rendered unfit for military or naval service—and, too often, their life ultimately destroyed—by being subjected to a so-called specific medical treatment—for a so-called specific disease which does not exist.

I have the honour to be, &c.,

Your obedient Servant,

DAVID MACLOUGHLEN, M.D.

Member of the Legion of Honour.

APPENDIX, No. I.

COPY OF A LETTER FROM THE ADMIRALTY.

ADMIRALTY, *2nd Sept.*, 1864.

SIR,

I AM directed by the Duke of Somerset to acknowledge your letter of the 1st instant, and to inform you, in reply, that the Board of Admiralty and the War Office have decided to appoint a joint committee to inquire into the question of Syphilis in the Navy and Army, which course was urged upon the Board by yourself, in connection with the pamphlet addressed by you to the Secretary of State for War.

His Grace desires me to add, that you are at liberty to make any use you think proper of this communication.

I am, &c., &c.,

(Signed) A. BUCKLEY.

To DR. MACLOUGHLEN.

LONDON: BENJAMIN PARDON, PRINTER, PATERNOSTER ROW.

OBSERVATIONS

ON

YELLOW FEVER.

By ROBERT LAWSON,
DEPUTY INSPECTOR-GENERAL OF HOSPITALS.

(*Reprinted from the British and Foreign Medico-Chirurgical Review for October*, 1862.)

LONDON:
PRINTED BY SAVILL & EDWARDS, 4, CHANDOS STREET,
COVENT GARDEN.
MDCCCLXII.

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OBSERVATIONS ON YELLOW FEVER.

Division I.—Influence on the Secretions.

Having been stationed in Jamaica from September, 1856, till June, 1860, I was enabled to examine some of the peculiarities of yellow fever as it occurred there during that period. Part of the results have appeared already in the pages of the 'British and Foreign Medico-Chirurgical Review;' the present communication embraces observations on the secretions during, and the morbid appearances left by, the disease, which are of importance both in practice and in giving more precise notions as to its nature. Many of the subjects in the following remarks were mentioned by Blair in his papers on the Yellow Fever at Demerara; others have been alluded to by La Roche, in his work on 'Yellow Fever;' but I have endeavoured to push the observations further, and to trace the connexion between the different phases of the disease more fully than either, or than I have seen elsewhere.

Urine.—The liability to suppression of urine in yellow fever, and the serious consequences resulting therefrom, have long been known; but it is only of late years that the composition of the secretion has been receiving attention, and as yet it is far from having obtained what its importance demands. In fact, men in practice have their time so fully occupied, especially during the prevalence of an epidemic, that anything beyond the most simple examination is out of their power.

The urine during the first days of yellow fever presents the ordinary characters seen in febrile affections. Its quantity is rather less than natural; its colour somewhat higher, though clear, and of moderate specific gravity. From the third to the fifth day of the disease, the quantity is often diminished to fifteen, or even twelve ounces, or less, in the twenty-four hours; its colour from six to seven of Vogel's scale, and specific gravity from 1018 to 1030 at 60°; it continues acid, and presents more or less sediment. Should the patient survive the fifth day, the quantity generally increases and often becomes copious—fifty, sixty, or even eighty ounces being passed in twenty-four hours. With this increase the colour becomes lighter, unless when obscured

by blood or bile, and the specific gravity less; and as the patient convalesces, the secretion gradually assumes its usual appearance.

Suppression of urine is most common from the fourth to the sixth day of the disease; but this period may pass, the flow become copious, and yet suppression occur many days later. At either period the result is almost universally fatal.

A cloudiness appears in the urine on the morning of the fourth day of the disease; and if a specimen, obtained at this time, be allowed to stand for an hour or two in a cylindrical vessel, a sediment will subside, frequently amounting to one-fourth the bulk of the fluid, or even more. On examination with the microscope, this is found to be composed almost exclusively of scaly epithelium from the bladder. On the morning of the fifth day, an equally copious deposit will occur, but differing from that of the previous day in being composed of granular tube casts from the kidneys, frequently with but a trace of scaly epithelium. The solid transparent casts called waxy are not uncommon at this period. After the sixth day the casts become gradually more hyaline, the quantity diminishes, and in a few days thereafter they nearly disappear. When it was possible to fix the date of the first accession of the fever, the desquamation of the bladder seemed fairly developed on the morning of the fourth day; while the casts from the kidneys, though probably formed at the same time, were not copious in the urine before the morning of the fifth day. It is possible these might occur earlier in some cases, but I have not met with any in which this was ascertained satisfactorily. In cases of mixed typhoid fever, presenting on post-mortem examination the distinct raised ulceration of Peyer's glands in the ileum, and which terminated with suppression of urine, albumen and granular tube-casts were found in it, but these occurred longer after the first accession of the disease than in pure yellow fever.

The casts are usually $1^{s}.0$ to $1^{s}.3$* in diameter. They are highly granular from the first, with few traces of the outline of the original epithelium. The solid waxy casts are of the same sizes; if these be illuminated with a pencil of small angle, and viewed with an object-glass of large angle of aperture, epithelium more or less granular can always be seen in them. The substance connecting the granular and epithelial matter in both descriptions of casts is soluble in caustic potash; acetic acid dissolves it in the granular casts, but seems not to affect the waxy. These reactions induce me to believe the waxy part of the casts is casein, which, it will be shown below, is common in the urine in yellow fever.

It is rare to find a blood-globule in the tube-casts, even at the commencement, and many cases of the disease run their course without a single globule being detected in the urine. In others there may be hæmorrhage from the kidneys or urinary passages, in which case blood-

* In this method of expressing microscopic measurements, the thousandth of an English inch is taken as the unit, and its fractional parts are given decimally, which offers far greater facilities for comparison, and for conversion into foreign measures, and *vice versâ*, than the method by vulgar fractions usually employed in this country. See Beale's Archives of Medicine, No. 8 (April, 1861), p. 292.

globules are found in the secretion, or in the casts. A third series occurs in which the urine is of the colour of blood, without a globule being found in it; in these the epithelium and substance surrounding the granular matter of the casts are deeply impregnated with hæmatine, though not a single entire globule can be detected among them.

If the case proceed favourably, the casts diminish in number, and become less granular and more hyaline on the sixth or seventh day, and soon disappear altogether. If it run on to suppression of urine at this period, they maintain their granular character; but if the flow of urine be increased after the fourth or fifth day, and the suppression do not occur until a later period, the casts become less granular and less numerous until just before that event takes place.

The urine is frequently coloured deeply by bile. This may be distinguished from hæmatine by the brownish-yellow colour a thin stratum gives with transmitted light, while urine coloured by hæmatine always presents a blood red. The former gives a green colour with nitric acid, varying in depth from a light pea-green to a greenish black, and occasionally, when not too deep, the usual changes to the violet and red can be perceived; while with the latter this acid produces a coagulum, from a dirty brownish grey to a dark liver colour. The two, however, may exist in the same specimen, when the reaction will partake of both characters.

The discharge of blood, whether in the form of globules or of hæmatine, and that of bile, in the urine, usually occur from the fourth to the sixth day, and either may continue for several days thereafter. The excretion of bile in this way is always beneficial. Blood, if in the form of globules—constituting hæmorrhage, in short—is generally beneficial, from whatever organ it proceeds, if the flow be not so copious as to depress the vital powers too much, and with its appearance unpleasant symptoms are often dissipated. When originating in the kidneys, it seems to act as a local depletion, obviating that engorgement of these organs so liable to arise at this period, and favouring the flow of urine. It is very different when the discharge is in the form of hæmatine without globules; then it seems to be strictly a secretion, for the epithelium of the casts, and that in the convoluted tubes of the kidneys themselves, is deeply impregnated with it, while blood globules are not to be seen either around the Malpighian bodies or inside the tubes. This form of discharge is often copious, always unmanageable, and almost of fatal import.

The colour of the urine has been stated already to be as high as from 6 to 7 of Vogel's scale, from the fourth to the sixth day. This arises from its ordinary colouring matter, the urœmatine. In addition, this secretion sometimes contains, for long periods, and in healthy persons as well as those labouring under disease, a large amount of uroxanthine, or its derivatives, urrhodine and uroglaucine. These do not deepen the colour, but as they seem connected with some peculiarities in the form of yellow fever, I notice them here.

The presence of urrhodine, or uroglaucine, may be determined by adding a few drops of urine cautiously to a drachm of hydrochloric

acid in a small test-tube, when a colour will be developed where the fluids meet, varying from red through purple to blue, according to the predominance of either of these pigments, and more or less intense according to their quantity. Their presence is indicated in another way. If a portion of urine treated with nitric acid, in the usual manner for the detection of albumen, be set aside for some hours, if containing more than a trace of urrhodine it will become of a deep reddish-brown colour, while the tint of uræmatine is not altered materially by this process. While these pigments were present in small quantity only, fever seemed to have less of the epidemic character, though the cases which presented themselves displayed an earlier and more serious implication of the liver, and more intense jaundice, than when they were more general and more copious. Just previous to my leaving Jamaica, the nitric acid gave the deep colour pretty generally, after having been absent from the early part of 1859. Upon this I stated the probability that the following season would be unhealthy, which prediction has proved correct.

If urine when heated, or treated with nitric acid, present a coagulum, this is generally believed to be albumen; but it may contain other matters which coagulate when so tested, and in yellow fever it does so very commonly. Globuline is coagulated by heat, and casein by nitric acid, as well as albumen, and these are by no means infrequent in the urine of fever in Jamaica. The following table shows the reactions of these three substances with different tests, and affords the means for distinguishing them:

	Heat.	Nitric acid.	Acetic acid.	Heated with dilute solution of carb. soda.
Albumen .	Coagulates at 146° Fahr.	... Coagulates	... Unaffected	... Unaffected.
Globuline .	Coagulates at 200° Fahr.	... Coagulates	... Unaffected	... Dissolves.
Casein . .	Does not coagulate.	... Coagulates	... Coagulates	... Dissolves.

In examining urine it was, in nearly every instance, passed through a paper filter, to remove epithelium, tube casts, mucus, or other extraneous matters; portions were then placed in three test-tubes, one of which was heated, another treated with nitric acid, and the third with acetic acid in a similar manner. The indications at the time were noted, and again after twelve to twenty-four hours.

On heating a specimen cautiously, with the tube inclined, the fluid along its upper edge sometimes became opaline, and the appearance then spread rapidly through the whole before the temperature was sufficiently high to form steam. At other times small bubbles of steam were generated and passed up, nearly reaching the surface, before an opalescence appeared, indicating a much higher temperature of the fluid. The coagulation in the former case was from albumen, in the latter from globuline. Sometimes there was a slight coagulation at the lower temperature, and a much more copious one at the higher, indicating an excess of globuline, though no free blood-globules were

seen in the urine. In common, however, the albumen so far exceeds the globuline that the latter cannot be detected in this manner; but it may be separated from the albumen by boiling alcohol, which I have done several times.

The nitric acid test was confirmatory of that by heat, and served to distinguish discoloration by blood from that by bile, as well as indicate the presence of urrhodine. Part of the specimen can be examined for chlorides, after the subsidence of the coagulum.

When acetic acid was added to a specimen containing casein, the colour became lighter, and more or less opaline, but in general subsidence did not take place to any extent for some hours. After twelve hours the precipitate had usually fallen, and constituted a fine amorphous, rather compact deposit, at the bottom of the tube. The supernatant fluid was then poured off, the precipitate washed and allowed to subside again, when the fluid was separated, and fresh water being added, a few drops of solution of carbonate of soda dissolved it at the temperature of the air (80° to 86° Fahr.); this observation has been repeated in so many instances, with the same result, as to leave no doubt concerning it.

Urine rich in urates gives a precipitate with acetic acid, if near the point of saturation, and at a low temperature, and the precipitate dissolves in carbonate of soda. This differs from casein in the precipitate forming immediately, and subsiding quickly; and, on decomposing the soda solution with an acid, by giving uric acid in a crystalline form, which can be recognised with the microscope. If a portion of the same urine be warmed, it will no longer give a precipitate on the addition of an acid, and if allowed to cool gradually the uric acid will be deposited in a crystalline form on the sides and at the bottom of the vessel. It was almost universally in the latter forms that it occurred in Jamaica.

I had seldom examined the soda solution for uric acid, but very frequently evaporated some drops of the secretion itself, acidulated with hydrochloric acid, on a slip of glass; and in the most decided instances of the presence of casein, did not find traces of uric acid, though hippuric was plentiful. The following case will illustrate this, as well as several other points noticed in this paper:

Henry Goodwin, a black soldier, aged about thirty, had a paroxysm of fever on the 10th August, 1859, but did not report himself sick. On the 12th, the third day of the disease, he went to hospital in the afternoon with a sharp attack of fever; the conjunctivæ were then deeply yellow. From this time till the morning of the fourth day he passed sixteen ounces urine, which was slightly albuminous. On the fifth day there was a remission; passed twenty-eight ounces urine. On the sixth day he continued much the same, the urine containing granular and epithelial tube casts in moderate quantity, with a little albumen and casein, very little urea, but much creatine and hippuric acid; no uric seen. The urine had not been examined microscopically before this day. On the seventh day fever ensued again; he had passed thirty ounces urine from the previous morning, of the same

character as last. About noon it became bloody, giving the colour of venous blood by transmitted light. It was then strongly acid, specific gravity 1014 at 84°, did not deposit a sediment, but had a few flocculi of granular and epithelial tube-casts, and epithelium from the bladder, but not a blood-globule could be detected. As the fluid filtered with extreme slowness, part was heated without filtration; coagulation took place partially, some time before ebullition, but increased as that occurred, and a sediment of a reddish colour fell, leaving the supernatant fluid pretty clear. Some of the latter gave a deposit with acetic acid, which dissolved in dilute carbonate of soda. A portion of the urine was treated with acetic acid; coagulation was produced almost immediately, and after some hours a deposit of one-seventh of the bulk of the fluid took place, of a reddish colour, and over it a thin loose stratum of deeper red colour, leaving the supernatant fluid clear dark amber; both deposits dissolved with carbonate of soda. As on the previous day, hippuric acid and creatine were copious, but there was little urea, and no uric acid. On the morning of the eighth day the fever continued; forty-two ounces of urine had been passed from the previous noon, of darker colour than before. Early this morning gallic acid was commenced, in three-grain doses every fourth hour. A specimen of the urine passed this forenoon was darker in colour than that of the previous day; it contained several granular tube-casts, which were tinged red, but none contained blood-globules, neither were any free globules seen. A coagulum of one-third formed by heating; but with acetic acid it was, to-day, not more than one-thirtieth of the whole, the supernatant fluid remaining of a clear deep cherry red. On the morning of the ninth day the urine collected in the previous twenty-four hours amounted to eighty ounces, of similar character; there was less fever, but a tendency to collapse; the gallic acid was increased to three grains every third hour. In the afternoon, ten ounces of a much lighter coloured secretion was passed, when the gallic acid was diminished a half. On the morning of the tenth day there was more fever; no urine had been passed since the preceding day; the gallic acid was then stopped. On the morning of the eleventh day, no urine having been passed for thirty-six hours, a catheter was introduced, and four ounces drawn off, of a dark brown muddy appearance. It contained numerous short solid pieces of granular tube-casts, of 2^{in}·0, 1^{in}·0, and 0^{in}·75 in diameter; these seemed infiltrated with a clear material, which in many had accumulated pretty thickly outside the granular portion, and with it was tinged throughout of a reddish brown colour. These casts were unaffected by strong acetic acid. No blood-globule was seen in the casts, or free in the urine itself. With heat the urine gave a coagulum amounting to one-fifth of the whole, and with acetic acid one amounting to one-tenth; the former dissolved in caustic potash, but was unaffected by carbonate of soda; the latter dissolved in carbonate of soda. The man died in the evening of this day.

This case is of much interest in the following respects:—1st. As showing the existence in the urine, at the same time, of albumen, casein, globuline, and the colouring matter of the blood. 2nd. In the absence of all trace of blood-globules throughout. 3rd. In the immediate reduction of the quantity of casein on the eighth day, under the influence of gallic acid. 4th. In the formation of waxy tube-casts under these circumstances, and the rapid diminution of the urine. Gallic acid passes through the kidneys unchanged, and may be detected in the urine within a very short time of its administration. It does not coagulate albumen, but precipitates casein immediately, and if brought in contact with the latter, sufficiently concentrated, as in the tubes of the kidneys, would cause its coagulation between and around the epithelium and granular matter constituting waxy casts, as in this case. Gallic acid would thus be a remedy of very questionable advantage in cases in which the urine contained casein.

The occurrence of albumen in the urine of yellow fever was first remarked, so far as I am aware, by Staff-surgeon Collins, at Barbadoes, in 1848,* and the same gentleman met with two cases in which the albumen was replaced by a substance having the properties of casein.† Blair seems to have doubted the correctness of the latter observation,‡ and there is no indication in La Roche's work, that any other person had detected this substance in the disease.

In watching a case from day to day it is found that, sometimes in the course of the third day, or by the morning of the fourth, heat indicates a small portion of globuline or albumen in the urine; and on the morning, or in the course of the fourth day, albumen generally appears in such quantity as to obscure the indications of globuline. The fifth day the albumen is more copious, and would seem to attain its maximum on that or the following one, after which it gradually declines. Casein appears about the fourth day, and accompanies either globuline or albumen. I do not remember to have seen it alone in fever. When albumen becomes very copious, the casein frequently disappears, and, under ordinary circumstances, seems to do so before the albumen. In some cases, globuline and casein have continued during the course of the disease, without albumen having been detected.

The quantity of albumen, &c., may be estimated approximately, from day to day, by the space the sediment occupies in the test-tube relatively to the bulk of the original fluid, and may be expressed conveniently in parts of the whole, either as a decimal, or vulgar fraction. The albumen was found to vary in different cases from a mere trace to 1·0; the globuline, from a trace to 0·7, though in general not exceeding 0·1; and the casein from a trace to 0·2, but generally less than 0·1.

The albumen varies greatly. At one time most cases present it to a considerable amount, at another there is much less, though the cases may be very severe, or even fatal. When the liver was severely implicated, and there was marked tenderness over it, with an early yellowness of the surface, the urine contained less albumen than when the

* Blair on the Yellow Fever at Demerara, third edition, p. 98. † Ibid., p. 99.
‡ Blair: Report on the Recent Yellow Fever Epidemic at Demerara, 1856, p. 18.

hepatic affection was less prominent. This peculiarly existed during the greater part of 1859, and early part of 1860.

Though the urine have a high specific gravity from the third day onwards, the urea seems much diminished. I have not determined the quantity with precision, but much less was obtained on evaporating a small portion of the fluid, acidified with nitric acid, than from healthy urine. La Roche gives the result of an analysis to the same effect.*

Though urea be deficient, creatine is unusually copious in the febrile affections of Jamaica, whether pure remittent or yellow. If two or three drops of urine from such cases be evaporated on a piece of glass, numerous needle-like crystals, visible to the unassisted eye, more or less branched, appear before the fluid has quite dried, and frequently cover the surface extending from one side of the specimen to the other, among the substances deposited during the evaporation. At a certain stage in the operation small rhomboidal plates appear, or more frequently hexagons, with the obtuse angles of the rhomboid removed, and, as the concentration proceeds, these are seen to shoot out both ways from the acute angles, forming the needle-like crystals mentioned: the needles always present a swelling in the position of the original hexagon, and the prolongations seem to have a triangular section, with the base on the glass, and the apex uppermost. These crystals present the nacreous appearance peculiar to creatine; they are soluble in water, ammonia, and dilute nitric, hydrochloric, and acetic acids, from which they are deposited again, generally in the form of hexagonal plates. Alcohol does not seem to affect them. Sometimes, though the specimen under examination be rich in creatine, it remains fluid and the creatine does not crystallize; if a drop or two of alcohol be added under these circumstances, numerous rhomboidal or hexagonal crystals appear, but they generally redissolve as the alcohol evaporates.

In one case, in which these crystals were numerous, and the portion of the urine from which they were obtained was evaporated to dryness over a water-bath, the residue was exhausted by alcohol, to remove urea, &c., and the creatine was separated from the remainder by ammonia. On filtering and concentrating the respective solutions, a quantity of creatine was obtained, about equal to that of the urea.

Creatinine exists in many of these cases in considerable quantity, besides creatine, but as it requires a troublesome process to isolate, it was less easily detected, and not so often looked for. In one case in which the urine had been treated as in the last paragraph, a portion of the concentrated alcoholic extract gave very little urea, even when nitric acid was added, but the remainder displayed numerous clusters of beautiful navicular crystals of creatinine. When a drop of this secretion acidified with nitric acid is evaporated on a slip of glass, in addition to the nitrate of urea, crystals are often seen resembling the dendritic masses of creatinine figured by Robin and Verdeil,† but

* La Roche on Yellow Fever, vol. i. p. 361.

† Robin et Verdeil: Traité de Chimie Anatomique et Physiologique, Atlas, pl. xxvii. fig. 7.

these mostly extend from one side of the axis of the mass only, and are not symmetrical, as represented by those authors; at other points they present the characters delineated at Fig. 2 *a* of the same plate. The exact composition of the crystals in question I cannot say, but if digested in ether, the latter on evaporation affords the symmetrical crystallization represented by Robin and Verdeil, with more or less hippuric acid, which usually accompanies them. I have recently obtained similar results from a specimen of urine from a case of bronchitis in this country.

Rounded masses resembling leucine were occasionally seen, when a few drops of the secretion were allowed to evaporate on glass, but this was rare. I do not recollect to have met with tyrosine, as figured by Frerichs in the frontispiece of the Sydenham Society's edition of his work on 'Diseases of the Liver.'

Uric acid was frequently present, and even in considerable quantity, when the urea was much diminished, and the chlorides almost or entirely absent. This was not found in every case, however, and I am not prepared to indicate the peculiarity of those in which it was observed.

Hippuric acid is formed copiously in the urine of febrile cases in Jamaica, as indeed in every other instance in which it was looked for. Uric acid was often plentiful in the same specimens, neither seeming to take the place of the other. When present in any quantity, it is easily detected by placing two or three drops of the secretion on a slip of glass, adding a drop of nitric acid, and evaporating slowly, when the peculiarity of the crystallization is quite characteristic.*

The chlorides in the urine undergo a marked decrease in the case of yellow fever, as met with in Jamaica. The only notice I have seen on this point is that given by La Roche,† on the authority of Dr. Wragg, of Charleston, who was of opinion that hydrochloric acid was thrown out largely from the kidneys. The details of Dr. Wragg's process are not given, nor the period of the disease to which his observations refer, which are important circumstances. My observations were made in the usual manner, by acidifying with nitric acid a portion of urine with its albumen removed (when so plentiful as to mask the operation), and then adding nitrate of silver. The freedom of the nitric acid from chlorine was previously ascertained.

With these precautions, the chlorides were found perceptibly less as soon as the urine contained traces of albumen, and on the evening of the fourth day and course of the fifth, when the desquamation of the urinary passages was in active progress, there was never more than a trace, sometimes not even a trace, to be detected. These began to reappear about the seventh day, when the case progressed favourably, and increased from day to day thereafter.

* British and Foreign Medico-Chirurgical Review, vol. xxviii. p. 487. I have found hippuric acid in advanced pregnancy and in chronic bronchitis, in this country, where no benzoic acid had been administered previously, and apprehend it is more common than is generally supposed.

† La Roche on Yellow Fever, vol. i. p. 359.

Blair remarks* that albumen was not detected in the urine of cases of intermittent which occurred contemporaneously with the epidemic, and he saw the value of the distinction in diagnosis. My observations are to a similar effect, having found, concurrent with decided yellow fever, intermittents and remittents, which presented the usual characteristics of these affections, and neither displayed desquamation of the bladder or kidneys, nor albumen, globuline, or casein in the urine, while the chlorides remained undiminished throughout. I met with one case, however, exactly resembling those of yellow fever, which occurred about the same time, save that there were neither tube-casts nor albumen in the urine, nor were the chlorides much diminished. This individual had previously had frequent attacks of inflammation of the sheaths of the tendons in the wrists, hands, ankles, and feet. How far the kidneys may have been influenced by the peculiarity of constitution indicated thereby, must remain an open question at present.

Albuminuria is common in Jamaica, and it is quite possible that febrile symptoms might arise in such a case, and lead to a doubt as to its nature. It may be distinguished from yellow fever, however, by the absence of the desquamation of the bladder on the fourth day, followed by that of the kidneys, and by the urine retaining a fair proportion of chlorides, though loaded with albumen.

Alvine Evacuations.—The alvine evacuations have not received the attention they require; until they have been as closely examined as the urinary, much valuable information regarding disease will remain untouched. My own observations on the subject have neither been so numerous nor so minute as those on the urine, still they afford some hints which are not noticed elsewhere, and which seem of value in explaining the characters of yellow fever.

Blair has given a short chapter on the character of the stools, as he saw them in Demerara,† which agree in the main with what was found in Jamaica. He describes the evacuations as feculent at first, with more or less admixture of mucus, and a matter he denominates "melanotic," and as giving off a very disagreeable odour. These were succeeded by what he calls the "caddy stool," a liquid light-coloured evacuation, depositing a dirty grey sediment, containing crystals of triple phosphates, and uric acid, and numerous little amorphous masses of black opaque matter, which he regards as its constant ingredient. As the disease advanced the caddy stool was replaced by a very scanty mucous stool, consisting of clear mucus, with broken-up epithelial matter, and myriads of epithelial granules, either uncoloured, or variously tinted of yellow, or green colour, by bile, or brown or black with the elements of blood. These may present several of the crystalline forms of the caddy stool, and are contemporaneous with diminished urine and black vomit. The elements of blood were sometimes so copious as to give the evacuation the appearance of black vomit.

In Jamaica the bowels were seldom costive or difficult to move. The first evacuations were always feculent, more or less modified by medi-

* Report, 1856, p. 21.

† Ibid., pp. 24–28.

cine, and generally offensive. About the fourth day, or earlier, the brown feculent character which had already been becoming less marked, often disappeared when the lighter-coloured stool Blair designates "caddy" took its place; this, though frequently liquid as he describes, was by no means always so, for I have seen it consistent, and formed, in many cases; it was never very copious. Its chief characteristic was the want of the brown colouring matter (usually thought bilious), supplied by the glands of the mucous membrane of the colon,* which is altogether different in colour from bile, and gives a different reaction with acids. These discharges may even have a yellowish or greenish tinge, from bile, however, while the proper brown is nearly or entirely absent. They seem to differ little from the clayey evacuations which accompany jaundice and other affections in this country, only less copious, and essentially depend on the colon performing its secreting function imperfectly, a circumstance which though frequently associated with retention of the biliary secretion, is not necessarily so, either in diseases of this country or the tropics.

The persistence of these light-coloured evacuations is always of serious import, as they are frequently followed by black vomit, or other forms of hæmorrhage. Their disappearance, on the other hand, on the occurrence of a more natural feculent evacuation about the fourth or fifth day, is usually the harbinger of a safe termination, and speedy convalescence. The suppression of the natural secretion of the colon would therefore seem to be intimately connected with the vicarious appearance of hæmatine in some form elsewhere. The importance of this principle in yellow fever is very great, as it directs attention to exciting the secretion of the colon, as the natural way of obviating many of the unmanageable symptoms of this disease, a point of late years too much overlooked.

The evacuations occasionally contained the elements of blood. These varied in appearance from blood little changed, through a fluid of the colour of dark venous blood with very few globules, to one exactly resembling black vomit, of a blackish brown colour, with scarcely a blood-globule to be seen. The more hæmorrhagic forms came from the lower part of the small intestine, or colon, and those without the globules from the stomach or duodenum. The mucous membrane of these organs respectively, in such cases as were examined, being found congested, softened, and easily abraded. In the intestines these fluids sometimes present a very different aspect in different parts. I have seen a fluid like very dark venous blood, with acid reaction, in the stomach and duodenum, which, in the lower part of the jejunum, had a black colour with alkaline reaction, and under the microscope a greenish tint, changes effected by an admixture of bile. In this case there had not been black vomit, but from the stomach to the cæcum the canal was filled with this bloody fluid. Some assistance may be obtained towards deciding on the part these discharges come from by the nature of the contained epithelium. The black vomit from the stomach, in addition to columnar epithelium, contains numerous small

* See British and Foreign Medico-Chirurgical Review, vol. xxviii. p. 488

granules with occasional granular cells; that from the intestine has the columnar epithelium in abundance; while the discharges from the colon alone contain casts more or less complete from the tubular glands of its mucous membrane. A discharge may contain all these, but one form or other will predominate, according to the locality where it wa produced.

A full chemical analysis of the alvine evacuations in yellow fever is very desirable. I made various attempts at qualitative examination, but as the methods were defective, and the results consequently uncertain, it would be useless to notice them further.

Discharges from Stomach.—Though the discharges from the stomach have attracted attention from the earliest period, much difference of opinion exists as to their nature and origin, and their value as characteristic of the disease.

At the commencement, if the stomach be irritable, the matters rejected, in addition to the ordinary ingesta, are mucous, more or less tinged with bile. To these succeed, in many cases, a clear fluid, with an acid reaction, which seems to have been particularized first by Blair, and which he denominated "acid elimination," or "white vomit." This, again, is followed by black vomit. All these may occur in succession, in the same individual, but one or more, or even all, may be absent in a genuine case of yellow fever.

The early vomitings are accompanied by a good deal of nausea, and much straining. With the white vomit there is extreme oppression at the precordia, often with a burning sensation; the straining during the efforts to vomit is very great, and, after a painful endeavour to relieve the stomach, the patient will often turn back in bed without having thrown off anything. When a little is rejected it is usually clear mucus, sometimes very acid, but sometimes this is less marked. The more copious the white vomit is, the less acid is it found to be, and the oppression at the epigastrium seems less.

When black vomit comes on, the discharge takes place without any very decided effort, and often without any apparent exertion of those muscles which are deeply engaged in the ordinary efforts of vomiting; and the oppression at the precordia, so remarkable with the white vomit, has often completely disappeared.

The transition from white to black vomit first manifests itself by the appearance of brown specks in the clear mucus, which have been likened to pinches of snuff. These increase in number, the mucus becomes more limpid, and tinged more or less of the same colour, and a sediment separates. The fluid in this condition often remains decidedly acid. As the brown matter increases in quantity, the acidity frequently becomes less marked, and sometimes is insufficient to redden litmus.

The nature, and place, and mode of origin, of black vomit, have given rise to much discussion. Many have thought it a morbid secretion of the liver; others have attributed it to a dissolved state of the blood, allowing it to exude through the mucous membrane; others have considered there was hæmorrhage from the capillaries, and that the blood-

globules were destroyed in the acid secretions of the stomach; others, again, have attributed the black vomit to a secretion from the mucous surfaces of the organs in which it was found.

On examining specimens of characteristic black vomit by the microscope I found much columnar and glandular epithelium, the latter granular; and many free granules which were colourless, pretty clear, spherical, and sometimes corrugated on the surface; these were half the diameter of blood-corpuscles, and of a different colour. The colouring matter was brown, amorphous, and no blood-globules were detected. Spores, torulæ, and other extraneous matters were common. These appearances agree in the main with those described by American authors; but I have not met with the masses "of modified and disintegrated blood-corpuscles," or "the granular detritus and irregular masses, apparently the results of degradation of blood-corpuscles" described by La Roche.* The discharge is sometimes much more of the colour of venous blood than the usual coffee-ground appearance, and may even contain blood-globules, little altered, from hæmorrhage, but in its most characteristic forms these may be, and most frequently are, completely absent.

When little black vomit had been ejected, or formed in the stomach, a large portion of the mucous membrane was often of a deep brown colour. When more of that had been formed, even though it remained in the organ, the lining membrane presented a less extensive discoloration, a few brown streaks only remaining, or even these were absent. It is clear, from this fact, that the discoloration of the mucous membrane does not arise from imbibition of the coloured fluids in contact with it. Yet on placing a section from the discoloured portions under the microscope, the tubular glands were found with their epithelium in a granular condition, and thoroughly impregnated with a brown colouring matter—the granules, however, remaining pretty free from it. Vessels could be detected among the tubes, in various places, distinctly, with entire blood-corpuscles in them. As has been stated by Blair and others, it is quite a mistake that the blood, generally, is in the dissolved state so often supposed by many authors.

The facts of the glandular epithelium in the tubular glands of the stomach being coloured brown and containing numerous granules, coupled with the disappearance of that colour as black vomit becomes copious, and the occurrence of similar elements constituting the characteristic portions of the vomit itself, appear to leave no doubt as to its place of origin, and as to its being a true secretion, though occurring in the course of disease. It is quite analogous in this respect to what has been described above as having taken place from the kidneys in the course of this disease, and to what I have elsewhere shown takes place in a state of health from the glands of the mucous membrane of the colon.† It is a significant fact, too, that those cases of yellow fever in which the colon ceases to perform this part of its

* On Yellow Fever, vol. i. p. 315.

† British and Foreign Medico-Chirurgical Review, vol. xxviii. p. 488.

function, are those most inimical to black vomit, or similar discharges, or hæmorrhage from other organs, while natural-coloured alvine discharges are the surest signs of amendment. The occurrence of hydrochloric acid in considerable quantity in the white and black vomits, coincident with the diminished elimination of chlorides from the kidneys, affords another indication of the stomach exercising a vicarious eliminative action in the disease.

Blair has given a table of the days of occurrence of white and black vomits, from which it appears that the former manifests itself most frequently on the third and fourth days of the disease, though frequently also (and nearly in equal numbers each day) on the second and fifth days; while in other cases it took place as late as the twelfth day. The black vomit appeared most frequently on the fourth, fifth, and sixth days, though cases were by no means uncommon on the third and seventh days, and instances were seen on the first, and as late as the thirteenth day of the disease. As these discharges may be regarded as efforts of the system at crises, it is clear they may be looked for at the various periods of the disease when critical evacuations might be expected; and though most frequent from the third to the sixth day, yet it is possible they might occur either sooner or later. Blair's table, however, may require modification; he was under the impression that the access of yellow fever was characterized by well-marked symptoms, which left no doubt as to its period of invasion; this, however, is not always the case, and the exceptions are more numerous than he contemplated. The following extract from one of the older writers on West Indian fever is more correct:

"It is worth remarking, that the fever sometimes appears in a very slight way, with languor, loss of appetite, some degree of headache, disturbed sleep, and whiteness of tongue; the patient being able all the while to go about his usual employment. In symptoms so moderate, the presence of a fever is hardly acknowledged, though the readiness with which they rise into a severe disease, on the least irregularity, or any anxiety or distress of mind, leaves no doubt of their nature."*

Cases answering this description must have occurred to every one of any experience in the tropics; and the difficulty I have had in fixing the period of accession of the disease in such, makes me doubtful as to the weight to be attached to Blair's determinations for the earlier days in his table.

Hæmorrhages from other Organs.—I have known three cases of discharge of bloody fluid from the lungs in the last stage of yellow fever; and oozing from the gums, nose, and conjunctiva are not uncommon. Copious discharges from the vagina are met with in females. As in none of these cases, however, had I examined the fluid with the microscope, I cannot give any information as to the condition of the blood it contained.

* Observations on the Diseases of the Army in Jamaica, by John Hunter, M.D., Physician to the Army, p. 95. London, 1788.

OBSERVATIONS ON YELLOW FEVER.

Division II.—Morbid Appearances.

Kidneys.—The prominence given to the urinary secretion in the preceding part of this paper naturally suggests that the condition of the kidneys after death should come under consideration first. These, with the liver and intestinal canal, are the organs most implicated in yellow fever, and it will be as advantageous to treat them in this order as in any other.

After death the kidneys are always found congested, and almost always somewhat larger than usual; those that were weighed having been from 5½ to 8 oz., though the subjects from which they were taken were none of them above medium size. In the cortical substance, though the bloodvessels were full, the intermediate portions were light greyish yellow, more prominent when cut into, and the thickness from the surface to the base of the pyramids rather greater than usual. The substance was rather more friable than natural, the capsules not more adherent than common. The pyramids showed the congestion better than the cortical part; they were not enlarged; on pressure, a little milky-looking matter exuded from the papillæ, and traces of the same were found in the calices; this has been noticed by Blair and others, and consists of tube-casts. The pelvis, or course of the ureters, seldom exhibited much congestion. In one case the whole organ seemed quite œdematous from interstitial effusion.

The bladder was always contracted, sometimes quite empty, at others containing urine, varying from two drachms up to five or six ounces. When death occurred before the eighth day this was always albuminous, and contained tube-casts. The lining membrane of the bladder itself was pale in every case which came under my notice, and nothing anomalous was detected in it.

On placing a thin section of the kidney under the microscope, the convoluted tubes were found with their epithelium very granular, the outlines of the cells being for the most part indistinct, and the nuclei difficult to detect among the multitude of granules, or if they were apparent, their contents were granular as well. In most instances the convoluted tubes were filled with this granular epithelium, and

frequently distended by it to a considerable diameter; I have met with them as large as 4^{s}-0; their canal of course was quite obstructed, and in such cases there was little or no urine in the bladder. In others, though the epithelium was equally granular, it did not close the canal altogether in any situation, so that some fluid could pass; and in these the substance of the epithelium was generally tinged brownish, and some urine found in the bladder. In the case of Goodwin, detailed above, the epithelium almost entirely filled the convoluted tubes whenever examined; in many places it was deeply tinged with hæmatin, which gave a brownish-red colour to the whole thickness of the cells, as in the casts that were obtained from the bladder. In another case there was a deposition of pigment at intervals along the convoluted tubes, covering the contained epithelium thickly in the form of minute granules for a distance equal to from one to two diameters of the tube, the intermediate portions of the canal being quite clear of it; this peculiarity was found not only in the convoluted tubes, but in the capsules of the kidneys and in the tubes of the cell-containing network of the liver.

The capillary vessels ramifying among the convoluted tubes always had their surfaces covered with nuclei. These, which in the usual condition of the vessels are scattered and not very prominent, in the congested kidneys of this disease were so numerous as to cover the whole surface continuously. Under the action of acetic acid they seemed to contract somewhat, so as to expose the parietes of the vessel between them and the whole to become clear; but the nuclei still remained distinct, studding the surface at much less intervals than in healthy vessels, or in those in other parts of the same subject. Under a power of 450 these nuclei appeared granular. The loops of the Malpighian bodies were similarly affected, and the appearance was quite distinct on the larger vessels in their interior. In this condition the capillaries appear tumid and opaline or dark grey, as they are just within or beyond the focus of the object-glass. The connective tissue around them generally seems swelled, and contains a little clear or opaline exudation, and often granular matter. In the case alluded to above, in which the kidneys seemed œdematous, which had passed the ordinary period of the disease, and proved fatal on the twenty-third day with suppression of urine, there was a large amount of opaline exudation found among the straight and convoluted tubes, with numerous granules, oil, and some pus globules, in addition to the condition of the capillaries just described, and the tubes had lost their sharpness of outline, so that the whole was clouded and indistinct.

These conditions of the kidneys were well marked in cases which proved fatal from the fourth to the seventh or eighth day of the disease. They indicate an active exudation into the parenchyma of the organ, and a catarrhal affection of its mucous surfaces. It can be easily understood that the latter, at least, though salutary in itself, may prove excessive; and by closing the tubes prevent the passage of urine, and so become one of the most fatal complications of the disease.

This seems to be the reason of the frequent suppression of urine in yellow fever about the fifth day, and one of the causes of its so often terminating in death after the urgency of the febrile symptoms had passed away. The case particularly alluded to above, however, shows that there may be a suppression at a subsequent period, after the flow had become copious, and danger from that source had apparently ceased, by interstitial exudation destroying the secreting power of the gland. This might occur earlier in the disease, but the choking of the tubes by the enlarged epithelium seems the more common cause at that period, though the congested state of the kidneys, and the active exudation into them even then, requires the closest attention.

Liver.—This viscus was generally somewhat enlarged, its weight, when ascertained, was from three pounds twelve ounces to a little above four pounds, the subjects being small, or not above medium size. There was generally a flaccidity about it, giving the impression that the firmness and cohesion of the parenchyma was diminished. On cutting into it, the colour was found very different in different cases. In several it was of a uniform light yellow, with tinges of grey or brown in different individuals; in others this uniformity of colour was varied by congestion of the portal or hepatic capillaries, or of both, producing varieties of the rhubarb or nutmeg liver; in others, little or no yellowness was visible, and to the naked eye the parenchyma did not differ in appearance from that of health. There were other cases, again, in which the colour was olive or greenish; in one such the outlines of the lobules could be perceived on the surface of a section quite distinctly from the interlobular tissue, as if that formed a separate capsule; the latter was congested, while the lobule itself was comparatively bloodless. These varieties of colour were mainly owing to the varying quantities of oil, bile, and blood in the organ. When there was a large quantity of oil, as in a young, robust, healthy white man, the colour was most uniform, and there were fewest traces of blood in the capillaries, or the redness of that was so covered by the bile and fat, that there was merely a brownish tinge throughout the yellow. When the oil was less copious, the capillary congestion came out better, and was more intense; but, on the other hand, more or less of the nutmeg appearance was often visible in livers in which no oil was detected by the microscope. The olive or green colour was found only when there had been an early and more decided affection of the liver, and deeper bilious impregnation of all the white tissues in the body, than in ordinary cases, and in which there was more interstitial exudation in the liver itself than was common, with little or no oil.

In the class of cases last mentioned, there was tenderness over the liver, and yellowness as early as the third day of the disease; the peritoneal covering in these was opaline in places, thickened, and with a quantity of exudation containing numerous granules under it, and on tearing it off, more or less of the parenchyma adhered to it. In one

case, about two drachms of pus was found between the surface of the liver and the diaphragm, inside the coronary ligament, where the liver was not covered by peritoneum.

The gall-bladder was often distended by bile, and never was quite empty. The contained fluid varied from a mucus tinged yellow, to a dark-green or almost black bile, which in a thin stratum was of a yellowish-brown colour; and the quantity of fluid in it did not seem to depend on the ducts being unobstructed, for it was occasionally found quite full, though these were pervious. Late in the disease, stools were occasionally seen quite black to the unassisted eye, but which with the microscope were found to consist of mucus coloured with a deep-green bile, and similar matter has been detected in the small intestine in some of the fatal cases, though the whole of the white tissues in the body were deeply tinged with bile, so that even when there is sufficient retention of bile to produce jaundice, still a notable quantity may find its way into the intestine.

On putting a thin section of liver from a case of yellow-fever under the microscope, the following appearances could generally be made out at some part or other. The smaller branches of the portal vein were found to be imbedded in a layer of connective tissue, more or less abundant in different cases, of an opaline appearance, separating the vein from the lobules on either side, interposing between the vein and accompanying artery and duct, and separating these from each other to a greater extent than in a sound liver. When this connective tissue was neither very abundant nor very opaline, the condition of the artery and duct could be perceived distinctly, and smaller branches proceeding from the vein or artery, or to join the duct, could often be distinguished. The condition of the smaller vessels, whether arterial or venous, resembled that already described in connexion with the kidneys,—viz., they were covered with closely-set nuclei and granules, and the connective tissue in their neighbourhood contained more or less exudation and granular matter. The bile-ducts in the smallest portal canals sometimes had their epithelium distinct and tinged brown, at other times this was less distinct, of an opaline appearance, without the least trace of brown; in the former case bile seemed to have been passing through them to the last, and in the latter its passage seemed to have ceased; the former was found when there had been no jaundice during life, the latter in the more frequent cases where it was well-marked.

These appearances were continued from the lesser portal canals through the interlobular spaces, and into the lobules themselves, the smallest vessels in all cases being covered with nuclei, and surrounded with more or less connective tissue, which seemed to contain exudative material, clear in some instances and opaline in others. The connective tissue was very copious in the lobules occasionally, lying between the tubes of the cell-containing network, and towards the margin of the lobules occupying as much space as the tubes themselves, and the connexion between the two was so slight, that in

making a thin section, the one was torn from the other, and the tubes of the cell-containing network left bare at various points.

In every case in which death occurred about the usual period in the disease, the hepatic cells were found of a pretty deep brown colour from biliary matter. The formation of bile, therefore, had gone on, though, owing to the condition of the smaller ducts already described, it may have been detained in the lobule. The cells were usually somewhat granular, the nuclei not always distinct. In one case only have I seen the cells dissolving away, leaving a little granular matter in the tubes in their place; this was confined to the immediate vicinity of the smaller portal canals, and was in a liver with much interstitial effusion. The case was that alluded to above as having proved fatal on the twenty-third day. The cells were frequently altogether without oil-globules, or displayed a few very small ones only; at other times the liver was decidedly fatty, and large clear globules were seen, equal in diameter with the tubes, or even swelling them out to twice that of the portion occupied by the cells without oil near them. On examining a very thin section of a portion of fatty liver, the large oil-globules appeared as if between the tubes of the cell-containing network, but on separating these as much as possible, the oil-globules were always found attached to and partially imbedded in the hepatic cells, the smaller oil-globules were often quite imbedded in them, while none could be seen outside the tubes among the capillaries, unless at a later period, when considerable interstitial exudation had taken place. The deposition of oil in the liver corresponded with that in the subcutaneous connective tissue in amount, and must be regarded rather as a physiological phenomenon than as a pathological one, and seems quite unconnected with the disease, all the characters of which were found equally well developed when no oil was detected in the liver at all.

Some of the smaller branches of the portal vein, and more frequently those of the hepatic vein, contained quantities of clear granular matter without distinctly-formed fibres or cells; at other places, or frequently close to the former, there were distinct fibrillæ, and granular cells of the size and appearance of the white globules of the blood, the two presenting exactly the character of the fibrinous concretions generally found in such cases in the heart.

There is thus an active exudation into the parenchyma of the liver in yellow fever, and the symptom from which it has derived its name depends on the exudation process having embraced the minute bile-ducts, and closed them against the passage of the bile, of which there are abundant indications in the lobules. The affection of the liver, as indicated by the occurrence of jaundice and uneasiness in the hepatic region, does not always appear at the same period of yellow fever; sometimes there is no yellowness until after the urine has become albuminous and tube-casts have appeared in it; at others, there may be tenderness over the liver, and bilious vomiting, with yellowness, as early as the third day, and with the kidneys as yet not affected per-

ceptibly, though in the next two days the urinary symptoms follow the usual course. In such cases the yellowness of the conjunctivæ and surface becomes much deeper than in those in which the liver is implicated at a later period, the urine contains more bile, and blistered surfaces give out a deep yellow serum profusely; if there be a pulmonary complication (and it is not infrequent), the expectoration is green. So far as I have seen, there was much less urrhodine in the urine when the liver was thus early affected than when it became so later in the disease; the cases were more prolonged, too, and the convalescence much more tedious, than when this organ was less seriously involved.

Spleen and Pancreas.—These viscera have not received as much attention as the liver or kidneys. The spleen varied in size from what was natural to one weighing above a pound; its texture was normal in some, and friable or even pulpy in others. It had a greenish tint occasionally, when there had been much bilious impregnation of the other tissues in the body. The pancreas was examined in a general way only; nothing anormal was detected in it.

Stomach and Intestinal Canal.—The stomach was occasionally much contracted, so as not to exceed the ordinary size of the duodenum, but more commonly it did not present anything remarkable in this respect. The intestines, so far as I have seen, were much as usual after death. When the patient had taken little food for some days, or had had great irritability of stomach, it was most likely to be greatly contracted, and its mucous membrane was then found in longitudinal folds, with their free edges congested, and most probably with some acid mucus more or less tinged with blood in it. When the organ contained black vomit, its size was seldom diminished.

The contents of the stomach and intestines varied considerably in different parts of their course, and in different cases. The stomach sometimes contained nothing but a little mucus, or fluid the patient had taken shortly before death; at others, a little clear acid mucus—the white vomit of Blair; this was seen tinged reddish-brown by blood, or contained brown specks, the transition to black vomit, or it had gone on to black vomit, and a variable quantity of this was found. The duodenum and intestines presented mucus more or less opaque from the quantity of epithelium it contained, and variously tinted with blood or bile, or occasionally both together. In the colon the mucus had sometimes become consistent, and occasionally presented a yellow tint from bile; here, as higher up in the intestine, the other appearances were occasionally obscured by bloody matter.

The mucous membrane of the stomach was somewhat thickened and tender, giving way readily; it was sometimes much congested, and this was generally confined to either the cardiac or pyloric half. When the organ contained black vomit there might be patches of congestion here and there. When little black vomit had been formed, a large portion of the mucous membrane was often of a deep brown colour; when the quantity was greater, there was merely a number of

streaks or patches of a brown colour; when that was copious, the whole inner surface of the organ was free from colour. This appearance is owing to the impregnation of the epithelium of the tubular glands of the mucous membrane with the matter of black vomit, as already explained.* The congestion sometimes extended to the duodenum, and I have seen it there to a greater extent than in the stomach of the same body. There was seldom much fulness of the vessels of the jejunum met with, but in the lower part of the ilium and colon it was occasionally seen, though there were at the same time congestion or black vomit in the upper part of the canal.

One feature of the disease—the desquamation of the mucous membrane of the duodenum and jejunum—was very remarkable in several instances, the columnar epithelium not only being found copiously among the mucus in the tube, in a separate form, but large flakes of it were numerous in which the cells still adhered to each other side by side, and such flakes could be seen also still loosely attached to the membrane. This condition seemed most developed when there had been little black vomit or hæmorrhage, but a good deal of irritation of the mucous membranes.

In the former part of this paper it has been shown that black vomit is a secretion from the tubular glands of the stomach, and a case was given in which a similar one had taken place from the kidneys. I have met with some instances in which there was black vomit in the stomach without any having passed down the intestine, yet in the ileum the mucus, though clear at other parts, was of a dark-brown or reddish hue opposite the patches of Peyer's glands, and these were impregnated with a similar colour. The colon, too, occasionally throws off a bloody-looking fluid, and after death it is found confined to it, not extending beyond the ilio-cæcal valve. From this we may conclude that in yellow fever many other glandular organs beside the stomach may give origin to a matter resembling black vomit.

Small ulcers were occasionally seen in the ileum, cæcum, and descending part of the colon. These had raised surfaces, appearing as if covered with a patch of adherent feculent matter. Their position and size rendered it probable that they were connected with the solitary glands, which were more prominent elsewhere than usual. Cases of typhoid fever were by no means uncommon at one time, with the enlarged tumid patches of Peyer well developed, and leading to ulceration, hæmorrhage from the bowels, and in some to perforation of the intestine; these were quite different from the others as regards the enteric lesion, but most of them occurred in the same locality. At the same

* British and Foreign Medico-Chirurgical Review, vol. xxix. p. 483 (April, 1862). In two cases of typhoid fever in which there had been frequent vomiting of mucus tinged green, the lining membrane of the stomach presented large patches of a greenish colour. The analogy of the black vomit suggests that in these cases the mucus, tinged apparently with bile, came from the stomach itself, and was not a regurgitation from the duodenum. This will apply to the vomitings in malarial fevers pretty generally, I expect.

place an intermediate kind of case was not infrequent, in which the enteric lesion of typhoid fever was quite distinct, whole patches of Peyer's glands being tumid, and many of them ulcerated; while death was preceded by more or less bloody discharge from the bowels, albuminous urine with granular tube-casts, going on to suppression, yellowness of the conjunctivæ (most of these cases were in black men), and after death congestion of the mucous membrane of the stomach or duodenum, and a condition of the liver and kidneys closely resembling that described above. There was thus a gradual transition from uncomplicated yellow fever through one with small ulcers in the ilium, cæcum, and colon, to another with well-marked typhoid ulceration in the ilium presenting many symptoms and post-mortem appearances of yellow fever, and finishing the series by one characterized by the fully-developed enteric lesion of typhoid fever, terminating in perforation and death. Though the appearances peculiar to each form of the disease were distinct enough in the extreme cases, yet in the intermediate ones their development and combination were such that it was impossible to decide to which the case should be referred.

Brain and Membranes.—The frequency of head symptoms in the course of yellow fever renders an acquaintance with the condition of the nervous centres of much importance; but hitherto comparatively little has been done, with the improved means for investigation of the present day, to increase the amount of information which has long been available regarding them in this disease.

When there had been much heaviness, stupor, or coma before death, the membranes of the brain were always found with their vessels full, and the pia mater looked opaline from interstitial effusion, and there was a variable quantity of yellow serum at the base of the brain and in the ventricles. On removing the substance of the hemispheres slice by slice, red points seemed more numerous than in a healthy brain, and the consistence was in some cases less firm than usual, but in others there was scarcely a perceptible difference, though the head symptoms had been well marked. On subjecting portions of the brain to microscopic examination in these cases, more precise information was obtained, those which to the unassisted eye presented nothing unusual, then manifesting unequivocal indications of disease. In every case I examined in which there had been a well-marked affection of the head before death, the large exudation corpuscles were numerous in the white matter near the surface of the hemispheres; and the smaller bloodvessels and capillaries, which are difficult to detect in a healthy brain, were often seen extending beyond a cut surface, or even ramifying in the substance of the section when it was compressed, with their sides covered with closely-set nuclei, the same as already described in connexion with the kidneys and liver; it was more difficult to determine whether there was exudation surrounding these to any extent, but their appearance rendered this probable, while the exudation corpuscles showed that active exudation had been going on. Amyloid bodies were seen in some instances, but the exudation corpuscles just noticed had neither the firmness nor fracture of these, but under pressure merely became flattened. Softening of the upper surface of the cerebellum was found in the case of Goodwin, which was detailed in the first part of this paper (vol. xxix. p. 475), and a soft state of its whole surface in another case.

Head symptoms are always a source of anxiety in yellow fever, and they will sometimes take even experienced practitioners unawares by the suddenness of their onset, and their unmanageable nature, when it was thought all danger from them had passed. The following case will illustrate this point: Corporal Brownlow, a white artilleryman, aged thirty-seven, had been four years in Jamaica, and had given way to intemperate habits latterly. He was stationed at Fort Augusta, two miles across the harbour from Port Royal. On the 7th August, 1859, he had a paroxysm of intermittent, which came on in the forenoon, and went off in the afternoon. On the 8th, the second day of his complaint, he walked about ten miles in the sun, returning to the fort in the evening much fatigued, and with severe headache. On the third day fever came on about seven A.M., with severe frontal headache, and he went to Port Royal, which he reached at four P.M., and was taken into hospital, where the fever went off at six P.M., with profuse perspiration, and he then expressed himself quite free from pain. Ten grains of calomel, with as much quinine, were given, and he had a good night and slept well. On the fourth day he was quite apyrectic; the bowels were moved thrice during the night. Quinine in doses of five grains was given every six hours. I saw him about noon, when he expressed himself quite free from pain; there was a complete absence of fever; pulse 86; surface cool and soft; and he seemed in a favourable condition, save only a slight want of animation about the eyes, scarcely amounting to heaviness. Half an hour afterwards fever came on, with great heat of surface and severe headache; pulse 120. Notwithstanding the application of ice to the head, and a blister to the back of the neck, delirium ensued quickly; at three P.M. he was comatose, with slow respiration, and he died at a quarter to six P.M. There was no yellowness in this case. Three ounces of urine were found in the bladder, which was highly albuminous, and contained granular casts; the mucous membrane of the stomach and duodenum was much congested. The inner surface of the dura mater and pia mater were much congested; the substance of the cerebrum soft, but not otherwise changed in appearance; the cerebellum apparently healthy. Under the microscope the cerebrum showed numerous large exudation globules; the small arteries and capillaries were covered in every direction with closely-set nuclei, and a quantity of granular matter.

It is scarcely to be supposed that the morbid appearances in the brain in this case were produced during the last six hours of life, the history of the case is altogether opposed to it; yet if it be admitted that considerable active exudation had taken place into this organ previously, the complete subsidence of fever and the freedom from

pain from the evening of the third day until the accession of fever on the fourth, though there was active disease in the brain, is a remarkable circumstance, and the rapidity with which this led to coma and death on the fourth day no less so; not that they are rarely met with, but because the force of the local affection was so much governed by the phases of the fever. It is possible that on the evening of the third day the head symptoms might have run on to a fatal termination but for the profuse critical evacuation by the skin; but on the fourth day, ere this could afford relief the brain was so deeply implicated that death was inevitable. Every one who has had experience in the malarial fevers of warm climates must have encountered cases of this description now and then, and those best acquainted with their character will be most desirous of getting even the smallest information as to their nature, or the slightest hint for averting their danger.

There is another form in which a cerebral complication is found in fever, but the accompanying fever is pure remittent or intermittent, and the urine remains copious to the last, and presents neither albumen nor tube casts. In this there is not more uneasiness about the head than usual in remittent fever, and there is neither increased fulness of the vessels about the head, nor any alteration in the senses, or mental manifestations to indicate that the brain is particularly implicated. The only peculiarity is the persistence of the regular accessions of fever, often slight in themselves, long after they should have given way in ordinary cases to the remedies employed. The patient, perhaps, cannot be persuaded there is anything serious the matter with him, and the medical attendant, though uneasy, cannot satisfy himself as to the cause of the fever going on in spite of his treatment, until at last, at the regular period of exacerbation, the patient experiences some unusual or unpleasant sensation about the head, congestion takes place rapidly, and within an hour or two he is comatose, and in a few more dead; or, the first indication of the implication of the head may be a convulsion, from which the patient never recovers, but which leads to a fatal termination even more quickly. Such cases are always a source of great anxiety to the medical attendant, even when fully alive to their nature; if he do not stop the fever, every paroxysm increases the mischief in the brain; and if he be not cautious in the measures he adopts to overcome the fever, he is very likely to increase the cerebral affection by his remedies, and so accelerate the result he is so desirous of averting. Every practitioner who has been long in the tropics, who will look back inquiringly on his past experience, cannot fail to recognise instances illustrative of both these difficulties.

Heart and Blood.—On opening the pericardium, serum, varying in quantity from half an ounce to ten times as much, and generally yellow, was found; the heart itself was rather pale, soft, and its cavities frequently distended. The cause of distension was found to be blood, or coagula of lymph, in variable quantities in different cases. Sometimes there was little lymph, the cavities being filled with dark

fluid blood; sometimes there were large coagula extending continuously from the hepatic veins through the auricle and ventricle into the pulmonary artery, and sometimes even into the ramifications of this vessel; in one case, a coagulum was withdrawn from it, which showed many distinct branches corresponding to the fifth subdivisions of the artery. These coagula were mostly met with in the right cavities, but sometimes smaller ones were found in the left, and there was a quantity of blood with them varying inversely as the size of the lymphy concretion. They were always lying free in the cavities of the heart and vessels, and nothing unusual was detected in the lining membrane of either, unless in one case, in which a portion of firm lymphy exudation was found adherent to the surface of one of the mitral valves, and the valve itself thickened. These coagula appeared to be larger and firmer in cases in which the liver was more severely affected than common; when the kidneys, intestinal canal, or brain were more implicated, they were less, or even absent. Their presence was perceptible during life by the distinct murmur over the origin of the pulmonary artery with the first sound of the heart.

Some of the American writers have stated that the heart in yellow fever was fatty; it is quite possible an individual with this organ so degenerated might contract fever, but fatty degeneration of it is neither a common nor necessary condition of the disease. I have never seen an instance of it. The soft undulating pulse of the latter stages of yellow fever, it is true, suggests an alteration in the condition of the muscular fibres, and on examination that proved to be the case, for on submitting a portion to the microscope they were found pale, rather opaline in appearance, not well defined, their transverse striæ indistinct, and with a very remarkable disposition to separate longitudinally into their component fibrillæ. The vessels among the fibres were all covered with closely set nuclei, and had a hazy outline, from exudation into and around them, and here and there a communicating capillary could be seen running across a fibre from one longitudinal capillary to another, in the same state. Portions of voluntary muscle from the same bodies presented none of those appearances, but had the fibres sharply defined, the transverse striæ well marked, and there was no disposition in the fibrillæ to separate from each other longitudinally; the capillaries were found at various points with clear membranous sides, with scattered nuclei, and without any trace of exudation around them. The heart thus appears to be subject to acute exudation in yellow fever, as well as the kidneys, liver, or brain, and the state of its actions in the latter days of the disease is obviously connected with this condition.

It seems still a common belief that the blood in yellow fever is in a dissolved state, and that exudation of this from the vessels into the surrounding tissues is the cause of the yellowness. The blood, however, is not dissolved, but the globules remain distinct and well formed, and the yellowness of the serum depends on the colouring matter of bile, as indicated by its changing to green on the addition of nitric acid.

I have examined portions of serum from the brain, pericardium, or from the blood itself, for urea, and have always obtained indications of it. For this purpose the albumen was coagulated by heat, and removed by filtration, the filtrate evaporated to dryness over a water-bath, and the residue exhausted by alcohol. On concentrating the latter, and adding solution of oxalic acid, crystals of oxalate of urea were obtained. In several instances the process was continued by adding an excess of solution of oxalic acid to the residue of the alcoholic solution, filtering, and agitating the filtrate with ether; on removing this, and allowing it to evaporate spontaneously, there were traces of hippuric acid; the fluid remaining after the removal of the ether being neutralized by carbonate of lime, evaporated to dryness, and extracted with alcohol, gave unequivocal indications of urea.

In several instances, a few drops of nitric acid were added to serum, and the whole boiled to remove the albumen. After separating the latter, the fluid remaining gelatinized on cooling. If treated with acetic acid the serum did not give this result.

Lungs.—The condition of the lungs varied much. Sometimes they were remarkably free from anormal appearances, even from the hypostatic congestion of fatal cases, and contained very little blood, though both sides of the heart were distended by it. At other times there were the traces of acute active disease in them. This was occasionally in the form of congestion of the mucous membrane of the trachea and bronchi, with bloody mucus in the tubes, and accompanied by more or less pneumonic condensation. Occasionally there was pneumonic condensation alone of a portion of the lung, and in one there were numerous small portions throughout the lungs, in front when there was no general congestion, as well as behind when there was much, from the size of a millet-seed to that of a filbert, which were firm, of greyish-yellow colour, and surrounded by a narrow line of congestion. Under the microscope these showed the air-cells filled with epithelial cells in a granular condition. Exudation into the pleura was not met with in any decided case of yellow fever.

Division III.—Form and Causes.

There is still much difference of opinion among authors on yellow fever, whether it be a disease of one paroxysm followed by a lull, in which the hæmorrhages or other fatal symptoms occur, or of a remittent character. Many authors whose opportunities of observing it were great, claim for yellow fever a distinctly remittent, or in certain cases an intermittent form; while others maintain that the remissions, if these occur at all, are nothing more than slight diminutions of the symptoms or abatements in the morbid feelings, and not remissions in the true medical acceptation of the term. Some of this divergence may be attributed to the varieties in the form of the disease in different climates or localities; but at the same place, and even in the same case, some medical practitioners will designate that a remission, which others regard a mere diurnal oscillation of symptoms quite unworthy of the name.

It may be asked, then, what constitutes *a remission?* The answer, I apprehend, can only be, that diminution in the febrile symptoms observed in cases of remittent fever, in localities where that disease is common. I have had considerable experience of remittent fever, personally, during rather a prolonged service on the coast of Africa, and when no other form than remittent was prevailing. In numerous attacks I found my pulse, during the exacerbation, was very rarely above 96, and in the remission not lower than 92. The exacerbations came on in the afternoon, and continued until about four the following morning, after which the headache, heat of skin, and feverish restlessness gave way, and there was a slight moisture inside the wrists and across the forehead. On the accession in the afternoon, these were replaced by the original symptoms, and much to the same extent. The comfort and relief during this abatement of the symptoms was very marked as compared with the feelings during the preceding or following paroxysm; and it would have been difficult to convince me that the one was not a decided remission, in fact, whatever it might have been according to theory, while the other was an exacerbation, not attended with great acceleration of pulse perhaps, but still with such an accession of fever, restlessness, wakefulness, and other disagreeable symptoms, as to leave no doubt of its nature, and create a strong desire for the return of the remission. I have had numerous opportunities of observing the same in others. The pulse, it is true, will generally alter a little more than in my own case, but very often does not differ above eight beats between the exacerbation and remission, though I have met with some in whom the change was only four. The amelioration is perceptible in such cases rather in the diminution of the restlessness and feverish oppression, than in the pulse or heat of surface. Many expect a remission to present an abatement of fever almost equal to a complete intermission, and will not apply the term to anything less marked. I can only say that in my experience this was not very common, and in far the greater number of cases it was as described above.

Authors seem pretty well agreed that the following peculiarities are characteristic of yellow fever:

1st. A febrile disease, usually terminating in convalescence or death from the fourth to the seventh day; but it may be as early as the second, or as late as the tenth or twelfth, or even later.

2nd. There is generally yellowness of the surface, and, in case of death, the same of all the white tissues in the body, commencing at various periods in different individuals or epidemics.

3rd. In the course of the disease the urine becomes much diminished in quantity, and often is nearly or altogether suppressed. These are more particularly seen from the third day onwards.

4th. The alvine discharges are devoid of the natural feculent appearance, especially from the third day onwards, until the disease gives way.

5th. As the alvine and urinary secretions assume these peculiarities, there is a great tendency to black vomit, or discharges of similar

matter from the bowels, or to hæmorrhages from the various mucous passages, or even the skin; and on death such may often be found in the intestinal canal when not manifested during life.

Though a case present most of these characters, those who attribute contagious properties to yellow fever declare, when remissions are mentioned in connexion with it, that he who mentions them must have mistaken an endemic remittent for true yellow fever. The remittent, they allow, may occasionally present yellowness, and even something approaching the appearance of black vomit, but state that it rarely proves fatal before the eighth, ninth, or tenth day, or causes suppression of urine, or the peculiarity of the alvine evacuations noticed in yellow fever. Instances are not rare, however, in which a fever distinctly remittent proves fatal by the fifth day with these characteristic symptoms, and black vomit as well. Nevertheless, as there may be a doubt as to the form of the disease when all these are not fully developed, it is of importance to obtain some symptom, or combination of them, diagnostic of yellow fever, and which will serve to distinguish it, whether fatal or not, from the other forms resembling it that may occur at the same time and place.

The diminution or suppression of urine is a constant feature in yellow fever, which the investigations of Collins, Blair, and others have shown to be accompanied by albumen and tube-casts, and farther conditions connected with which have been more fully developed in the previous part of this paper. Blair, at an early period, found that in ordinary intermittents the urine did not contain albumen, and immediately saw the value of the distinction in diagnosis. In Jamaica I found the same peculiarity: there were certain cases with all the appearance of ordinary remittents and intermittents, in which, though watched from day to day, there was no trace of albumen, or the other albuminous substances particularized above, found at any time; and there were neither desquamation of the bladder or uriniferous tubes of the kidneys, nor material diminution of the chlorides in the urine. There were other cases of fever, again, sometimes under treatment at the same moment in contiguous beds, in which the urine contained albumen, &c., presented the desquamation of the bladder and kidneys, and the absence of the chlorides, occurring in the order and at the period of the disease described above. These cases all presented other characters of yellow fever, and some terminated fatally, with black vomit or hæmorrhages, from the fifth to the seventh day. Therefore, without asserting dogmatically that the urine must present these in every case of this disease wherever it may arise, it seems quite justifiable to designate any in which they do occur, at the period, and in the succession previously detailed, as undoubtedly yellow fever. With the means of distinguishing them admitting of such precision, and so easily put in practice, the diagnosis between the yellow and other forms of fever will acquire much more certainty, and the relations between them be made out in a clearer manner than has hitherto been done.

With the advantage of this means of diagnosis, I have no hesitation

in confirming the observations of many of the older observers, that yellow fever, in Jamaica, is frequently remittent, or sometimes even an open intermittent; and that, in cases of this nature that prove fatal, death takes place for the most part on the fifth, sixth, or seventh days of the disease, usually with yellowness of the surface, black vomit, or other hæmorrhages. The disease, therefore, answers the character of true yellow fever, and is not merely a yellow bilious remittent, which many who endeavour to prove the contagiousness of yellow fever assert.

The following case shows the disease in its remittent form, and illustrates many of the other points dwelt on in the previous part of this paper. Sergeant P. Sheehan, a European, aged twenty-nine, had been eight months in Jamaica—five at the mountain station, Newcastle, and the last three in Kingston, as a clerk in a public office, but had not had fever. After some days' indisposition he had a paroxysm of fever on the afternoon of the 31st August, 1859; but the following morning, feeling better, returned to his office. On the 1st September, or the second day of the disease, fever ensued again about one P.M., with severe frontal headache, suffusion of the eyes, and slight vomiting. Happening to be at his office at this time, I sent him to hospital. On the third day there was a remission in the morning; at two P.M., the exacerbation took place, with irritability of stomach and bilious vomiting, but the headache was less than the previous day. The cutaneous capillaries were injected, giving a dusky-reddish colour to the surface; and when any part was pressed, the marks of the fingers were left bloodless for a little, while the intermediate spaces retained their colour. Stools consisted of a fetid dirty mucous-looking matter, tinged with bile. Urine scanty; on acidulating some passed in the afternoon with nitric acid, it displayed a little albumen, and with nitrate of silver very little chlorides. On the morning of the fourth day there was a remission again, which at two P.M. was followed by the exacerbation. At five P.M., there was moderate fever, the capillaries of the surface much injected, and a copious eruption, resembling lichen tropicus. The marks of the fingers remained after pressure, as on the previous day. The tongue was furred in the centre, red at tip and edges; the stomach much less irritable. Stools more feculent in appearance, and less fetid than the previous day. There was a sense of weight across the loins, but no tenderness on pressure or percussion. A portion of urine passed this morning, after standing a little, presented a sediment of one-fourth its bulk. This consisted almost entirely of scaly epithelium from the bladder, with a few slightly granular tube-casts from the kidneys. The urine, after being filtered, was of the colour No. 6 by Vogel's scale;* specific gravity, 1023 (at 60°), and strongly acid. It contained a moderate quantity of albumen, also of casein, very little urea, scarce a trace of chlorides, but a good deal of hippuric acid, creatin, and apparently creatinine. On the fifth day there was the usual remission in the morning, only

* Thudichum's Pathology of the Urine, Plate 8.

more complete, the skin cool and moist; pulse 80; and there was no exacerbation in the afternoon. A portion of urine passed this morning presented a sediment nearly as copious as that of the previous day, but which consisted of tube-casts, mostly very granular, with traces only of epithelium from the bladder. The contents of some of the casts were tinged brown. The colour and constituents of the urine, otherwise, were the same as on the fourth day of the disease. From the fifth day there was no return of fever, the skin acted well, the papular eruption disappeared, the urine became copious, and the convalescence was uninterrupted. On the eighth day the tube-casts were much less numerous, and the chlorides decidedly increased in quantity. On the ninth there was no indication of albumen with nitric acid, and the chlorides were more plentiful. He returned to duty quite well on the thirteenth day.

This case, though slight, is interesting in many respects; it was the first attack in an unacclimated European; it presented the frontal headache, the injection of the conjunctivæ and skin, alteration in the alvine discharge, diminution of urine, and the duration of cases of yellow fever; the appearance of albumen in the urine on the third day, of scaly epithelium from the bladder on the fourth, and of tube-casts from the kidneys on the fifth, with great diminution of the chlorides and increase of the albumen from the third to the fifth days, are all well marked, and leave no doubt as to its having been true yellow fever. The form was distinctly remittent throughout, the patient himself remarking on his freedom from fever in the forenoon. The appearance of the eruption on the fourth day, together with the desquamation of the bladder and more feculent character of the stools, accompanied as they were by less irritability of stomach and a more moderate exacerbation in the afternoon, show these to have been critical efforts, insufficient to prevent the febrile paroxysm at a later hour that day, but enough to moderate it, and to obviate its renewal the next. Had the improvement in the stools not taken place, secretion of hæmatin from the kidneys would likely have occurred, of which some of the casts on the fifth day gave indications by their brown colour; and had the kidneys also ceased to act, black vomit might have been looked for. The rapid improvement of the case under the opposite conditions is well marked, and is of value in suggesting the plan of treatment.

In the following case, as well as that of Brownlow, given above, the fever seems to have been intermittent in form, though the account is not quite so precise on that point as desirable. Thomas Coker, aged twenty-five, a black soldier, employed as policeman in barracks at Up Park Camp, in Jamaica, had a paroxysm of fever on the afternoon of Monday, the 17th May, 1858, which induced him to go to hospital the following morning, where he received some medicine, and was excused duty for the day. On Wednesday, the third day, he felt better, and went to his duty in the morning; it could not be ascertained subsequently whether he had had fever that afternoon. On the fourth day he was pretty well in the morning, but a paroxysm of fever

came on in the afternoon, with vomiting. Next morning, the fifth day, he walked to the hospital at 7 A.M., being then feverish, inclined to drowsiness, with soreness in pharynx, and pain in swallowing. Conjunctivæ yellow; tongue red at tip and edges, white in centre; pulse small and quick; condition of the stomach, bowels, and urinary organs not noted. After admission he vomited once, and passed some urine, which were thrown out without having been examined. At half-past one P.M. he brought up a small quantity of black vomit, and died immediately. On examining the body three hours after, the white tissues were all of a pretty deep yellow colour. The stomach contained a pint of acid black vomit, its mucous membrane was somewhat congested in parts; that of the duodenum and jejunum was thickened, as if about to desquamate, and the solitary glands were enlarged like those in cholera cases. The mucous membrane in the lower part of the ileum was somewhat congested. The liver was rather large, flaccid, and presented congestion of the hepatic and portal vessels, with a circle of yellowish-grey colour between. Gall-bladder distended with dark fluid bile. Spleen rather large and pulpy. Kidneys enlarged and congested; bladder contained a quarter of an ounce of urine only. This case was well marked yellow fever appearing in a black man, a circumstance I have found of more frequent occurrence than many authors lead us to suppose. The congestion of the lower part of the ileum accompanying that of the stomach and duodenum, and the enlargement of the solitary glands, deserve attention in connexion with what has been already stated regarding typhoid complications.

These cases are corroborative of the opinion entertained by the older writers throughout the West Indies and Southern States of America, that yellow fever is often a remittent, or intermittent, and consequently, that whatever may be the form it presents in other localities where the ordinary causes of periodic fevers may be less common, yet when they are rife, the yellow fever so closely resembles their more common products in many of its features, and so coincides as to time of appearance and locality with ordinary remittents, as to suggest a community of origin, the resulting disease taking the guise of yellow, or pure remittent fever, for reasons all of which we are not yet well acquainted with. The following table of the mortality among the troops at the chief military stations in Jamaica, between 1804 and 1820, will show its regularity according to season. The deaths from all diseases are included, but as about five-sixths of them were from fever, and when numerous generally of the yellow form, the table will give a pretty fair idea of the periods of activity of the causes of fever. To facilitate comparison, the numbers in the table have been calculated on the assumption that 1000 men died at each station, but the actual number of deaths is given also.

Mortality in each month in 1000 deaths from disease, among the white troops at the undermentioned stations in Jamaica, between 1804 and 1820:—

Month ending	Port Royal, 1807 to 1820 (14 years).	Spanish Town, 1804 to 1820 (17 years).	Up Park Camp, 1804 to 1820, excluding 1819 (16 years).	Up Park Camp, 1804 to 1820, including 1819 (17 years).	Stoney Hill, 1804 to 1820 (17 years).
January 20th .	65	94	75	64	110
February ,, .	37	45	37	30	79
March ,, .	75	43	23	22	42
April ,, .	101	45	26	21	21
May ,, .	91	33	32	28	17
June ,, .	99	40	34	30	25
July ,, .	50	71	43	52	52
August ,, .	65	83	80	125	66
September ,, .	120	66	95	127*	91
October ,, .	89	106	156	145	221
November ,, .	112	152	263	227	183
December ,, .	105	222	131	129	103
Year . . .	1000	1000	1000	1000	1000
Total deaths recorded in period	536	995	1929	2398	967

These stations are all on the south side of Jamaica, and within sight of each other; the distance from Port Royal to Spanish Town being about nine miles in a direct line, to Up Park Camp five miles, and to Stoney Hill ten miles. They differ in the time of occurrence of the least and greatest mortality, and, while Spanish Town, Up Park Camp, and Stoney Hill have each a single minimum and maximum in the course of the year, Port Royal has an earlier minimum than either, and a maximum in April, when the others are about their minimum; and maxima occur again in September and November as well. The table has been brought down to 1820 only, as up to that time the troops seem to have been retained at the different stations whether they were healthy or not; the severe fever epidemic of 1819 induced a deviation from this system, and the remains of the 50th and 92nd Regiments, which had suffered so terribly from it at Up Park Camp, were removed in August and September. Similar movements took place in subsequent epidemics, so that the records for the periods embracing these give a less correct view of the activity of the morbific influences at each than those previous to 1820.

These facts show that fever in Jamaica is a disease of season, the period for which is well-defined at each station, and that these periods differ materially at different stations, though in the immediate neighbourhood of each other. Each retains its distinctive features to this day, though now they are never permitted to develope their powers to any extent, the troops being removed as soon as fever threatens to be serious. The experience of other countries is to the same effect, the yellow fever in all observing regular periods of increase, culmination, and decline, which are partly dependent on the climate, partly on circumstances more immediately connected with particular localities, as at Port Royal.

* In consequence of the severe epidemic of 1819, most of the troops were removed from Up Park Camp in August and September, and did not return until December, which gives a considerably different result if 1819 be included. Previous to this year the troops do not seem to have been removed, however sickly the season.

Many illustrations of the power of local causes to generate yellow fever, can be obtained from the countries where the disease is common; but some, taken from a place where fever of this form is rarely met with, and when there was no question of importation to complicate it, may be more convincing. The subjoined cases are particularly interesting in this respect; the subjects of them were men of the 36th Regiment, stationed with their company at Vido, a small island in the harbour at Corfu, where they were employed removing a considerable depth of moist alluvial clay for the foundation of a water-tank; both seem to have been drinking freely before their attack. It is to be remarked, that at Vido there is some peculiarity leading to fever, as it is stated in the 'Statistical Report on the Sickness and Mortality among the Troops in the Mediterranean' (p. 41), that between 1817 and 1836 the majority of the cases of remittent fever in the returns for Corfu were derived from Vido.

Private J. Culleton, aged twenty-six, while employed as abovementioned, was attacked with fever on the 22nd of August, 1850. The following day, the second of the disease, he was admitted into the Regimental Hospital at Corfu, in a state of considerable prostration; the heat of surface but slightly increased; pulse small and frequent; tongue coated, with a brown, dry streak in centre, but moist and clean at edge. On the third day the prostration continued, and there was oppression at the præcordia, nausea, and vomiting. Lemon colour of the surface, with little elevation of its temperature; pulse 136, small and unsteady. On the fourth day the surface was moist; pulse 110; tongue moist and cleaner; yellowness increased; stomach irritable. During the night he had passed three ounces only of a high coloured, turbid urine. On the fifth, the yellowness was deeper, temperature of surface natural; pulse ninety-four; the nausea and vomiting rather less; alvine evacuations offensive, and wanting in bile; passed six ounces of urine only since previous morning; an eruption of bullæ filled with a yellowish serum, with some purple discoloration about their bases, had appeared on the arms and chest. On the sixth day, the yellowness was deeper; pulse continued the same; no urine had been passed; and there was a fixed pain in the region of the right kidney, for which he was cupped to six ounces. On the seventh day, the suppression of urine continued. In the evening, a purgative enema brought away an offensive motion without bile. The eruption did not present an increased number of bullæ, but they were larger, and their contents had become a dirty, sanious pus, or were mixed with dark-coloured blood. On the eighth day, after having been wandering all night, there was epistaxis; the functions of the liver and kidneys were still suspended; the stomach irritable, the matters ejected of a dark, grumous character from admixture of blood. Death occurred at midnight.

On examining the body, the mucous membrane of the stomach was found softer than natural, and congested in parts, more especially

about the cardiac orifice. There was fulness of the vessels, with effusion of blood beneath the mucous membrane in the ileum and rectum, but no trace of ulceration anywhere. The liver weighed five pounds two ounces, its colour was between olive green and dark brown; structure friable, and capillaries congested. Gall-bladder full of dark-coloured bile. Spleen soft, easily broken up. Kidneys almost double their usual weight; much congested, with some muco-puriform matter* on the lining membrane of the calyces and uriniferous tubes. Bladder quite empty, but healthy. The low fever, its abatement from the third day, the diminished secretion of urine on the fourth, and want of bile in, or ordinary feculent appearance of, the stools from the fifth, are all characteristic of yellow fever, and serve to distinguish the case from any of the other forms of fever. But for the eruption on the fifth day, black vomit, or hæmorrhage from some mucous surface, would probably have appeared on that day, and even this did not obviate the epistaxis and black vomit on the eighth day.

The other case was that of Private G. Hargrave, who was attacked on the 17th September, at Vido; but I have no detail of symptoms before the 19th, the third day of the disease, when he was admitted into the General Hospital at Corfu. There was then much debility present, with headache, soreness of chest (part not specified) and abdomen, and pains in limbs; heat of surface slightly above natural; pulse small, weak, and frequent; bowels acting freely from medicine given at Vido; tongue thickly coated with a brown fur. On the fourth day the headache and uneasiness in chest and abdomen continued; the skin and conjunctivæ were yellowish; pulse less frequent, rather firmer; was purged during the night; urine rather scanty, high coloured, depositing lithates freely; tongue as yesterday. In the evening the fever was less, but was much troubled with flatus. On the fifth day the surface was cool, the yellowness increased; stomach irritable, and vomited after taking anything; tongue coated, but moist and clammy at the edges; bowels freely moved during the night, when he passed a few drops of urine; pulse 96. On the sixth day the fulness at the epigastrium and irritability of stomach had increased, and become distressing; the yellowness was deeper; no alvine evacuation or secretion of urine; pulse 100. In the evening an enema brought away some hardened lumps of offensive slate-coloured fæces. On the seventh day there was considerable drowsiness, stomach rather less irritable; pulse 100, smaller; no urine secreted. In the evening there was one liquid stool, containing some clots of blood, and only one ounce of turbid, high-coloured urine passed during the day. On the eighth day there was again increased irritability of stomach, and he was passing dark-coloured offensive liquid evacuations from the bowels, containing much dark liquid blood; tongue brown and dry; pulse thready; temperature of surface failing. These symptoms increased, and he died at eight P.M.

On examination after death, the surface of the lungs was found

* Most likely tube-casts, but the matter does not seem to have been examined with the microscope.

mottled with dark red spots of active congestion; they contained much fluid, with considerable hypostatic congestion. The mucous membrane of the stomach, towards the pyloric orifice, and the upper part of the duodenum were intensely congested. The intestinal glands were free from ulceration, but throughout the jejunum, ileum, and colon there was exfoliation of the mucous membrane, the epithelium lying in ragged patches on the subjacent membrane, beneath which there was extravasated blood. The liver weighed four pounds; its texture was softened and portal capillaries congested; gall-bladder full of dark-coloured bile, ducts pervious; spleen of usual size, very friable. The kidneys weighed seven ounces each, and were much congested; bladder contracted, and did not contain a drop of urine. This case, like the former, presented a commencing diminution of the pulse and fever on the third day. The yellowness was first perceived the following one, when also the scantiness of urine attracted attention, which subsequently was almost completely suppressed. The irritability of the stomach on the fifth day, the light-coloured alvine evacuations noted the following one, and hæmorrhage from the bowels at last, are all characteristic; and the congestion of the pyloric portion of the mucous membrane of the stomach and of the duodenum, the desquamation of the intestinal mucous membrane, congested state of liver and kidneys, and empty bladder, leave no doubt whatever that the case was yellow fever of a malignant description. The supposed deposit of lithates on the fourth day, from its immediately preceding suppression, was most likely a sediment of epithelium from the bladder or tube-casts, or both. It does not seem to have been examined by the microscope, nor with the view of seeing whether it really were composed of lithates. The treatment in both cases was judicious; it consisted of quinine, with cupping over the loins and epigastrium, and external warmth. Mild saline diuretics and diaphoretics also were given, to promote the flow of urine and determine to the surface, and wine and nourishment as required.

These cases were the only ones presenting the characters of yellow fever seen at Corfu in 1850, and there was no question of importation to suggest a doubt as to their origin. The men were stationed on a small island which had previously produced much remittent; they were engaged excavating the soil, an operation which has often proved hazardous to those engaged in it; and their susceptibility was heightened by free indulgence. Under these circumstances they contracted fever, which proved to be the yellow fever; and it can be attributed to no other cause than the emanations from the soil to which they were exposed in the island, if not actually in the work on which they were engaged. The cases are particularly valuable. They were recorded by officers who had no theory to support. The notes, of which the above is an abstract, were communicated by Dr. Jopp, surgeon of the regiment.

I have encountered yellow fever in Barbadoes, Sierra Leone, and Jamaica; and after the best consideration I could give the facts which presented themselves, am firmly impressed with the belief that the

evidence they afford was quite in accordance with the origin of the disease from local causes, and irreconcileable with the opinion that it either arose from, or was propagated by, contagion. General statements were often submitted to me which would have borne a different construction, but on a full examination of the circumstances they were said to embrace, their insufficiency became apparent, and the deductions from them fell to the ground. It would occupy too much space to give details for all these, but I may here refer to the outbreak at Newcastle, in Jamaica, in 1856, an account of which appeared in the number of this Review for October, 1859, p. 445.

Newcastle is placed on the crest of a sharp ridge, so narrow that in several places there is space for a single barrack-room only. The cantonment occupies something under 800 yards of the ridge, within which distance it falls from 4120 feet to about 3500 feet above the sea. Here, in August and September, 1856, cases of yellow fever showed themselves in persons recently from the low ground, and on the 17th and 18th September, two men in the same ward of the hospital with the last case, and who had not been away from Newcastle for months, were attacked. After this the disease appeared in two houses near the hospital, and subsequently in other parts of the cantonment, and before the end of December had proved fatal to forty-five persons. This general statement is correct in every particular mentioned, and would be received by many as incontestable evidence of the contagiousness of yellow fever. Most of those advanced for this purpose are of the same description. Its insufficiency for this purpose will be obvious, however, and these facts appear in a very different light, when it is explained that, on tracing every person to his place of residence at the time of attack, it was found that there were four zones in the cantonment, embracing all the rooms and tents across the ridge, which enjoyed immunity almost complete from the disease. These included, and alternated with, three others, in which the disease appeared; and the hospital and rooms where the first cases occurred were in one of these unhealthy zones. But the proofs in favour of local causes did not end here. Other patients and attendants on the sick having been attacked in the hospital, it was cleared, and another opened on one of the healthy zones; and though the unhealthy situations continued to afford fresh cases, which were removed to this as they occurred, the disease could not extend itself from them to the attendants or others at a point not 200 yards from where they originated.

In every instance I have met with yellow fever among the troops, the limits within which it appeared were well defined, though the positions of danger and immunity did not alternate so remarkably as at Newcastle. Facts of this description, of which there are many, show the unsoundness of the evidence in favour of contagion sought to be derived from the spread of yellow fever among persons in an unhealthy locality, or from its non-appearance among others in quarantine who may happen to be placed in a healthy one; they prove, also, that sickly spots may be very limited in extent, and may adjoin

others that are healthy, and that these may even be mixed up together in a manner wholly irreconcileable with the notion of the extension of the disease by personal communication. It would be well, in any attempt to prove that crowding or other personal influences were instrumental in extending yellow fever, to admit these facts, as unless this be done, no sound advance can be made in our information on the subject.

If yellow fever arise from the same local causes which at other times produce remittents or intermittents, it may be asked whether the emanations from these are merely more concentrated, as some suppose, or are somewhat changed—whether, in short, there be merely a more concentrated poison, or another with somewhat different properties produced. The latter view represents the facts better than the former, for were the poison more concentrated only, all cases of yellow fever should be more severe than remittents, whereas there are many cases of the former well-marked, even in unacclimated Europeans, which are as slight as the slightest remittent, and sometimes scarcely sufficient to detain the patient in bed. On the other hand, pure remittents may be so severe as to prove fatal in four or five days. Again, yellow fever is sometimes produced by the emanations from the holds of ships,* which are not known to give origin to intermittents or remittents. It has been observed, too, that heavy rains either suspend the production of the poison causing yellow fever, as seemed to be the case at Newcastle, in November, 1856,† or alter its nature so far that most of the fevers which appear during their continuance are mild remittents only, as occurred at Sierra Leone in the epidemic years 1823, 1829, 1837–8, and 1847, though when the rain was succeeded by fair weather, whether at the end of the rainy season or during a break in its middle, yellow fever presented itself, in the latter case to be supplanted again by the remittent on the recurrence of heavy rain.

A further proof that the emanations causing yellow fever are in some respect different from those giving rise to remittents, is derived from the symptoms of the former itself. Its peculiarity, as compared with remittents, consists in the desquamation of the bladder and uriniferous tubes of the kidneys about the fourth day, the cessation of the secretion of colouring matter by the colon about the same time or earlier, and the early active exudation into the substance of the liver and kidneys, leading respectively to jaundice and suppression of urine; the black vomit and hæmorrhages, and irritation and exfoliation of the mucous membrane of the small intestine, when they occur, seem to be consequent on the suppressed function of the colon, kidneys,

* This does not refer to the odour of "bilge water," as it is called, which is well known from the sulphuretted hydrogen it contains, but to an emanation arising from a foul hold in a sailing vessel, and more frequently met with of late years in steamers and vessels which have carried coals to the tropics. Of the first, Bancroft gives many instances in his essay and sequel; many also are mentioned by La Roche. Others are noticed in the Reports on the Health of the Navy; and a very striking one in the Address of the President of the Epidemiological Society, Transactions, vol. i. p. 139.

† British and Foreign Medico-Chirurgical Review, Oct. 1859, p. 479.

and liver. In ordinary remittent, the functions of these organs are less frequently suspended, and very rarely so early as in yellow fever; the system can, therefore, go on relieving itself from time to time by partial critical evacuations, and, provided the brain do not become seriously affected, the patient has a fair chance of recovery. The occurrence of desquamation of the uriniferous tubes, and the other symptoms connected with them, on the fourth and fifth days in the yellow form of the disease, coincide in time with the natural remissions of the second tertian period, and are therefore to be regarded as critical efforts, and their appearance is undoubtedly connected with some peculiarity in the poison from which the disease originally sprang. Being of a critical nature, it is quite possible they might appear during the first tertian period in some cases, or not before the third or fourth in others, but for the most part they are met with in the second period, or between the third and fifth days of the disease.

Can a fever originally of a continued form present, at an early period, an affection of the kidneys and other organs such as those which have been shown to characterize the remittent forms of yellow fever, and, on their appearance, remit and assume the other characters of the latter disease? The reply, it seems to me, must be in the affirmative, as most who have seen yellow fever must have met with cases in which there was no apparent remission until the fourth day, or later, when the urinary secretion became diminished, and albumen was found in it. There is nothing extraordinary in this, if the affection of the kidneys be regarded as a critical effort, for a sufficient crisis will at all times resolve a fever, of whatever form it be, and though in our experience in this country such seldom occur, and the continued fevers are usually extended over a long period, yet in warm climates, where pure synocha is met with, it is otherwise, for a sharp attack of that is frequently terminated by a profuse sweat on the fourth or fifth day, and the patient may be able to move about within a week. It must be admitted, therefore, that yellow fever may present a continued as well as a remittent or intermittent form, the course of all these being assimilated only after the lesions peculiar to the disease come to be developed.

Fevers in tropical climates are by no means so simple or well-defined in their forms on all occasions as many suppose; on the contrary, they are often very complicated. I have known cases commence as remittent, and continue as such to from the sixth to the tenth day, having an intermission on the morning of these days, yet the same afternoon fever recurred, which soon took on the character of yellow fever, and proved fatal on the fourth or fifth day of that form, with black vomit and other unmistakeable symptoms of this disease. I have seen in other cases which commenced as intermittent, diarrhœa ensue, and after three or more tertian periods, the fever became continued, and assumed the character of typhoid fever, and ultimately presented the affection of the kidneys and urine seen in yellow fever, and then terminated in death. On examining the

bodies, the intermixture of the morbid appearances peculiar to yellow and typhoid fevers were detected in variable proportions, as already detailed. The cause of the typhoid complication in these cases was a privy immediately in rear of the building from which they came, but to windward of it at night; this had a deep cesspit, which had been emptied, and thus exposed the additional surface of the sides, as well as the bottom, to give off emanations. On clearing the building of its inmates, the typhoid complication disappeared. These facts show that yellow fever is not a complaint separate and distinct from all others, but that it becomes mixed up with them in various ways, according to circumstances.

Division IV.—Treatment.

There are cases of yellow fever so slight that they get well with little or no treatment; there are others, again, and unfortunately they are much more numerous, that seem doomed from the first, and in which treatment is of no avail. The number of the latter varies much in different epidemics, but under all circumstances they may be expected to cause a high mortality, quite beyond the power of medicine to prevent. There are many, however, between these extremes, in which the disease endangers life, and in which an enlightened and discriminating treatment may avert a fatal result: such a plan of treatment is still a desideratum in this disease.

Treatment is naturally divided into means for resolving the disease during its course, and those for meeting the various morbid actions which arise when that is unchecked, and the evil consequences resulting from them. A few remarks on each in connexion with what has gone before, though they have no pretension to be considered as more than an outline, may serve to clear away some of the obscurity in which thewhole subject is involved.

Blair, at Demerara, employed large doses of calomel and quinine as early as possible in the disease, with the view of checking it; the quantities he employed were twenty grains of the former and twenty-four of the latter, which he repeated every six hours, for several times, if necessary. This medicine acted freely on the bowels and skin, and, according to his experience, was often sufficient to cut it short. The same practice has frequently proved successful in Jamaica; but, according to Dr. Davy, it was not attended with beneficial results at Barbadoes; and the American practitioners at New Orleans have not found it answer their expectations in stopping the fever, while the large and frequently repeated doses of quinine were often highly injurious. This discrepancy may be explained in part by the fact, that fever at Demerara generally, and in Jamaica very often, is of the periodic form, and yellow fever when it arises will retain more or less of the same peculiarity; in such, if the fever can be checked, and the system brought under the influence of quinine, that medicine may prevent another paroxysm, and thus obviate the affection of the liver or kidneys when these have not actually commenced. At Barbadoes,

on the contrary, though periodic fevers are not unknown, they are not common, and when yellow fever arises, it is apt to have a continued form, and not be amenable to the anti-periodic influence of quinine; hence its exhibition there was not likely to be equally beneficial. This explanation, I apprehend, will apply to a considerable extent to New Orleans; for although there were abundant sources of remittent fever around that place, still in the city itself, when many of the cases of yellow fever originate, the causes will be rather those peculiar to large towns, with the surface more or less covered in, than to the more exposed places where remittents are common. The calomel is a very essential part of the treatment; it acts powerfully on the colon, causing a profuse dark pultaceous stool, and seems to anticipate that condition of the intestine when its secretion ceases. I saw a case of yellow fever at Barbadoes cut short by an emetic, followed by strong purging with calomel and sulphate of magnesia, but without quinine, while another, attacked at the same time, and in the contiguous bed, in which these measures were not adopted, went on to black vomit and death. These were men in hospital, and were brought under treatment within a few hours after the fever had declared itself. The practice deserves notice, though I have not many cases to adduce in support of its efficacy.

Blair, who recommended these large and frequently repeated doses of quinine in yellow fever, at first thought he had never seen them act injuriously; subsequently, however, he altered this opinion; but many still believe they do no harm. In 1847, at Sierra Leone, I saw coma induced in a robust adult female labouring under remittent fever by a dose of quinine of fifteen grains only, at a time when much larger were commonly exhibited; and though she had no more fever there was for a considerable period afterwards so much fulness and uneasiness in the head as to induce caution in the employment of this medicine with others. I have seen or heard of several other cases of coma from over-doses of quinine, and have known a good many men in whom even moderate quantities, not exceeding twenty grains in twenty-four hours, have brought on at least congestion of the membranes of the brain, which could not be distinguished from meningitis, unless perhaps by the readiness with which it gave way to a large blister on the back of the neck. The experience of the physicians at New Orleans is to the same effect; the frequency of deafness, blindness, partial paralysis, and other consequences of injury to the nervous centres, by the too free exhibition of quinine, has rendered them more cautious in their use of it. The fact seems to be, that many persons can take large quantities of this medicine without further inconvenience than a temporary singing in the ears, while others are much more sensitive to it, and smaller quantities are sufficient to induce serious disease of the brain. So far as I have seen, there is no certain means of distinguishing these. It is satisfactory, however, to know that most of the beneficial effects of quinine can be obtained with smaller doses, if not so quickly on all occasions, at least with less risk. During the latter years of my service at Sierra Leone and

the Gambia, I never gave more than fifteen grains of this medicine in the day, and though living in the midst of severe remittents, found the results not less satisfactory that when large doses were employed, while the bad effects were rarely encountered.

Should the effort to cut the disease short have failed, or should the patient not have been seen until it was too late to attempt it, the object of the medical attendant will be to moderate excessive action in any organ, and endeavour to bring about as complete a crisis as he can about the fifth day, the natural period of resolution in the disease. For this purpose nothing is of more importance than to re-establish the secreting function of the colon and to obtain feculent evacuations, not mere bilious discharges—for a patient may have these and yet die—but proper dark-brown feculent stools. But how to bring about this desirable result is the difficulty. Violent measures of any kind are not likely to be successful at this period of the complaint; and the best devised will but too often prove ineffectual. Gentle excitement of an extensive portion of the lining membrane of the colon, with frequent copious enemata of tepid water, or any bland fluid, or these rendered more stimulating with any of the ordinary substances employed for this purpose, deserve a full trial; powerfully stimulating enemata of any description, or drastic purgatives, will only serve to increase the mischief. Should the case present violent purging, with or without blood, which is sometimes the case, this of course would be inapplicable.

Should a natural alvine secretion be obtained, it is not likely there will be much further trouble with the case; but if, as will too often happen, it is not, the next condition demanding attention will be the state of the kidneys. The congestion of these on the fourth and fifth days will require watching, so as to diminish the chances of suppression of urine, and to bring about a more natural secretion, so far as that can be done by reducing the congestion, and preventing the closure of the uriniferous tubes by accumulated epithelium. This point has not received that attention it deserves, though it is obvious that serious diminution of the urinary secretion will inevitably aggravate the other symptoms, if it do not induce a fatal result. Cupping, either dry or with the abstraction of blood, and frictions with stimulating liniments over the loins, have proved useful; these, with warm baths, or still better, hot-air baths, deserve a full trial; not that they will cure every case, or even a large portion of those in which they may be required, but they afford the best chance of relieving the kidneys, and may save life under circumstances otherwise all but hopeless. Small doses of acetate of ammonia with potash or soda, or their salts in common use, with diaphoretics, so as to act gently on both kidneys and skin, may prove beneficial, in addition to the other measures.

Local abstraction of blood, counter-irritation, and a variety of medicines calculated to relieve urgent symptoms, or check excessive discharges, can be had recourse to as the judgment of the practitioner may suggest. The patient will often derive much comfort, or troublesome complications be kept in check for a little, by a discriminating

employment of these; but inasmuch as all the conditions calling for them seem to be but efforts of the system, whether by secretion from a mucous surface, or exudation into the parenchyma of an organ, to rid itself of what under ordinary circumstances should have passed by the bowels, kidneys, or skin, unless the functions of those parts be restored, remedies directed specially to other organs are but palliatives, useful in their way, no doubt, but still not striking at the root of the evil.

The administration of alcoholic stimulants in yellow fever requires notice, as they are often pushed at a time when, to say the least, their use is very questionable. When a patient is very low, and the heart's action weak and languid, it is necessary to employ wine or brandy to maintain life; and provided the kidneys be unaffected, large quantities of either can be given, it may be with benefit, at all events without serious injury; but when the kidneys are congested, and still more if secretion has ceased, the alcohol will accumulate in the system if given freely, until it either cause irritation of the bowels and diarrhœa, or pass off through the lungs. I have known the air in a large room in which there was a window and door always open, to be so impregnated with the vapour of brandy given off with the breath of a patient in yellow fever, that it was disagreeable; and I have seen the lungs of another who had suppression of urine, and died of the disease, so impregnated with brandy that they gave off the odour of it from every part as strongly as if they had been steeped in it for some time. A patient whose life is already endangered by the embarrassment of the kidneys and intestinal canal, is not likely to have his chances of surviving increased by so drenching him with alcohol; the congestion of the kidneys will be most certainly increased, if it have not as yet gone beyond what is compatible with a restoration of function, and the irritation of the bowels will only present a further obstacle to a healthier action on their part.

These remarks are necessarily very incomplete. All practice in yellow fever must at present be more or less empiric, and we can expect to substitute more rational plans only as our knowledge of the diseased actions and their results becomes extended. It is much to be desired that the alvine evacuation should be as fully investigated both in health and disease, as the urinary has been; but even then, until the transformations of matter in the system during the secondary assimilation are more fully understood, we shall not be in a position to develop a really scientific practice in this disease.

I was indebted to the various medical officers who served with me in Jamaica for their assistance in carrying out the investigations on which the above remarks are based. The details of cases were obtained from their records, though I saw many of them frequently myself, and was present at nearly every post-mortem examination. All the remarks on the urine and morbid appearances of the various organs are from my own observations.

OBSERVATIONS
ON
THE OUTBREAK OF YELLOW FEVER
AMONG THE
TROOPS AT NEWCASTLE, JAMAICA,
IN THE LATTER PART OF 1856.

BY ROBERT LAWSON,
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An opinion has long prevailed that the severe forms of tropical fever could not originate, or spread, at a considerable elevation above the sea. The grounds for this opinion seem to be the statement of Humboldt that yellow fever was confined to the low country on the coast near Vera Cruz, and that it did not pass the farm of l'Encero, elevated 3045 English feet above the sea, "the heat there being insufficient to develop its germ;"* and that of Fergusson, with reference to the varieties of fever occurring at different elevations in St. Domingo. The remarks of these authorities were no doubt correct for the *time* and *place*, but it must not be thence concluded that all the conditions requisite for the production of those forms of fever, except that of suitable elevation, were present in the cases they adduce. Their deductions, therefore, require to be applied cautiously to other localities, and may, under certain modifications of the conditions, be even found inapplicable to the same localities at another time.

With that disposition so common among us, however, to help out preconceived notions by an appeal to the authority of a great name, rather than to correct them by a careful deduction from facts, the opinions of Humboldt and Fergusson have been pushed much beyond their legitimate bearing; but we know too little of the actual causes of severe tropical fever to be able to say with certainty where they may be produced in sufficient intensity to develop the disease, far less to define the point beyond which their production is impossible.

There is no certain test for the presence and operation of the efficient causes of fever but its occurrence among men or the lower animals; but observations on the latter are too few and desultory to admit of frequent application. For all practical purposes, therefore, observations on bodies of men, under conditions sufficiently varied, afford the only means of extending the information on the subject and deciding doubtful points.

In Jamaica there are military stations which have been in existence for many years, the records of which are available for elucidating some

* Political Essay on New Spain, vol. iv. p. 170. English translation, 1822.

of the laws of the disease. Taking Kingston as a centre, the following stations are included within a circle of about eleven miles radius—viz., Port Royal and Fort Augusta, at the level of the sea, and nearly surrounded by it; Up Park Camp and Spanish Town, at moderate elevation above and some distance from the sea; Stony Hill, eight miles from the sea, and 1360 feet above it; and Newcastle, nine miles from the seaboard and about 4000 feet above it. On the north side of the island lies Maroon Town, about twelve miles from the sea coast, and elevated about 2500 feet above it. With the exception of Newcastle (which was first occupied as a military post in 1841), these stations were garrisoned many years, and the returns for them are given in the statistical reports on the health of the troops in Jamaica from 1817 to 1836 inclusive.

The following table, taken from these data, shows the average mortality from fever per 1000 of mean strength, at each of the stations above mentioned, together with the extreme annual variations:

Station.	Annual mortality per 1000, from fever for twenty years.	Extreme annual variation per 1000.
Port Royal	93·9	From 0 to 298
Fort Augusta	55·5	„ 0 to 278
Up Park Camp ...	121·0	„ 21 to 479
Spanish Town	141·0	„ 42 to 368
Stony Hill	70·5	„ 3 to 431
Maroon Town	15·3	„ 0 to 34

These results form the best approximation to a numerical expression of the activity of febrific causes in the different localities for the period they embrace. From them it is obvious that on the average the stations surrounded by the sea were healthier than those at a short distance from it, and near the same level; while in the case of Stony Hill,* and still more of Maroon Town, elevation has been attended with a great diminution of the activity of the causes of febrile disease, though not by their entire disappearance. It is manifest, too, that these causes had very different degrees of activity in different years at the same station, though the periods of increase and decrease were nearly contemporaneous at them all; thus indicating the presence of an epidemic constitution at certain epochs, whatever the nature of that may be.

In 1840 an epidemic period commenced, which continued with variable intensity to the beginning of 1842. It commenced at Maroon Town, and twelve deaths occurred from fever originating there, or thirty-six per thousand of the mean strength within the annual period. In the year 1841–42 there were twenty-four deaths at this station from fever; of these, two in May and five in June, were in men of the 68th Regt., which corps had not been away from the station; the remainder were in the 82nd, which arrived there in the end of June, and many of them were attributed to the low ground. This outbreak was

* Since this was written, I have found, on personal examination, that there is a considerable amount of marshy ground actually among the buildings at Stony Hill, and a considerable portion of the surface seems to be kept wet by springs coming to the surface at various places.

coincident with that which occurred in the 60th Regiment on the south side of the island, immediately on its arrival from the Mediterranean. In the fatal cases at Maroon Town, black vomit was either ejected during life, or found in the stomach after death.

In February, 1842, a case resembling yellow fever showed itself at Newcastle, and terminated fatally on the fourth day. I have not found it expressly stated that the man had not been away from Newcastle, but from the context this seems implied. Staff-Surgeon Hawkey and Staff-Assistant-Surgeon Jameson were sent to examine the case, and their opinion, as given in the General Quarterly Report to March 31st, was, "that the real origin of this instance of fever was very doubtful indeed; that the symptoms during life were most equivocal; but that the appearances of the characteristic black fluid in the stomach after death clearly betrayed the morbid agency of febrific miasm."

In October, 1848, a period when yellow fever had been prevailing extensively in the West Indies, a malignant fever broke out in the family of the schoolmaster-serjeant of the 97th Regiment, at Newcastle. The family consisted of himself, his wife, and three children, and a woman who attended them: all these, except the serjeant, were attacked with fever; he had dysentery; and the wife and children died.

The disease was confined to this family, and was attributed chiefly to the emanations from a cesspool to windward of, and within thirty yards of the hut in which they lived. None of these had been away from Newcastle for a considerable period previously. Deputy Inspector-General Dr. Watson, in his official report to the officer commanding, states that the disease was "a fever of a peculiarly low and pestilent nature;" but Staff-Surgeon Dr. McIlree, who was then surgeon of the 97th, and had the cases under his immediate observation, has favoured me with a statement from his notes made at the time, from which it appears several of these were characterized by rapid course, yellow skin, and black vomit; in other words, were decided yellow fever. The hut in which these cases occurred was situated close to the bend of the road immediately in front of the lowest barrack, at a point 3520 feet above the sea.

In July, 1850, cases of severe fever began to appear at Maroon Town, and Dr. Maclean, Deputy Inspector-General, in his annual report for that period, states that the fatal cases were characterized by yellow skin, and the formation of black vomit in the stomach.

I have thought it advisable to adduce these facts with reference to the more elevated military posts in Jamaica, previous to entering on the special consideration of the occurrences at Newcastle in the end of 1856. They show that though the high land stations may, in ordinary years, present a degree of health little inferior to that observed in Europe, yet when an epidemic constitution prevails, they are by no means exempt from its influence, and may even, as in the case of Newcastle on the late occasion, suffer severely, though it is probable to a far less extent than the low land stations under similar circumstances.

The military station of Newcastle is situated near the western extremity of the Blue Mountain range, on its southern aspect, and about nine English miles N.E. by N. from the sea-beach at Kingston. Owing to the difficulties of the ground the distance by the road is about fifteen miles. The highest point in the neighbourhood of Newcastle is St. Catherine Peak, which attains an elevation of 5000 feet above the sea, from this the ground proceeds southerly 1600 yards to another peak less elevated, forming the eastern boundary of the space enclosing the station. From the flank of the latter peak a sharp ridge is thrown off to the S.W., though at a greatly reduced elevation, which forms the southern boundary of the valley on that side of Newcastle. The ground slopes away from the peak to the southward, throwing off abrupt ridges intersected by deep hollows, and forms the eastern boundary of the Hope Valley, which drains the whole, and through which the road to Newcastle passes.

From St. Catherine Peak the ridge of the Blue Mountains passes in a westerly direction, and at the distance of 2270 yards there is a small pointed peak, from the southern base of which a sharp ridge runs off about S.S.E., rapidly declining in elevation until it nearly meets the spur crossing from the peak to the southward of St. Catherine's, thus forming the western boundary of the space surrounding Newcastle. The cantonment itself is on a spur given off from the connecting ridge about midway between St. Catherine Peak and that to the westward. This spur has a southerly direction, and falls rapidly as it leaves the parent ridge, maintaining, however, an elevation much the same as that of the western bounding height, at a corresponding distance from its northern commencement.

The cantonment occupies a space of nearly 800 yards in length; and the difference of level between the highest and lowest building is 505 feet. The mess-room is 4050 feet above the sea.* The top of the ridge is so contracted in many places that there is room for single houses only, while its sides descend at an angle which is seldom less than forty degrees, and in some places fifty degrees, below the horizon. At other places it spreads out considerably, giving room for more extensive buildings; but the slopes terminating in the water-courses are everywhere abrupt, and the latter deeply excavated. On the western side of the cantonment there is but one large valley, which is pretty well cleared; to the eastward the valley, as it ascends from the lower part, branches out into a number of smaller ones, separated by sharp ridges, and these generally contain much bush. From the nature of the ground the fall is everywhere so great that water finds a ready outlet, and there is nothing of the nature of marsh to be seen; while, from the frequent rain and the supply from the springs, the main water-courses have always a stream in them.

The soil in the neighbourhood seems to be clay, mixed with vegetable matter on the surface; though where excavated the clay is found

* Some years ago it was proposed to make a carriage-road from the low lands to this station; when the levels were taken, the elevation of the plateau on which the mess-room stands was found to be 4020 feet above the sea. This information was derived from the plans in the Engineer's Office, in Jamaica.

stiff and unmixed, and is of a red colour. This clay overlies a bed of marl of a yellowish-grey colour, and that again seems to be bedded on sandstone of a purplish-blue colour, and of remarkable firmness and cohesion; large boulders of this nature are found all over the flanks of the hills, where the action of the rain has washed away the soil and left them exposed. The stratum of clay attains considerable thickness in many places, and in several has been eaten into deep gullies from the action of the surface-drainage, or extensive slips have taken place.

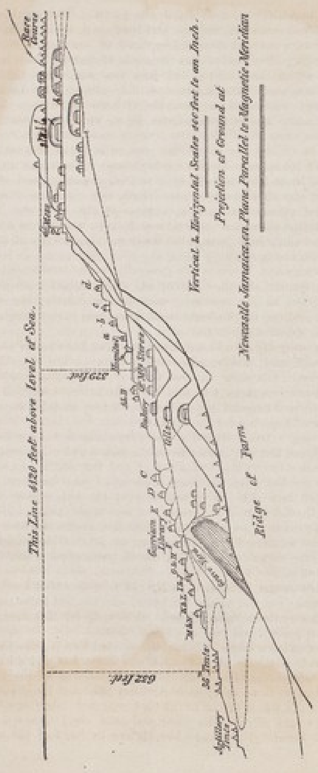
It has been necessary to cut the ground at Newcastle into terraces, to obtain level space sufficient for building. The face of the scarp in these cases (usually composed of a red clay, sometimes embracing a portion of the marl also,) is occasionally left uncovered. Sometimes it is partially covered in, and in others wholly, by a stone retaining wall. The scarp varies from a few feet to twelve or fourteen in height, and there is a passage between the back of the corresponding house and its base, varying from three or four to ten or twelve feet, in different cases.

The houses for the men are of one floor, raised from the ground about two feet on a stone wall, with four ventilating spaces in front and back, and one at the ends, each seventeen inches long and seven inches and a half deep, fitted with open iron gratings, through which there was generally a sufficient draught. The huts are of wood, lined substantially, and closely floored, and open to the ridge inside the roof. They have a door covered with a porch; glass sash windows; and an arrangement in the roof for ventilation, which, if properly attended to, and care taken to admit air below, would always secure a sufficiency of fresh air for the inmates.

The rooms lettered A and B are fifty-three feet long, twenty-six feet broad, ten feet six inches from the floor to the tie beam, and ten feet six inches from that to the ridge; and the roof is hipped at each end. At six feet from the front there was a partition forming a sort of verandah, but with louvre boarding at the upper part, communicating with the rest of the room. There were jalousies in front of these buildings in place of glazed windows, though elsewhere the sash windows were inserted. Allowing for the shape of the roof, the cubic space in these rooms is 16,447 feet in the greater part, and 4074 feet in the verandah.

The other rooms, lettered C to N, are fifty-four feet long, twenty-four feet wide, ten feet to the tie beam, and ten feet from that to the ridge. The roofs are also hipped. Allowing for this arrangement, the cubic space in these rooms is 18,480 feet.

The hospital is a stone building, surrounded by a jalousied verandah, ten feet wide at the front and sides, and seven feet and a half at the back. The main building is divided into three wards, numbered from 1 to 3, from west to east; each is thirty-one feet long, twenty feet wide, fifteen feet four inches to the tie beam, and eight feet nine inches from that to the ridge. The partition walls are of stone, and reach to the tie beam. The space above is open from end to end of the



building, and there is no ceiling to the wards. Each ward has a door, and two sash windows, both in the front and back walls; and over each, a louvre-boarded opening the width of the door or window, and a foot high. The cubic space in each of these wards is 9507 to the tie beam, or 12,219 feet, including that up to the ridge. There is a similar arrangement in the roof of the hospital for ventilation to that already mentioned in connexion with the barracks.

The officers' quarters are of one floor, which is raised from the ground, on walls or pillars, about twenty inches or more, according to the nature of the surface. They are sufficiently commodious, and fitted with glass sash windows everywhere. There are several other buildings about the cantonment for staff-serjeants, and workshops, which are of a similar character. These were for some time occupied by married people during the progress of the sickness. There are also in several places huts of wattle and daub, which were occupied by married people, which have earth floors merely, and are of course not raised from the ground.

The privies and kitchens are generally on the western slope of the hill; the former are all constructed with cesspools, which are not trapped, and at the commencement of the disease they were very offensive. During its progress charcoal was used pretty freely, and their condition was much improved.

The barrack cells are in a substantial stone building about 400 feet to the eastward of the hospital, and 140 feet below it, on the edge of a ravine. They are in two rows, of four each, placed back to back. There is a passage of five feet wide in front of each row, with jalousied windows, and the cells open directly from them. The cells are ten feet long, eight feet wide, and ten feet three inches to the eaves, giving a cubic content of 820 feet. Each has a small opening at the side of the door, near the floor, and a barred opening over the door of the same width, and about three feet high. In the cells to the eastward there is an opening in the roof for ventilation; in those to the westward there is a similar opening, but instead of leading directly from the cell, it opens into the upper part of the passage already mentioned, and of course does not insure the same thorough ventilation as the other. There was no privy attached to the cells, and the prisoners in obeying the calls of nature had to go to a spot in the bottom of the ravine, where a temporary place was erected. The surface drainage passing through this spot carried off the soil completely.

The guard-room was a small wooden building raised from the ground on pillars. It was originally situated over the centre of the space now occupied by the front wall of the church, but was removed from this to the front of A room, about the end of September or first week in October. The trench for the foundation of the church was commenced on the north side on October 8th, and the ground opened all round by the 16th. The ground was not fairly filled in again before the end of October. The soil ([illegible] clay) removed from the trench was employed to raise the surface in front of the new guard-

room. This guard-room was occupied until November 5th, when it was vacated, and the men on guard accommodated in marquees on the parade-ground.

At the commencement of the epidemic this guard furnished one sentry over the guard-room, one at the hospital, one at the quarter-master's store, and one at the canteen. At a later period two others were given for rooms C and E, when these were occupied by sick. There was, besides, a small guard of one corporal and three privates mounted over the cells every night, and which was accommodated in a bell tent close to the cells.

In the early part of June, 1856, two companies of the 36th Regiment were stationed at Up Park Camp, and the European artillery at Port Royal. On June 10th, the former were removed to Stony Hill; and the following day, thirty-five of the latter went to Stony Hill, and thirty-six to Newcastle. Four cases of yellow fever had proved fatal at Port Royal among the artillery between the 12th and 30th of May; and a man of the 36th died from the same disease at camp on May 10th.

In June two officers of the 36th died at Stony Hill of yellow fever —one on the 16th, and the other on the 29th; and about July 20th, fever of the same character began to show itself among the men, and continued during August. As this was attributed to the barrack being out of repair,* sixty-five of the 36th were removed to camp on August 9th, and on the 20th of the same month they left camp for Newcastle.

Fever continuing at Stony Hill, on August 21st, the men of the 36th who were able to proceed were sent to Newcastle, and the artillery to camp; but several cases proving fatal at camp subsequently, they also were moved to Newcastle on September 19th.

The strength of the force at Newcastle during the last six months of the year was:

	Officers, including staff.	N. C. officers, drummers & privates.
July	12	490
August	14	499
September	18	650
October	20	685
November	18	667
December	19	637

These numbers include one serjeant and eight men who were stationed at the Botanic Gardens, a post in a narrow valley six miles from Newcastle, on the road to Kingston, and about 1100 feet above the sea.

On the detachments from Camp and Stony Hill proceeding to Newcastle the troops were somewhat crowded, thirty-six men occupying each room, and the remainder being in tents on the flat space in the immediate vicinity of the rooms.

In consequence of two patients having contracted fever in hospital,

* Recent examination has directed attention to a considerable extent of marshy ground of long standing in the neighbourhood of the buildings at Stony Hill.

the sick (with the exception of yellow fever cases) were removed from that building on September 21st, and accommodated in marquees on the open space in front of it. The building was whitewashed, and the sick re-occupied it on October 14th; but fever again appearing, they were removed on October 23rd to rooms C and D, which were cleared for the purpose.

The first case of yellow fever which was seen at Newcastle in 1856 was that of Private William Green, 36th Regiment. This man had been suffering from chronic catarrh, and went to the Botanic Gardens on January 23rd, for change. He complained of being out of sorts on June 27th, but being sickly, little was thought of it; becoming worse, however, on the 29th he was removed to Newcastle, where he became yellow, had black vomit, and died on July 2nd. He had not had communication with any case of fever previous to his own attack, and had not been away from the post above half a mile at any time. The serjeant and the men at the post remained healthy, both then and throughout the subsequent epidemic at Newcastle.*

On going to the hospital, Private Green was placed in No. 3 ward, in which there were several other patients; the number under treatment at the time was 20. There was no other case for some time.

On August 21st, the detachment from Stony Hill arrived at Newcastle, and the following day two of them, Privates Brown and Griffiths, went to hospital with fever; the former died on August 25th, and the latter on the 27th, both being yellow, and having had black vomit. Another man of this detachment, Private Anderson, went to hospital on the 23rd, and died on the 26th, presenting the same symptoms. On August 24th, another, Private Ross, who arrived from Stony Hill that day, went to hospital, and died on the 28th, with the same symptoms. Private Reuben Smith arrived from Up Park Camp on August 28th, where he had been in hospital under treatment for remittent fever from August 12th to the 27th; as he complained of weakness, he was taken into hospital, though not then placed on the books. On the 31st, fever appeared, while in hospital, and he died on September 7th, with yellowness of the surface, and black vomit. These men were accommodated in No. 2 ward, in which there were several other patients; the total number of sick in hospital at the time increasing from 24 on August 23rd, to 33 on Sept. 7th. These cases may be, perhaps, referred to the low ground; at all events, nothing decided can be said as to where they were produced; the next, however, is more important, and requires special consideration.

Private Henry G. Meloney, 36th Regiment, the next case, arrived from Stony Hill on August 21st, and was accommodated in a tent at the west end of the hospital, and to the north of the orderly-room.

* Dr Bowerbank informed me that there were two cases of yellow fever in this neighbourhood: one on Sept. 16th, which recovered, and the other on Oct. 9th, which proved fatal; both individuals, however, had been away from the locality in the low ground previously.

This was a delicate-looking man; he had been under treatment for fever a day or two before he left Stony Hill, but since his arrival at Newcastle had been employed on the public works, though weak and sickly. He got wet on September 6th, and had a rigor, and he attributed his subsequent illness to that wetting. He was admitted on September 7th, labouring under low fever, which pursued an obscurely remittent form until the night of the 14th. The following day there was a considerable improvement, and in the evening a decided exacerbation, and the tongue then presented for the first time the red tip and sides so common in yellow fever. The fever continued during the 16th, and on the 17th there was pain in the chest (epigastrium), for which a sinapism was applied with relief, and about midday the fever remitted. There was slight fever during the night, and the following day yellowness of the surface was noted, and in the evening vomiting of brownish matters and much prostration. From this period he gradually became weaker, and died on the 19th, at half-past nine p.m. On opening the body, the liver was found large, pale, and friable, and the stomach and intestines contained a large quantity of black vomit.

It is not easy to determine whether this case should be attributed to the low ground, or whether it was the result of exposure at Newcastle. The man had been sick at Stony Hill, but was at work seventeen days at Newcastle before he got wet, and manifested symptoms of fever there—a long period of incubation, but not longer than has been occasionally observed, so that nothing can be satisfactorily deduced from that. The course of the disease was unusual for yellow fever, having gone on from the 6th to the 14th without displaying the character of that disease decidedly. On the 15th, there was either a relapse or an attack of a new fever, which presented the peculiar tongue frequently seen in yellow fever; this remitted on the forenoon of the 17th, and was accompanied by the uneasiness about the præcordia characteristic of this disease; and the following day the yellowness of skin, irritability of stomach, and sinking, and terminated fatally on the 19th. The latter part of the course of the disease was in every respect, therefore, analogous to the ordinary course of yellow fever, and it is difficult to suppose that, had the original attack been of this nature, some of the symptoms it subsequently presented would not then have shown themselves. These speculations are of importance, for if the original attack were remittent fever only, then the subsequent yellow fever must have arisen from causes in operation at Newcastle, and not from poisoning of the system during his residence at Stony Hill; for had that been the case, it would have been brought into action on the first attack on September 6th.

Meloney was treated in No. 2 ward, the same in which Smith, the last man labouring under yellow fever, was, and in the next bed to that in which he was, in the north-west corner of the ward. Smith died at seven A.M., on September 7th, and the body, with the bedding, was removed in half an hour to the dead house; while we have seen that Meloney was actually indisposed the previous day, and he

came to hospital at ten A.M. only. His first attack of fever, therefore, arose independently of the hospital or of its inmates; had contagion been superadded to the first attack, it must be concluded that the form would have been aggravated at once, and it is contrary to all experience to suppose that the disease would have gone on for a week, at the end of that time show the improvement it did, and then, from contagion applied a week before, assume the characters of yellow fever.

The question is, therefore, narrowed to this: if his first attack were yellow fever, it was called into action by his getting wet on the 6th, and the state of the system determining that form of disease may have been contracted either at Stony Hill or at Newcastle, there is no evidence to determine which; if the first attack were merely remittent, the subsequent one must be altogether attributable to causes in operation at Newcastle, and if the reasoning given above be correct, these could not have been connected with specific contagion.

On September 17th and 18th, two men who were in the same ward with Meloney, at its south-east corner, became affected with fever, which assumed the yellow form. These were Privates Joseph Austin and Timothy Wild, both labouring under ophthalmia; the former had been under treatment since April 10th, and the latter since August 30th, and it is believed neither had been away from Newcastle since March. Both had yellow skin and black vomit, and Wild died on the 20th; the other recovered.

These were the first cases of yellow fever in men who had not been away from Newcastle, and they arose under circumstances sufficiently suspicious. From the above details it is clear that they can decide nothing as to the causes of the disease, unless that these, whatever their nature may be, were in operation.

The next cases which occurred, however, are of greater use; these were in Private David Monk, who was engaged on the public works, and lived in the piazza of A room, and Mrs. Bell, who lived in B room, which was occupied by married soldiers and their families. These rooms, as will be seen by the plan, are one hundred feet in front of the hospital, and at a considerably lower level, and are ninety-five distant from each other. Monk, while engaged at the public works, got wet on Saturday, September 20th; on the Sunday he was feverish in his room, and the following morning went to hospital; he died on September 26th, yellow, with black vomit.

Mrs. Bell, an industrious, respectable woman, was attacked on September 22nd, and died on the 25th; yellow, with black vomit. So far as could be ascertained at the time, neither of these had been away from Newcastle since the early part of March. Immediately after their decease inquiries were made to ascertain whether either had had communication with those who were previously sick, or had washed clothes for them, or been in any way exposed to contagion, but no trace could be found of communication, in any way, with the sick, or with each other. The husband of Mrs. Bell was not attacked subsequently.

These cases occurred under circumstances so different from those

preceding them, that many of the doubtful points surrounding the origin of the latter can be eliminated. They do not appear to have been away from Newcastle for months previously, therefore their attacks cannot be attributed to the influence of the low ground. They do not seem to have had any communication with others labouring under the disease, either directly or indirectly, therefore it cannot be attributed to specific contagion; and they lived in different buildings, and do not seem to have had communication with each other, therefore they afford a stronger proof of the cause being in operation at Newcastle, and somewhat diffused.

While these circumstances were taking place, several cases of fever occurred in barracks, but they presented none of the malignity of the yellow fever, and were returned as Febris C. C. Of these, one, Private Walsh, came from A room on September 2nd. This man had been on guard on August 1st. He belonged to the light company, which had not been away from Newcastle for some time previously. The next was Private Smithson, who lived in a tent between the hospital and B room, who went to hospital on September 11th; he came from Stony Hill on August 21st. The next case was from A room on September 14th. The subject of it, Private William Ball, Light Company, had been on guard on the 2nd. Another case occurred on the 15th, in Private Whilehan, in L room. This man was permanently employed on the public works. The next case was that of Private John Sye, who lived in B room, and was employed as regimental policeman. He was attacked on September 17th. The next case was that of Private Fallon, who lived in H room, and who came from Up Park Camp on the 20th August. He was attacked on the 19th September. Another man, Private George Fisher, arrived from Up Park Camp on September 24th, and went to hospital immediately. On September 26th, Serjeant Freeman was admitted from B room. He came from Up Park Camp on August 20th, and had been on guard on September 17th. Another came from L room on September 26th. The subject of it, Private Sturdy, had been on guard the previous day.

Of these men, Walsh, Ball, Whilehan, and Sye were treated in No. 1 ward, and Smithson in No. 2, and all subsequently were placed in marquees outside, when the hospital was evacuated on September 21st. Whilehan had one scruple of quinine and five grains of calomel on the day of admission. Freeman had ten grains of quinine, and Sturdy ten grains of quinine with eight grains of calomel. The others had from nine to fifteen grains of quinine each the second day. In none of these cases were there either yellowness of surface or hæmorrhages of any kind, and they all recovered. They were returned as common continued fever from the first, and nothing arose during their progress to alter this opinion. It seemed proper to introduce them here, not that they have any very important bearing on the case, further than showing that the disposition to fever was, if anything, more remarkable then in the neighbourhood of the hospital and rooms A and B, than anywhere else in the cantonment.

On September 27th, Serjeant Joseph Catton, who was acting as

serjeant-major, and had been drinking very hard for some time, was taken to hospital at six a.m., affected apparently with epilepsy; there was tenderness of epigastrium, with some irritability of stomach, and vomiting of brownish matter resembling incipient black vomit. He died at one p.m., in a fit. On examining the body, the surface was yellowish; the membranes of the brain congested; the mucous membrane of the stomach of a bright scarlet colour, denuded of epithelium around the cardiac orifice, and containing some light brown fluid. The liver had the nutmeg appearance. It may be doubted whether this were a case of yellow fever, but the appearances on dissection agree very closely with those found in that disease. From September 1st he lived in the serjeants' mess-room, a building to the south of B room; his duties as serjeant-major would require him to be moving about much, though they were not likely to have brought him in contact with the sick; but upon this point there is no positive information.

On October 7th, Private Charles Voile went to hospital. In him the disease assumed the form of yellow fever, and he became yellow, and had black stools. He had not been absent from the station for months. He came from B room, the same from which Mrs. Bell, whose case has been alluded to above, lived in, and from the next bed to that occupied by her. This coincidence might be construed into proof of contagion, but it must be received with the qualification that his wife and child, who slept and lived at the same place, and had not had the disease before, as well as many others similarly circumstanced in the same room, were not affected.

On October 10th, Serjeant Bennett, who lived in a tent below B room, near the serjeants' mess, was attacked; he died on the 13th, without being yellow or having any hæmorrhage, but with suppression of urine. His wife, who had not had the disease, was not subsequently attacked. There is no ground to suppose that this man had not had communication with persons labouring under the disease, and therefore by itself it is of no great value in elucidating its causes.

After October 12th, the disease showed itself in several localities, and in a very aggravated form. The first case was that of Private Leather, who had been in the cells, and at hard labour,* since September 17th, by sentence of court-martial. This man was employed on the roads during the day, and locked up when not at work. He was employed under the superintendence of a non-commissioned officer, and his work did not take him near any of the sick with yellow fever, or into the rooms from which they came. He was admitted to hospital on October 12th, and died on the 17th; yellow and black vomit was found in the stomach. Here, then, is a third case which arose under circumstances which, had they been arranged to prove the origin of the disease from local causes, could not have fallen out more remarkably. Further,

* By the court-martial return, Private Leather was confined Sept. 12th for insubordination, tried on the 14th, sentenced to be flogged, but the sentence was commuted to forty-two days' imprisonment with hard labour. The proceedings were approved on the 15th, and, according to the usual custom, the imprisonment would commence on that date, instead of the 17th, as above; but under either view the man was a prisoner from Sept. 12th, either in guard-room or cells.

it indicates that the cells were within the range of the causes of the disease.

On October 13th, Serjeant Price, the hospital serjeant, was seized, and he died on the 15th, under a marked form of the disease. He had lived in a room, officers' quarters, above the hospital, and for three days before his attack, in his own room in the hospital. The same day, Private Hickey, from G room, was attacked. He died on the 16th, yellow, with black vomit. He was on the main guard on October 4th, and had been on pass to the village of Middleton two days before admission, which, from the character of the place and the usual practice there, is equivalent to stating that he had been indulging most freely in various ways. These cases by themselves prove little, for Serjeant Price was in the middle of the causes of disease, if these were local, and exposed to contagion, if that existed; while Hickey, in addition to local exposure, had been dissipating and absent from the locality, though it is not known that he was ever exposed to contagion. Several others were attacked subsequently in G room, who had not been away; and on the other hand, there were many men during the course of the epidemic who had been at Middleton on pass, or absent without leave, who never suffered. It is worthy of remark that a man was admitted from the same room as Hickey, on the 11th, with common continued fever.

The next case may be attributable to the low ground; the facts, however, were these, and upon the whole, they seem to warrant its being referred to Newcastle. Ensign G—— had exchanged from the 36th to the 3rd W. I. Regiment; he left Newcastle on the 13th October for Up Park Camp, to join the latter corps. He was guilty of considerable excess that afternoon, and exposed himself a good deal to the sun; the next morning (the 14th) he reported himself sick at camp, and he died on the 17th, yellow, with black vomit. When Mr. G—— first complained at camp, he said he had felt unwell before leaving Newcastle. He lived in *b* room of the officers' quarters, just above the hospital.

On the 15th October, there were five attacks, of which four were returned as yellow fever, and one as common continued fever. Of these, the first was Private Thomas Wild, who had been under treatment since June 16th, for chronic hepatitis. He was in a tent till October 13th, and in No. 3 ward after that date. He had yellow skin and black vomit, but recovered. The next was Serjeant Charles Kiernan, who came from Stony Hill on August 21st, and lived in the verandah of B room. He went into hospital on October 15th, and died on the 25th, having been yellow and had black vomit. Two artillerymen were admitted; one from M room,—he was on the guard on the cells eleven days previously,—and the other from a tent on the lowest plateau in front of it. These seem to have been slight cases, and both recovered. A man of the 36th was admitted from K room. He had been on main-guard on the 12th. His case was returned common continued fever, and he recovered.

On October 16th there was but one admission from fever, and that

of the common continued form. The subject of it, Private Mills, came from H room. He had been on the main-guard two days previously. On the 17th there were two admissions—one, Captain Oram, from room B. He had come from Stony Hill on August 21st; he died on October 20th, yellow, with black vomit. The other case was of the common continued form, and came from a tent to the west of C room. He recovered.

On the 18th there were two cases of yellow fever; these were Private Gale, who had been under treatment for a sprain in the hospital marquee since the 15th, having previously lived in I room. He had epistaxis, but was not yellow, and recovered. The other was Lieut. Hugo, who lived in C room of the officers' quarters, above the hospital, next house to that which Ensign G—— had occupied. He had walked about twelve miles on October 12th, and got wet, and on returning took a cold bath. He was yellow, and had incipient black vomit, but recovered.

On the 19th there was but one seizure—Private Matthew Caffrey, an hospital orderly, and much employed about the fever patients. He had been employed in the hospital at Newcastle since May 8th, 1856. He died on the 25th, yellow, with black vomit. There was but one case on the 20th—Private Henry Winters, who lived in B room. He was on the cell-guard on the 19th, and had come from Stony Hill on August 21st. He died on the 22nd, yellow, with black vomit. Two of his children, Susanna and Mary Ann, were attacked on the 22nd and 23rd respectively. The former was yellow, the latter not, and neither had hæmorrhage; both recovered. This man's family comprised his wife and two other children, neither of whom had previously had the disease, and were not attacked subsequently, though the mother nursed her sick children. They occupied beds in the married room, opposite that of Mrs. Bell, the first case in this room.

Three cases occurred on the 21st. One of these, Private Thomas Adams, was under treatment in a marquee in front of the hospital, from October 17th, under the head of Dyspepsia. He had been in a tent near A room before reporting himself sick. He arrived at Newcastle from Up Park Camp on August 20th. There was yellowness of surface, but no hæmorrhage, and he recovered. The other case came from A room. The subject, Private Gribbin, had not been absent from Newcastle for months. He died on October 25th, yellow, with black vomit. The third case on the 21st was Private Patrick McDermott, who lived in I room. He was neither yellow nor had hæmorrhage, and recovered.

One case, on the 22nd, has been already alluded to. Another occurred in Private Thomas Gunning, who lived in L room. He had been on the main-guard on Oct. 19th; he had neither yellowness nor hæmorrhage, and recovered.

On the 23rd there were three cases—two of yellow and one of common continued fever. One of the former has been already alluded to in connexion with B room; the other, Mrs. Kehoe, had left that room on October 21st for a tent below M room, from which she came

sick on the 23rd, but is classed as if from B room. She had not been away from Newcastle for months; she had black vomit and hæmorrhage from the mouth, but recovered.

At this time the hospital was evacuated, and the other changes in the distribution of the men were made which have been already mentioned. The disease has been traced thus far day by day to show the succession of the cases; but in describing its subsequent progress, it will be better to follow it in each locality where it appeared.

To commence with the race-course. The men from A and C rooms were sent here from October 21st to 25th. One case of yellow fever had occurred in A room on September 21st, and another on October 21st, and none had as yet appeared in men residing in C room. On the 26th one case of fever occurred, which was returned as common continued fever, and recovered.

On the 27th a case was reported as yellow fever, and another on the 28th, which terminated fatally on November 1st; neither of these had yellowness or black vomit. On the 30th there was another case, which terminated fatally on November 4th, with yellowness and black vomit. All these men had lived in A room before coming to the race-course, and the period which elapsed from their leaving it to the attack was quite within the period of incubation, and in these the disease may be fairly referred back to the influences they were subject to in that room. They carried their bedding with them, and that of the men attacked was not exchanged, yet the disease disappeared almost immediately, and it did not affect men from C room, where hitherto it had not appeared.

On November 2nd a case occurred at this locality in a man who had attended Lieutenant Hugo (who had yellow fever on October 18th) until a few days previously; his case, however, was considered more fright than fever, and he never presented a serious symptom. From the beginning of November there was no case among the people here until the 28th, when a case of common continued fever, of a trivial nature, occurred, which terminated favourably. On December 7th one case of yellow fever was brought here from below, which terminated fatally; and another occurred a few days afterwards, but without the disease affecting any one else; these will be noticed hereafter.

The cases of two officers, Ensign G—— and Lieut. Hugo, have already been alluded to. Subsequent to them a female servant of an artillery officer was attacked; she resided in *c* room, the second below the mess-room. She had been at Port Royal on November 22nd, and on returning that day got wet. She was seized on the 26th; there is no reason to suppose she had been in communication with sick.

On the 28th Lieutenant Stuart was attacked; he had been at Kingston on November 21st and got wet, and did not change his clothes; he resided in *d* room under the race-course, the first to the north of the stable, but had his office in *a* room, next above the hospital. Lieutenant Stuart was yellow, but had no hæmorrhage, and recovered.

Staff Assistant-Surgeon Gordon was attacked the same day as

Lieutenant Stuart, and had yellow surface and black vomit, and died on December 7th. This officer arrived from England on November 14th, having never been in the tropics before; he went to Newcastle on the 19th, and had diarrhœa on the 24th and following days, and fever on the 28th; he resided in *b* room, above the hospital, the same in which Mr. G. was. Both these officers were among the sick, and Mr. Gordon, the morning before he was seized, had been present at a post-mortem examination of a man who died of dysentery, but in whose stomach black vomit was found.

Lieutenant Le Gallais, R.E., is the last case among the officers, and it is doubtful whether in him the disease be attributable to Newcastle or the low ground; he lived in *f* room, the first below the mess-room. On December 2nd he fatigued himself in the valley between Newcastle and the farm, passing through the bush in search of a place for ball practice. He took a cold bath on returning home. On the 3rd or 4th he went to Spanish Town, felt unwell on the 6th, but stated he had not been quite right since the 2nd; had a rigor on the 7th, followed by fever, and died on the 11th; yellow, with black vomit.

Though these cases may be referred to other localities than Newcastle, yet it is a significant fact that all of them occurred in persons who either lived, or passed a portion of their time, in the houses on the ridge between the mess-room and hospital. Seven of these houses were occupied by Europeans, and persons in four of them suffered, while officers in other parts of the cantonment escaped, though they were as much in contact with the sick, or absent from Newcastle, as those who were attacked.

Proceeding downwards, along the cantonment, the next locality which exhibited fever was the hospital. Its course in this building has been traced to the 23rd, the day when the sick were removed to rooms C and D, but as several cases occurred in these rooms, within a few days after the removal, which were in all probability referrible to influences in operation at the hospital, it is as well to consider them here.

The first case which occurred after the sick were removed was that of Private R. Box, who had been employed as hospital orderly since September 16th, and who was much in contact with those sick with fever. He was attacked on October 24th, and died on the 30th; yellow, with black vomit. The next attacked was Private S. Sharpley, who had been under treatment since April 9th, for stricture of the urethra; he exhibited symptoms of fever on the 25th, and died on October 30th, with incipient black vomit. Private John Fieldhouse was the next case; he had been on the main-guard on October 18th, and lived in N room; he was in the hospital for a few hours on the 23rd, labouring under acute rheumatism; the complaint took the form of yellow fever on October 28th, and he died on the 31st; yellow, with black vomit. The next case was in Private John Draine, who had been in hospital from October 13th, with delirium tremens; he was attacked on the 29th, but recovered. Private John Wilson, the next case, had been in hospital from September 10th,

affected with ophthalmia; he was attacked on November 9th; he also recovered. The last two cases did not exhibit either yellowness of surface, or hæmorrhage of any kind. These men had all been in the hospital before it was evacuated, and, with the exception of Box, they were all in C room, until the fever declared itself, when they were removed with their bedding to D room, which was employed as the fever ward. The only other case in the hospital was that of Private Joseph Needham, who was admitted from the race-course on November 18th, under the head of dyspepsia, which, on the 22nd, was changed to dysentery; he sank rapidly on the 26th, and died; on examining the body, black vomit was found in the stomach, and ulceration in the colon. He had attended a man sick with yellow fever on August 28th. Needham was treated in E room, among the men convalescent from fever.

It is to be here observed, that though there were a considerable number of men under treatment at this time, none but Needham was attacked with yellow fever, who had not been in the hospital previous to October 24th, where it was then prevailing; and it is further to be remarked, that while occupied by the troops, no case of fever had come from either C, D, or E rooms. From the latter fact it is clear that, up to the date of removal of the troops, the causes of fever were not operating in these rooms with any intensity; and subsequently, when many cases were introduced from other places, they did not affect the hospital attendants, or spread beyond the men who had been exposed to those in operation at the hospital.

After the hospital come the tents, huts, and buildings, near A room, which are mostly situated between it and the abrupt edge of the ridge. The case of Private Smithson, who was in one of these tents, has been already noticed. The next which showed itself here was that of Private Patrick Hart, a tailor, who worked and lived in a tent at the south end of the tailors' shop; he was attacked on October 25th, and died on the 31st; yellow, with profuse hæmorrhage from the bowels. The next case there was Mrs. Lindup, who had been in B room until October 21st, and since then in the shoemakers' shop, which is under the same roof with the tailors'; she was attacked on the 28th, had neither yellowness nor hæmorrhage, and recovered. A boy, named Thomas Moore, who lived in the southernmost of the two huts at this point, was attacked on November 3rd; and another, Frederick Davis, who lived in the south end of the barrack store, on the 6th; both these cases were returned as common continued fever, and presented neither yellow surface nor hæmorrhage, but as both had large doses of quinine at first, it is possible the progress of the disease was checked before it arrived at that point.

On 4th November, a rainy and stormy period commenced, which lasted ten days, materially checking the onward progress of the fever. In the beginning of December, however, cases again appeared at different points, and nearly simultaneously.

The first case in this neighbourhood, in December, was that of Edward Bradish, the son of a serjeant, who, with his mother, lived in

the hut next to that in which the boy Moore was attacked. Bradish was reported sick on December 6th. On the 7th, he was removed to the race-course with his mother; the following morning she washed him and put on a clean shirt, shortly after which he threw up a quantity of black vomit, and soon expired; he was yellow. The next case in this locality was that of Serjeant-Major Wildbore, who resided in the north half of the staff-serjeants' quarters; he had been living very hard; he was attacked on the 7th, and died on December 12th; yellow, and with black vomit. Mrs. Bradish, the mother of the boy mentioned above, was attacked at the race-course on December 14th; she was yellow, and had hæmorrhage from the gums, but recovered. Her case can be referred with more propriety to this point than to the race-course, where she was when actually attacked. No cases occurred among the persons on the race-course subsequent to the introduction of these two, though there were then many persons there who had not undergone the disease.

The cases in A and B rooms have been already traced up to the time when these were evacuated, and their inmates distributed elsewhere. The next locality to be considered is that including the quartermaster's store, the cells, and bakery, which are situated round the top of a ravine to the east of the hospital, and under the range of officers' quarters, where the disease showed itself. The case of Private Leather, which occurred on October 12th, has been already noticed. The next was that of Private Michael McDonald, who was confined in the cells on October 25th, drunk; he had previously been in I room. He was admitted to hospital on the 26th, under the denomination of common continued fever, and was discharged on November 1st, the case not having any symptom of malignity. Private Marriott, a shoemaker, was the next case; he slept in G room from the middle of September, but wrought in a tent at the north end of the quartermaster's store from August 21st; it is therefore impossible to say with certainty to which place his case is referrible, as fever was common in both, though it seems more likely to be attributable to this one. Marriott was attacked on October 28th, and died on November 1st; yellow, with black vomit. On October 29th, Serjeant McGarry, provost-serjeant, reported himself sick; he had resided in the verandah of A room till the 25th, he then slept two nights in the cell in which Private Leather had been when attacked, and afterwards, two nights in a tent on the flat to the east of the cells; he died on November 1st; yellow, with black vomit. Private Lawrence Gordon was attacked the same day as Serjeant McGarry. Gordon had been absent at Middleton on the 19th and 20th, was in the guard-room from the 21st to the 25th, and in the cells from the 25th to the 29th; he died on November 3rd; yellow, with black vomit. The next case was Private Littlewood, a shoemaker, who since August lived and wrought in a marquee close to the quartermaster's store; he was reported sick on October 30th, and died the following day; yellow, with black vomit.

Robert Hines, a sickly child, who resided with his family in the

hut to the northward of the quartermaster's store, was the next case; he was attacked on November 3rd, became yellow, but had no hæmorrhage, and recovered. Private Woods, who had been absent without leave on November 4th, and was sent to the cells on the 6th, was the next case; he was attacked on the 8th, became yellow, but had no hæmorrhage, and recovered.

Here, as among the tents and huts at the opposite side of the hill, the disease now ceased for nearly a month, but reappeared on December 4th. The first case was Private James Warren, a bandsman, who had been in the cells for drunkenness and insubordination seven days previous to his attack; and he had previously been in a marquee occupied by the band, below N room; he was yellow, had black vomit, and died on December 8th. Private Edward Jones was next attacked in this neighbourhood; he was employed in the garrison bakery, and had slept there from September 3rd; he was attacked on December 11th, became yellow, had black vomit, and died on the 14th. The next case in this locality was that of Gunner Joseph Hownsome, Royal Artillery, who was attacked on the 11th; he was confined in the cells the previous day, for absence without leave and returning drunk; he was yellow, but had no hæmorrhage, and recovered. The last case referrible to this neighbourhood was that of Private Richard Eckworth, who was employed in the garrison bakery, and slept there until within five nights of his attack, and afterwards in G room; he was reported sick on December 21st, and died on the 23rd; yellow and black vomit was found in his stomach. There is reason to believe that this man had been feverish for some days before he went to hospital.

It has been remarked above, that no cases of fever occurred in C, D, or E rooms, while occupied by the troops. A case, which was returned as common continued fever, appeared on the 17th, in a corporal who lived in a hut to the westward of C room, and on the brow of the slope; but neither his wife nor son was affected. The hospital cook, who cooked in an open shed at the back of the kitchen, near D room, and also on the brow of the slope, was affected with common continued fever from October 25th. Neither case showed any symptoms of malignancy, and both recovered.

The garrison school and library come between E and F rooms. No case arose there; but in a hut to the westward, and at a somewhat lower level, a girl, Margaret Jackson, was attacked on November 6th; the case was returned common fever, it displayed no malignancy, and she recovered. The family consisted of the father, mother, and two other children, none of whom were subsequently affected.

In F room, below the garrison library, there was but one case of fever during the whole course of the disease; it occurred on October 23rd, was returned common continued fever, displayed no feature of malignancy, and recovered.

From C to F room the ridge is so narrow, that there is space for one room only on each terrace; below F, however, it spreads out a little, and admits of two rooms on each, placed end to end. The

rooms on the first terrace below F are G and H; the fall being rather abrupt, the scarp behind these is faced with a retaining wall of stone and lime, which is about eight feet behind the back wall of these rooms, and reaches as high as their eaves. This wall has five rows of holes in it for drainage. Immediately to the west of G room a gully commences, which is eaten deeply into the clay soil; and, ninety feet N.W., and on the same level, there is a privy with a cesspool, which is occasionally offensive. There is now a small building to the west of G room—a washhouse, but it was erected after the commencement of the fever, and not used during its progress. The position of the gully above noticed is such that the ascending current of air through it, caused by the sun's heat during the day, is thrown on the end of G room, and into the space between the back walls of it and H and the high retaining wall behind them, circumstances to be borne in mind.

In G room, during the course of the epidemic, there were two cases returned as common continued fever, and six as yellow fever; of the latter, four died. There were, besides, the cases of Marriott and Eckworth, previously mentioned, which might be referred to this room, though the evidence is on the whole stronger for their being placed as they have been above. In H room there were two cases classed as common fever, and three as yellow, two of which were fatal. In I room, in front of G, there were four cases returned yellow fever, but only one death; and in J room, at the end of I, there was not an attack of fever during the course of the epidemic.

The cases of Rowlands, on October 11th, and Hickey, on the 13th, from G room, have been already noticed. The next was Private Wright, who was reported on October 26th, had yellow skin and black vomit, and died on the 28th. This man did not appear to have been on guard since September 28th, nor absent from Newcastle for some considerable time before. After Wright, Private Price was affected on November 4th, had yellowness of surface and black vomit, and died on the 8th; he had been employed on the public works until two days before his seizure. On November 8th there were two attacks in this room; one, Serjeant Aren, was on guard on the 6th, and was out the whole night, in consequence of the guard-tent blowing down during a storm; he became yellow, but had no hæmorrhage. The other, Private Ryan, attended yellow fever cases on October 25th, in hospital, and on November 3rd was confined in the guard-room for absence without leave. Both recovered.

Here, as in the neighbourhood of the hospital, the disease now ceased for a time. On November 11th, as mentioned above, the men from F, G, and H rooms went to the farm, taking their bedding with them, and were succeeded by others from the other rooms. On December 3rd, a case of yellow fever made its appearance among the new men; the subject of it, Private Hearsey, had been employed on wood-cutting fatigue for the week previous to his attack, but had not been away from Newcastle, or the high ground behind it; he died on the 7th; yellow, with black vomit. On December 13th there was a

case of common fever in Private Noonan; this man had attended fever cases in hospital on November 4th, and been on guard three days previous to his attack; there was nothing malignant in his case, and he recovered.

In H room, the cases of Fallon and Mills, on September 19th and October 16th respectively, have been already referred to. The next case of fever from this room was Private Joseph White; he had been on the cell-guard on October 27th, and was attacked on the 30th. He became yellow, and had hæmorrhage from the gums, but recovered. Whether in this case the disease should be attributed to the exposure on guard at the cells, or to causes operating in H room, there is no means of discovering. The next case was that of Private Edmund Butler; he was attacked on November 4th, and died on the 12th; yellow, with black vomit. He had attended fever cases in hospital on October 21st, and was on escort duty as far as the Gardens on the day he was attacked. Serjeant Brough was the last case in this room; he was on the main-guard on the 6th, when the guard tent was blown down, and the men of the guard exposed to the rain. He had to be relieved in the evening, and was sent to hospital at once; he died on the 8th, having become yellow, and having had black vomit.

In I room there were but four cases of fever during the epidemic. These were returned yellow fever, but none of them were either yellow, or had black vomit. One of these, Private McDermott, has been already noticed. The next was Private Lucas, who had been on the main-guard on November 2nd, and employed on wood-cutting fatigue on the 8th. He came to hospital on November 8th, and recovered. In this room, as in the several localities mentioned, the disease ceased from this date until December 3rd, when John Bergen, a drummer, was attacked; he recovered. On December 9th, Private John Rostron was attacked; he was a stone-cutter employed on the public works, and got wet on the 8th; he died on the 15th. This was the last case in this room. Neither of these men had hæmorrhage, or became yellow.

In J room, as already stated, there was no case of fever of any description during the continuance of the epidemic.

In K room there were four cases, three of which were returned as common continued fever, and one only as yellow fever. There was no death. The first case, that of Private Poole, who came under treatment on September 15th, has been already noticed. The next was Private David Bell (not the same whose wife died), who was returned as being affected with yellow fever; he was seized on November 9th, and had neither yellowness of surface nor hæmorrhage, and recovered in a few days; he was employed on the public works. As in other rooms, there were no fresh cases in this from November 9th, for upwards of a month. On December 26th and 29th, two cases of common continued fever showed themselves, but neither displayed any trace of malignancy, and with them the disease terminated here.

In L room, at the end of K, there were in all six cases of fever,

and but one death. The two first were ordinary fever; they occurred in September, and have been already referred to. A case of yellow fever, Private Gunning, on October 22nd, has elsewhere been noticed. On the 25th, another man, Private William Price, was attacked; he had been on the main-guard on October 16th, and had cooked for his company in a kitchen on the brow of the slope, to the west of M room, for five days before admission; he had epistaxis, but was neither yellow, nor had any other hæmorrhage; he recovered. Private S. Beard was the next case; he had been on the main-guard on October 25th, reported himself on November 3rd, and died on the 5th; yellow, with black vomit. On November 8th, Private Pemblett was attacked, he had attended fever cases on October 30th; he had yellowness of conjunctivæ, and hæmorrhage from the gums, but recovered. With Pemblett the disease ceased in this room.

M room, on the terrace below K and L, was occupied by the artillery, and they had besides a number of men in tents on the lowest of the three plateaus, below this room. Two cases of fever were admitted on October 15th. One from this room, and the other from one of the tents; from this date until December 17th, there was no other case of fever among them. On that day Bombadier Lee, who lived in M, and had been on the cell-guard on December 12th, was seized; and on the 22nd another case came from one of the tents, who had been on the main-guard on December 8th; both were returned common fever, neither displayed any malignancy, and both recovered.

In N room, at the end of M, there were three cases of fever. The first, Serjeant Matthews, was employed on the public works. He was attacked on November 2nd. The next, Private Johnson, was attacked on the 9th. He had been on the main-guard on the 6th, during the storm. Neither of these displayed symptoms of malignancy, though classed as yellow fever. The next and last case, however, did. This was Private Leadom. He had been on the main-guard on Nov. 15th, and was attacked on the 21st, became yellow, and had black vomit, and died on the 25th.

Immediately below M and N rooms, the road makes a sharp turn in front of them, and below this there are three terraces, which were occupied by tents during the greater part of the epidemic. On the east end of the upper terrace, a marquee was placed; immediately in front of it, on the centre terrace, and about eight or nine feet lower, another marquee was pitched; to the right of this was a hut of wattle and daub, and to the right of that a number of bell-tents. On the other terrace, at a considerably lower level, were the artillery tents. The position of them will be easily understood by referring to the plan.

On October 29th, the band of the 36th, which up to that time had occupied E room, and had not had a single case of fever, were removed to the two marquees above noticed. The ground was somewhat uneven, and the men levelled it by cutting down a portion of the neighbouring

clay-bank, and filling up the irregularities. They also cut trenches around the tents, to carry off the water. While doing so, they reached some decaying thatch, a little under the surface, which gave out a very disagreeable odour, lasting for some time. After these occurrences, the first case of fever showed itself in this locality in Private Boyle. He lived in one of the tents to the west of the hut, on the centre terrace. He had been on the main-guard on October 28th, and had been drinking hard. He was attacked on November 2nd, and died on the 8th; yellow, with black vomit.

The next case was that of Private Tuer, of the band, who resided in the upper marquee. He was reported on the 4th, but seems to have been complaining a day or two before, and died on November 6th; yellow, with black vomit. Private Hogan, also of the band, was the next case. He was in the lower marquee. He was reported on the 7th, and died on the 10th; yellow, with black vomit. Private Dove, also of the band, though employed as clerk in the orderly room, was seized on the 7th likewise. He resided in the upper marquee. He was yellow, but had no hæmorrhage, and recovered. Private McCulloch was seized on the 9th. He had been on the main-guard on the 6th, and got wet. In him there was no symptom of malignancy, and he recovered. He lived in one of the tents to the west of the hut.

From November 9th, fever ceased here, as in the other parts of the cantonment, until December 5th, when Private Duff, a bandsman, who lived in one of the marquees, was attacked with ordinary fever, displaying no symptom of the more severe form of the disease. He recovered. On December 6th, the band was removed from this locality, and encamped at the farm along with the other troops there, and one of them, Private Connors, who had resided in the lower marquee, was attacked on the 9th, and died on the 10th; yellow, with black vomit. This man had been drinking very hard for some time, and the previous evening had attended the funeral of Assistant-Surgeon Gordon. Connors' case may possibly have arisen at the farm, but it seems more probable that it was connected with this position.

There were two cases in huts to the east of the cantonment, some way down the slope. These are situated near the top of a gully, but a little to one side of it. The first case from these huts was Serjeant Lane, who lived in the centre hut of those nearest the barracks. He was attacked on November 6th, and died on the 8th; yellow, with black vomit. He had been on the main-guard on October 28th. No other case occurred in this locality until December 3rd, when a woman (Mrs. Holmes) who lived in the hut nearest the farm was attacked. She had yellow surface and black vomit, but recovered. This woman had been in Kingston on the 24th November, and walked back, carrying a large parcel. Mrs. Holmes managed the washing for the hospital, and the personal clothing of the patients sick with fever was sent to her, and washed by black women in the neighbouring brook. On questioning this person as to whether she had counted the foul linen or had it in her house, she stoutly denied both, and stated that she always

sent her eldest son (who had never had yellow fever) for it to the hospital, and made him count the articles out to the women who washed them, outside the enclosure, around the hut.* The family in the hut, besides Mrs. Holmes, consisted of the father and three children, none of whom had previously had the disease, and none of whom were subsequently attacked.

On November 11th, two companies which had occupied E, F, G, and H rooms, and several tents, were sent to the farm, a small ridge running off to the southward from the high ground, and nearly parallel to that on which the soldiers' barracks are placed, but lower, and separated from it by a winding ravine. Its position will be readily understood by inspecting the plan. These companies took their bedding with them from the rooms they had occupied before they moved.

The first case of fever which occurred here was on November 22nd; it was returned as common fever, displayed no symptom of malignancy, and recovered. Here, as elsewhere, the operation of the causes of fever seems to have been suspended or modified in some way, until the first week of December, when another case of common fever presented itself on the 6th. On the 11th, another case was reported, which was returned yellow fever. The patient, Private McGowan, became yellow, but had no hæmorrhage. The same day another case, also denominated yellow fever, in Private Field, was reported. He was neither yellow, nor had any hæmorrhage; he had been drinking very hard for some time before he was attacked. The last case, Private McDougal, was attacked on December 14th. He had been absent at Kingston without leave to December 3rd. His case was ordinary fever, and there was no symptom of malignancy in it. All these cases recovered.

During the progress of the epidemic, men were sent from barracks to attend those sick of fever, in addition to the regular orderlies. These men went on duty about ten A.M., and remained in attendance on the fever cases in the fever ward, rendering them all the assistance they required, until the following day at the same hour. There were 156 men so employed; of these, forty-six were on similar duty a second time, seven a third time, and one a fourth time. Three of these men had had common continued fever shortly before they were so employed, and one yellow fever. Some of them may have had yellow fever before, but from all that could be learned, very few only were ever affected with this disease. During the epidemic, only eight of these fatigue-men were affected subsequent to being engaged near those sick with fever. They were as follows:—

* Such is the statement Mrs. Holmes made to me, but I do not believe it; for on asking her the reason for adopting the precaution of keeping the soiled linen outside, she said she was afraid of infection; but on being asked why, if she feared that, she exposed her son to it, she could not give any satisfactory explanation. That the boy was much employed in the manner stated there is no doubt, but I question whether he was exclusively so.

Names.	Last attendance on fever cases terminated.	Date of attack.	No. of days elapsed between attendance and attack.	Forms of disease.	Room.
J. Needham	Aug. 29	Died Nov. 26	92 (died)	Dysentery, with black vomit in stomach	Died in E room; came from race-course.
Edm. Butler	Oct. 22	Attacked Nov. 4	13 (died)	Feb. ictero-des	H.
Jas. Pemblett	Oct. 31	" Nov. 8	8	Ditto	L.
Patrick Ryan	Nov. 2	" Nov. 8	6	Ditto	G.
George Lucas	Nov. 3	" Nov. 8	5	Ditto	I.
Jos. Hearsey	Nov. 10	" Dec. 3	23 (died)	Ditto	G.
Mic. Noonan	Nov. 5	" Dec. 13	38	Feb. e. e.	G.
Jas. Higgins	Nov. 30	" Dec. 26	26	Ditto	K.

Taking these cases as they stand, the period which elapsed between the exposure and seizure, in the first ninety-two days, was far beyond that in which contagion usually operates. The man came to hospital with dysentery on November 21st, and died on the 26th, having black vomit on the stomach, and he was never in D room, which was the fever ward, but was treated in E room, which was used as a convalescent ward for fever cases, and in which there were none who were not convalescent at the time, and moving about. Under these circumstances, it does not seem reasonable to refer the supervention of symptoms of yellow fever on those of dysentery to the action of specific contagion after his admission to hospital.

In the second case in the above list (Private Butler), thirteen days elapsed between the last exposure in the fever wards and the attack, a period not incompatible with the action of specific contagion, were it existing. The subject of this case came from H room, and on referring to the list of attacks in that room, it will be seen that another man there was attacked on the 30th October, five days before Butler, though it cannot be positively asserted whether he got the disease in the room, or from exposure on guard at the cells, and another man was attacked two days after Butler, the immediate exciting cause being exposure to rain, on guard, the same day. Butler had been on escort duty as far as the Gardens, on the morning of the day on which he was attacked. This man, therefore, had been exposed to specific contagion if it existed, and likewise to the action of the causes of disease in operation in the hospital before it was removed, within a sufficiently recent period; he was exposed also to the causes of disease in and around H room, and to the air of the lower ground; but the men who were attacked on the 30th October and 6th November in the same room, were exposed to neither the first nor last, so far as can be ascertained. The weight of this evidence, therefore, is in favour of some local cause.

The third case in the list is that of Pemblett, who contracted fever eight days after having attended sick. He came from L room, and was attacked on November 8th. In this room, too, cases had preceded Pemblett's, in men who had not been in contact with sick, or away from Newcastle, though they had been exposed on guard or otherwise

within a short period of their attack, and it is unreasonable to conclude that his attack could have proceeded from contagion, while there is no ground for assuming that those who preceded him arose in this way.

The next of these cases was that of Private Patrick Ryan, who became sick on November 8th, having been in contact with fever cases last on the 2nd. This man lived in G room, from which several fatal, distinct cases of yellow fever had come within the preceding four weeks, none of whom had attended fever cases or been particularly exposed to them. Ryan was confined in the guard-room on November 3rd, it is believed for absence and drunkenness. His case did not present any of the more characteristic symptoms of yellow fever, and he recovered. In the face of such evidence, no one can attribute this case to personal communication with the sick.

The next of these cases, that of Private G. Lucas—the last exposure was on November 3rd, and he was attacked on the 8th. This man lived in I room; he was neither yellow nor had any hæmorrhage, and recovered. He had been employed on wood-cutting fatigue on the day of admission, an employment involving considerable exertion and exposure. A similar case had occurred in the same room, on October 21st, in a man who had not been in attendance on sick; and two others occurred subsequently; so that here, as elsewhere, the attendance on fever cases seems to have been the accidental circumstance, and not the essential one in the production of the disease.

The case of Private Hearsey is the next. This man lived in G room, where, as already stated, there had previously been much fever. His last exposure in attendance on fever cases was on November 10th, and he was attacked on December 3rd, the interval being twenty-three days. This man died on December 18th; yellow, with black vomit. He had been on wood-cutting fatigue for the week previous to his attack, and was therefore undergoing considerable exertion and exposure. The date of the attack, too, is the same as that on which several other cases occurred in other parts of the cantonment, who had never attended fever cases, nor, so far as is known, were exposed to contagion. Here, again, it is not only impossible to refer to contagion as the cause of the disease, but the whole weight of the evidence is against that view of the case.

The next of these men who attended fever cases who were attacked was Private Noonan, who resided in the same room with Hearsey. Noonan's last exposure in the fever wards was on November 5th, and he became sick on December 13th, or thirty-eight days after exposure in this way. Noonan had been on the main-guard on December 10th. This case did not present any trace of malignancy, and he recovered.

The last of these men who was attacked was Private James Higgins. This man lived in K room, and was in attendance in the fever wards to the morning of November 30th; he became sick on December 26th, twenty-six days after the exposure; his case was returned Febris C. C., and presented no trace of yellow fever: he recovered. Higgins was employed on the public works previous to his attack.

These facts have a very important bearing on the question of the propagation of the fever. They show that out of 156 men, taken indiscriminately from the different rooms, very few of whom could have had yellow fever before, and who afford 210 instances of exposure for twenty-four hours to the emanations from the sick in the fever wards, that only 8 were subsequently affected with fever of any sort, of whom 3 died; while, from the remainder of the troops in the cantonment, amounting, at the commencement of the epidemic, to 523, there were 89 attacked with fever, of whom 38 died. Putting those numbers into the form of a centesimal ratio for the sake of comparison, they stand:

	Total strength.	Attacked per cent.	Died per cent.	Died per cent. of attacked.
Men *who attended* fever cases ...	156 ...	5·1 ...	1·9 ...	38
Men who *did not attend* fever ...	523 ...	17·0 ...	7·3 ...	43

These numbers most fully warrant the conclusion that exposure to the effluvia from the sick was not an active cause in propagating the yellow fever at Newcastle in 1856; and if it be considered that of the eight men who attended on sick and were subsequently themselves attacked, four presented none of the prominent characters of yellow fever, while of the four who did, three came from rooms in which persons had previously been attacked with decided yellow fever, without communication with sick, so far as is known, there is no alternative but to limit the conclusion in these cases still more, by excluding the operation of specific contagion altogether.

The following conclusions seem fairly deducible from the preceding details. To render them clearer, the principal facts have been appended:

1st. That yellow fever prevailed at Newcastle, in 1856, in well-defined zones, alternating with others which presented a much smaller amount, and, for the most part, a different form of fever, attended with a much smaller mortality. These zones embrace:

	Cases.	Deaths.
A. Officers' quarters above mess-room and race-course encampment (including last two cases at race-course, the others being referrible to A room)	2 ...	0
B. The buildings between the mess-room and parade-ground, including officers' quarters, hospital, A and B rooms, bakery, cells, and all tents and huts in the neighbourhood (excluding first six cases in hospital as referrible to low ground, and the last as indeterminate)	60* ...	31*
C. Rooms C to F inclusive	4 ...	0
D. Rooms G and H inclusive	13 ...	6
E. Rooms I to N inclusive	19 ...	3
F. Tents on two upper plateaus below M and N	7 ...	4
G. Artillery tents on lowest plateau	2 ...	0
H. Huts near graveyard	2 ...	1
I. Farm encampment	5 ...	0

* If the cases which occurred in the officers' quarters be set aside, as of doubtful origin, these numbers will be, cases 54, deaths 28, presenting exactly the same characters for a more limited locality.

In consequence of the frequent changes which took place, it would be very difficult to ascertain the mean number exposed in these localities; and the persons being exposed at different periods of the epidemic, the resulting ratios of attacks and deaths would not be strictly comparable. The rooms from F to N, however, were occupied during the whole course of the disease by soldiers, and as each room contained on the average thirty-four men, the comparative progress of the fever in these may be determined with tolerable accuracy.

Rooms.	Strength.	Attacks.	Deaths.	Per-centage of strength Attacked.	Per-centage of strength Dead.	Per-centage of deaths on attacks.
F	34 ...	1 ...	0 ...	3·0 ...	0·0 ...	0·0
G and H ...	68 ...	13 ...	6 ...	19·1 ...	8·9 ...	46·1
I to N ...	204 ...	19 ...	3 ...	9·3 ...	1·5 ...	15·8

These ratios show conclusively that the causes of fever operated with much greater intensity in some localities than in others, and that these unhealthy spots were distinctly circumscribed. It is questionable how far the three deaths in the rooms from I to N were due to these localities, one of the men having been permanently engaged on the public works, and the other two having been on the main-guard (which brought them into an unhealthy locality), one nine days and the other six days, before his attack; were these cases produced by exposure on guard, the healthiness of these rooms would appear still greater.

2nd. That bodies of men moving from an unhealthy to a healthy locality soon lost the disease, though they carried most of their bedding and their clothing with them; and, in the healthy spots, did not communicate the disease to others who were from other healthy spots.

The light company moved from A and C rooms to the race-course, about October 24th; four of them, from A room, were attacked up to the 30th (one of them decided yellow fever), but no man from C room was attacked. On December 7th, a woman and child were removed from near A room to the race-course; the child had decided yellow fever, and a week after the woman was attacked, but the disease stopped with them.

After the removal of the hospital to C and D rooms, no patient except Needham, or permanent hospital attendant except the cook, who had not been in the regular hospital, was attacked with fever. Previous to this removal, and immediately after it, several hospital attendants and patients suffered from the disease in its most aggravated form, but all had been exposed to the morbific influences in the first situation.

The married people and their families were removed from B room on October 21st, and distributed in various places. Three cases occurred within the next two days, but then the disease ceased among them, except in one woman, who went to the shoemakers' shop to reside—itself an unhealthy locality.

On November 11th, two companies were removed from F, G, and H rooms to the farm, and carried most of their bedding with them, yet the aggravated form of fever did not continue among them.

3rd. Persons going from healthy to unhealthy localities to reside, caught the disease.

The Band removed from E room (where they had been quite healthy) on October 29th, to the upper two plateaus below M and N rooms, where fever appeared among them; and there are many instances in which people went to the cells, or went to the hospital, from healthy localities detailed above, in which they were soon after affected with the disease in an aggravated form. An argument will undoubtedly be advanced here by some, that the Band having occupied E room previous to removal, were within reach of the contagion from D room, then the fever ward. This is met by the fact that the first case in this locality was that of Private Boyle, who lived here before the arrival of the Band, and did not belong to it, and had not been near the sick, so far as is known. Boyle came sick on November 2nd, and Tuer, the first of the Band, on the 4th, though he seems to have been unwell a day or two before. Both died of decided yellow fever. The fact stated above, too, of those who actually attended the sick suffering much less than those who did not, is adverse to the idea of the Band having been affected by contagion previous to removal.

After the removal of the men from F, G, and H rooms, on November 11th, F and G were occupied by men who, up to that time, had been in I and F rooms; and fever appeared among those in G in December.

4th. The activity of the causes of the fever seems to have been much diminished by a course of wet weather commencing on November 4th, accompanied by a severe storm, and heavy rain on the 6th and 7th; and yellow fever disappeared after December 21st, on the accession of strong cool northerly winds.

The admissions from fever of every description in November and December were as follows:

November 2nd	3	December 3rd	3
,, 3rd	3	,, 4th	1
,, 4th	3	,, 5th	1
,, 5th	0	,, 6th	2
,, 6th	4	,, 7th	2
,, 7th	2	,, 9th	2
,, 8th	5	,, 11th	4
,, 9th	4	,, 13th	1
,, 10th to 20th	none	,, 14th	2
,, 21st	1	,, 17th	1
,, 22nd	1	,, 21st	1*
,, 26th	2	,, 22nd	1
,, 28th	3	,, 26th	1
		,, 29th	1

5th. The disease showed itself in its most malignant form in persons who had not been away from Newcastle for many months, and who were not exposed to others previously affected with it, or to their clothes, or other media usually considered as likely to convey contagion.

* The last case of yellow fever.

The cases of Private Monk in A room, on September 21st, and of Mrs. Bell in B room, on the 22nd; and again, Private Leather, on October 12th, from the cells, are clear instances of this.

An additional proof of the possibility of such an occurrence is given by the appearance and progress of the fever in the family of the schoolmaster-serjeant of the 97th, as recorded by Dr. McIlree, in 1848, noticed above.

6th. Persons in contact with sick in a healthy locality did not contract the disease more frequently, or indeed as frequently, as those in barracks.

The list of the men who attended the sick of fever in hospital shows that of 156 who were so employed, giving 210 separate instances of exposure for twenty-four hours to the emanations from the sick in the fever wards, only 8 were afterwards attacked with fever—a smaller proportion than among those in barracks, though their exposure to contagion, were it existing, was of course infinitely greater.

Further, no hospital attendant, or patient, except Needham, who had not been in the hospital building, contracted fever after the sick were removed from it and the surrounding influences; though, had contagion been the exciting cause of the disease, there was as much or even more reason for the attendants becoming affected after the removal than before it; 32 of the 41 deaths of soldiers having occurred after the removal, and the ventilation of the rooms not being better than that of the hospital.

Taking these facts together—and in this argument they must be taken together, unless they can be shown to be unfounded—they appear utterly opposed to the view that the disease either arose from, or was propagated by, specific contagion.

That a cantonment of about 800 yards in length, on a narrow descending mountain ridge, should present four well-defined healthy zones, alternating with three others in which a disease supposed to be contagious prevailed, while the communication from one extremity to the other was free and unrestrained (save with those actually sick in hospital), is contrary to all experience, and of itself, were there no other evidence, would go far to overthrow the idea of specific contagion having acted; but with the additional weight of the evidence adduced above, this position seems quite untenable, and there is no alternative but to look for the explanation of such circumscribed effects to the influence of causes equally local in their operation.

The first unhealthy zone, noticed above, embraces the buildings between the mess-room and the parade-ground; by referring to the projection it will be seen that these follow the course of the ridge, pass on to the hospital, B room of the men's quarters, quartermaster's store, bakery, and cells, and form a sort of crescent round the head of a deep abrupt gully, which at its upper part runs nearly east and west. The valley may be said to have a southerly exposure, as the bounding height to the north is much higher than that to the south, a point that will be hereafter alluded to. On the western side of this zone,

A room, the tailors' and shoemakers' shop, and some huts are situated; these are immediately over the upper extremity of a watercourse, and a considerable gully, formed by a land-slip; both the watercourse and gully having a southwesterly exposure, and descending at an angle of about 40° below the horizon.

The next unhealthy zone comprises G and H rooms. As mentioned above, there is a high retaining wall supporting the bank behind these rooms, about eight feet from them, and as high as the eaves; about thirty feet from this space, and directly in a line with it, a gully commences, which drains that part of the barracks, and is so placed with regard to G room as to throw the current of air which ascends through it on the end of that room, and into the space between it and the wall at its back.

The last situation where the disease showed itself severely was on the upper two plateaus below the barracks, where it appeared after the disturbance of the ground in levelling, and the exposure of some decaying vegetable matter from cutting trenches to carry off the surface water. There is no gully or watercourse near these spots, such as those above mentioned.

There is a large gully on the east side of the barracks, beside the grave-yard, but it is wider than those just referred to; it is less steep, and from the form of the ground at the top, the ascending currents of air through it are not directed immediately on any of the buildings. That it was not perfectly innocuous may be inferred from the occurrence of two cases of yellow fever (one of which proved fatal) in persons living in the huts on its northern side. At all other points where the men remained healthy, though the ground of the ridge occupied by the buildings was narrow, the ground on either side of it sloped away gradually for a little distance before terminating in the steep descent of the mountain side; and there were no gullies or ravines opening near the houses, or the natural undulations of the ground had more or less of a northern exposure.

The valley terminating to the east of the hospital had its bottom and sides covered with the thick bush usually seen in such localities; this grew over its whole extent, from the lowest point in the plain almost to the road under the quartermaster's store; between this road and the store there was a quantity of old thatch, which had been pulled off the roof of the store, and thrown down there in June, 1856. This had been covered with earth, and it was not until going over the ground early in 1857, that, on examining the ruts cut in it by the water, the straw became apparent, and led to further examination, when it was found extending over an area of some thirty or forty yards.

The gullies to the west of the hill did not contain any bush; but there was a small quantity of open bush beyond them, on the side of the hill. A quantity of refuse—such as bones, ashes, pieces of cloth, &c.—had gradually accumulated over the slope and about the outlets. This was cleared away in the middle of October, and the men employed on the duty complained of the unpleasant odours evolved, but,

unfortunately, it was not remarked whether any of them were subsequently attacked with fever. The large gully near the grave-yard, besides having a more gradual slope than the others, is almost completely clear of bush; its bottom and sides presenting the bare red clay, with little or no vegetation.

All these hollows have a southerly exposure; and, during the prevalence of the fever, the sun passing to the south of the zenith, shone into them some portion of the day, causing ascending currents of air through them, which impinged on the buildings around their upper outlets. It has been shown that in these buildings the disease was more prevalent and fatal than in others; and a very short removal from the course of the current seemed to give almost complete immunity from the disease.*

The privies on the west side of the hill were frequently offensive during the progress of the epidemic. The emanations from privies have been referred to as exciting causes of fever elsewhere; and the occurrences at Newcastle, in 1848, show they are not innocuous here; but they do not seem to have exercised any marked influence during the late epidemic, for rooms D and E, and I and K, which are near privies, were almost free from fever; and while G suffered severely, F, which is nearer the privy, escaped.

The meteorological phenomena were not observed during the progress of the epidemic with as much minuteness as would have been desirable. The thermometer was registered daily at six A.M., two P.M., and six P.M.; but, unfortunately, the instrument was kept in the surgery, and its indications were much affected by the temperature of the room—standing higher in the morning, and lower at two P.M., than it would have done if properly exposed. On October 23rd, when the hospital was evacuated, the thermometer was placed in a small house, jalousied all round, through which the air could pass freely at all times, and there was an immediate and considerable change. The mean temperature as indicated by the thermometer was:

	Six A.M.	Two P.M.	Six P.M.	Mean.
July . . .	67·5°	74·2°	72·5°	70·8°
August . .	67·1	73·8	72·0	70·5
September .	67·4	73·7	71·8	70·6
October .	65·3	72·7	70·1	69·0
November .	62·2	69·2	64·2	65·7
December .	60·1	68·8	63·5	64·5†

* In January, 1857, there was an excellent illustration of the influence of the form of ground in determining the direction taken by the ascending current through the valley to the east of the hospital. Some of the thatch alluded to above was being burnt in the hollow in front of the quartermaster's store, and it gave out a pungent ammoniacal odour. There was a north-easterly wind blowing fresh at the moment, and the odour from the burning thatch was quite strong under M room. When there, I stated to Drs. Foss and Jopp that, from the form of the ground, I anticipated we should find the odour quite perceptible on the hill above the hospital, though to the north of the point where the fire was, and 200 feet above it, and on proceeding to the rooms C and D of the officers' quarters, we found the odour very powerful.

† Since April, 1857, meteorological observations have been made at Newcastle more systematically. The results for July to December, 1858, are given below; they agree

This table shows that the often repeated opinion, that the causes of yellow fever could not exist unless where the mean summer temperature reached 80°, is erroneous, the disease having prevailed, as an epidemic, at Newcastle, with a mean temperature 10° lower, and continued until the mean temperature had fallen 5° more.

Mere heat did not seem sufficient to call the causes of the disease into operation; for in July and August there was none, and, though a few cases occurred in September, it did not attain its greatest force until October and November, when the temperature was diminishing. It ultimately disappeared about December 21st, when cool weather came on, accompanied with strong northerly winds and some rain. It will be remembered that the disease stopped about November 10th, that a few cases occurred in the latter part of that month, and that early in December they were more numerous, but that the last was on the 21st of that month. Taking the mean temperature for periods of ten days in each month, they are—

	Six A.M.	Two P.M.	Six P.M.	Mean.
November 1st to 10th	62·3°	70·2°	67·0°	66·4
November 11th to 20th	62·7	68·8	62·9	65·7
November 21st to 20th	61·5	68·5	62·7	65·0
December 1st to 10th	61·2	70·0	63·8	65·6
December 11th to 20th	61·2	70·7	63·3	66·0
December 21st to 31st	58·2	66·0	61·5	62·1

The periods of aggravation of the disease were thus coincident with increased temperature during the day; such increase, however, was accompanied by a clearer sky and stiller state of the air than when the mid-day temperature was less. There were unfortunately no observations of the absolute maximum temperature of the day, or of the amount of the sun's radiation.

The dew point was not observed during the course of the epidemic, but the quantity of rain collected was as follows:

Months.	Inches.	Wet days.	Remarks.
July . . .	0·00	0	
August . .	5·52	12	Well distributed.
September .	5·27	12	Ditto.
October . .	3·37	5	On 5th, 12th, 15th, 16th, & 17th.
November .	17·30	14	Between 4th & 13th, 12·3in. " 18th & 21st, 5·0in.
December .	5·00	5	On 17th, 22nd, 24th, 26th, & 28th.

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pretty closely with those for 1856 as to temperature and distribution of rain, while in 1858 there was no serious disease:—

1858.	Temperature: Mean minimum.	Temperature: Mean maximum.	Temperature: Mean of month.	Mean monthly dew point.	Rain in inches.
July	64·3°	74·7°	68·0°	60·2°	4·11
August ...	64·4	74·8	68·5	60·2	6·42
September ...	62·9	74·8	68·6	61·8	11·10
October ...	63·7	72·1	67·9	61·5	12·12
November ...	62·3	72·3	66·9	61·0	13·24
December ...	60·3	70·7	65·2	59·1	5·15

From this table it appears that the occurrence of the disease was preceded by a moderate quantity of rain; and its cessation, in November, soon took place under the influence of the heavy rains which commenced on the 4th. The causes of the fever, however, do not seem to have been altogether removed by the rain, but their action merely suspended, or rendered less intense for a period, but soon resuming their force with a return to dry and warm weather. Thus, after the cessation on November 10th, the rains went on to the 14th, and on the 15th there was fine weather, which was terminated by heavy rain on the 18th, continuing to the 21st inclusive. A case of yellow fever occurred on the 21st, which proved fatal. A man died in the hospital with black vomit on the 26th; and other cases appeared in the officers' quarters above the hospital, though it was not before December 3rd they again showed themselves in barracks.

This fact of the suspension of yellow fever under the influence of heavy rain is one of much importance; it has been observed in every epidemic of yellow fever at Sierra Leone; and while cases of the yellow form of the disease, in its most malignant character, have shown themselves in the breaks of the rains, or at their termination, the disease which appeared during the continued heavy rain was always pure remittent fever, and of that there was generally no scarcity. Can this be explained on the assumption of yellow fever being propagated by specific contagion? It seems much more in accordance with fact to conclude, that the origin of yellow fever is intimately connected with (though not altogether dependent on) some local emanation, the production of which is either suspended or modified by heavy rain, but which, on a return to dry weather, may again be produced with its former properties.

The above facts with reference to Newcastle seem to leave open no other conclusion, than that the yellow fever there in 1856 arose from local causes. Whether similar causes were in operation there in other years, and if so, why they did not lead to a similar result, are questions that the present information on the subject does not admit of being answered. It would seem, however, that in addition to the ordinary local causes of disease, an epidemic constitution is necessary to account for the prevalence of fever.

Much difference of opinion seems to exist as to the nature of an epidemic constitution; some limiting its influence to a comparatively circumscribed locality; others claim for it a more extended operation, but assert at the same time that its effects should be manifested by the same form of disease in all places within its sphere of action. Both views seem the result of overstrained deductions from too limited observations; as there is reason to believe that a more extended investigation would show that an epidemic constitution influences mortality from all forms of disease, and that its operation may be traced nearly contemporaneously from Hindostan to Mexico, and from Lapland to the Cape of Good Hope.

It will be sufficient, to prove the existence of an epidemic constitution in the present instance, to state that during the summer of

1856 yellow fever prevailed pretty extensively in the West Indies and around the Gulf of Mexico; and was therefore sufficiently general to warrant the conclusion of there having been something in operation beyond mere local influences.

While engaged on this paper I learned that some of the medical officers at Newcastle were of opinion that yellow fever was imported there from Stony Hill. With the view of getting every information on this point, I called for the opinions of Staff-Surgeon Foss, Surgeon Jopp, and Assistant-Surgeon Tobin, 36th Regiment. The first and last have expressed their belief that it arose from local causes, and was not imported. Dr. Jopp thought it had been imported, and his reasons for that opinion are contained in his official 'Report of the Newcastle Epidemic of 1856.'

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THE

PRODUCTS AND RESOURCES

OF

TASMANIA,

AS ILLUSTRATED IN THE

INTERNATIONAL EXHIBITION, 1862.

COMPILED BY

GEORGE WHITING,

SECRETARY TO THE INTERNATIONAL EXHIBITION COMMISSIONERS FOR TASMANIA:

WITH AN APPENDIX, CONTAINING PAPERS ON

THE VEGETABLE PRODUCTS EXHIBITED BY TASMANIA, BY THE HON. W. ARCHER, F.L.S.,

AND

ON THE CLIMATE OF TASMANIA BY DR. E. S. HALL.

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LOCAL EXHIBITION IN HOBART TOWN.

The Products collected by this Commission to illustrate the Resources of Tasmania in the International Exhibition in London in 1862, were opened for local exhibition in Hobart Town, December 3rd, 1861. The following report of the ceremonial is taken from the *Hobart Town Daily Mercury*:—

"The Exhibition was formally opened yesterday by His Excellency the Governor Sir H. E. F. Young, Honorary President of the Commission.

"Amongst those present were Sir Valentine Fleming, Chief Justice, the Hon. T. D. Chapman, Premier, the Colonial Secretary, the Colonial Treasurer, the Attorney-General, the Solicitor-General, the Hon. W. Nairn, President of the Legislative Council, Hon. W. Archer, M.L.C., the Right Worshipful the Mayor of Hobart Town, the Ven. Archdeacon Davies, Lieutenant-Colonel Russell, J. Allport, with other gentlemen. Several Ladies graced the ceremony with their presence.

"His Excellency and Lady Young, accompanied by Colonel Gore Browne and Mrs. Browne, arrived at half-past two o'clock, and were received by the Chairman and members of the Commission.

"The Chairman (Dr. Crowther) addressing His Excellency said,

Sir Henry Young,—

"The Commissioners have done themselves the honor of requesting that you would favour them by formally opening the Exhibition of Tasmanian products, intended for the International Exhibition. They have done so, not only from a desire to give all possible prominence and *eclat* to an event so important in all its bearings on the future of Tasmania, but because they feel that the object of the Commissioners has had your cordial sanction and responsible aid from the beginning, and, moreover, because the ceremonial of proclaiming that this first stage of their labours has attained a practical maturity, would form a graceful termination of a long official connection with this colony, which has been distinguished by a marked desire to develope our material resources.

"Your compliance with their request would also leave, with many of the advocates of scientific progress in Tasmania, a pleasing memento of a valued friend and coadjutor.

"The Commissioners whom your Excellency appointed to represent the interests of Tasmania, feel some gratification in soliciting your inspection of the results of their labours, which have at length reached a stage in which success appears no longer doubtful.

"This point has not been reached without considerable difficulty and anxiety. The public appeals of the Commissioners, copiously advertised and addressed in circulars to almost every official and professional person in Tasmania, met with no adequate individual response, excepting in some few honourable instances. The Commissioners soon learned that if Tasmania were to be fairly represented in the Great Exhibition this important result must be brought about rather by the purchase of suitable products as a matter of business, than by reliance on the uncertain exercise of individual patriotism and liberality.

"The co-operation of every individual who had taken an active interest in former exhibitions was solicited, and in many cases this aid was cheerfully accorded. Individual Commissioners, each according to his facilities, have exerted themselves to carry out the objects of the commission.

and amongst these gentlemen the name of Mr Boyd, of Tasman's Peninsula, stands pre-eminently conspicuous. The main part, however, of the products now displayed before the public have had to be sought for under circumstances of no ordinary difficulty, and to be purchased by public money.

"Among those products the timber of Tasmania occupies the most conspicuous position. H.M. Commissioners in England have granted permission for a Trophy of Tasmanian Timber to be erected in the Central Avenue of the Great Exhibition Building, the Commissioners have felt bound to respond to this act of consideration by endeavouring to occupy so prominent a position in the world's view, in a way creditable to Tasmania. Every portion of this structure now before your Excellency, for the design of which we are indebted to our Secretary, Mr. George Whiting, (who has been ably seconded in the mechanical arrangements by Mr. Kipling, builder,) will serve some purpose of illustration. Our spars, railway sleepers, joists, quartering, flooring boards, ship's knees, planking, &c., together with our valuable splitting timber, will be shown in every variety of kind and condition. New specimens will be seen fresh from the bush, others which have been felled in proper time and fairly seasoned, together with specimens, which have sustained the severest tests to which timber can be subjected, and have stood the wear and tear of a term exceeding that of a human generation. Piles and planks which have experienced the alternations of exposure to salt-water, fresh-water, and dry air, in our wharves; planks, timbers, and trenails, which have been exposed to all sorts of destructive agencies, in our stranded ships; posts which have remained in the earth almost intact for thirty-five years' duration, and many other such illustrations, will offer incontestable evidence that Tasmanian timber, if judiciously selected and prepared, is unsurpassed by the timber of any other country—in durability, and stubborn resistance to the ordinary vicissitudes to which wooden fabrics are liable. Much labour has been required, in this most unfavourable time of the year, in procuring the timber of which the trophy is constructed, the main portion of which was growing green in the forests when the Tasmanian Exhibition Commission was appointed.

"All these specimens will bear their Tasmanian and botanical names. They will be accompanied by an Herbarium (prepared by Mr. Boyd) of their leaves and blossoms, and will, it is believed, convey to the world a fair notion of what our woods really are.

"Of our ornamental woods, which are now coming into general request in the neighbouring colonies for cabinet work, a more varied and beautiful collection has never been exhibited. Many of the specimens will equal, if not surpass, for furniture, the finest samples of walnut, rose-wood or mahogany. The timber-buyers of Europe will find in this trophy a great variety of our fresh-felled timber. In close proximity to these will be seen specimens of similar kinds of woods cut in Autumn, and carefully seasoned under cover. Near to these a department of durability will arrest the attention by displaying the specimens which have been so long in use, and to which I have already alluded.

"The structure of the trophy itself will serve to display our Blue Gum, Stringy-bark, Peppermint, Blackwood, Myrtle, and Huon Pine; whilst around its base and in every available foot of surface will be disposed our most handsome cabinet woods, some in neat packing cases, and more in the varied and grotesque forms of their original growth. Our ship planking, measuring 80 and 90 ft in length without a defect, cannot fail to attract

the notice of those who are searching the world for a substitute for the now no longer easily procurable British oak. Prices will be attached to those sorts of timber which form so large an item in our exports to other colonies.

"The Trophy will also be made subservient to the illustration of another of our main branches of industrial production—namely, our sea-whaling. Two whaleboats by the best boat builders of Hobart Town (Chandler and Miller) will be suspended from the sides of the pedestal. These boats are made of Colonial wood,—and the harpoons, and all other gear connected with them fitted up by colonial workmen.

"The octagonal column of the trophy will be surmounted by two jaws of the sperm whale. Whalebone as taken from the black whale, will be open to inspection. At each corner of the pedestal will be placed oil-casks, water-casks, and flour casks, for whalers, of colonial manufacture, on which will be suitably displayed, the Oil and Head matter which command so sure a market in other countries. Tasmanian Wool, choice brands of which fetch the highest price in foreign markets of the wool of all these colonies, will be adequately represented, as the clip of the present season becomes secured. Already promises have reached the Commissioners of a large number of specimens on their way for exhibition, and it is gratifying to believe that in this our chief export Tasmania will still maintain the high character which she so honorably achieved in 1851.

"The mineral resources of Tasmania suggest hopes of great advantages at no very distant period, more especially as regards our coal, of which Your Excellency will perceive a varied and valuable collection from numerous localities selected by Mr. Gould, whilst other samples have been exhibited by private proprietors. Indeed coal is found to exist in nearly all parts of the Island, and it is hoped that before long some practicable mode of rendering our unquestionably valuable coal beds available, will induce capitalists to enter largely into this important branch of industry.

"Our metalliferous collection comprises gold, which metal exists in greater or less quantities in various parts of Tasmania—particularly of the Fingal district. We cannot as yet claim to be considered a richly producing gold colony, but it has been deemed desirable that the small portion collected by a few hands in one district during the few months in which the commission has been in operation, should be shown, in order to prove that amongst our prospects of latent mineral wealth the discovery of gold in payable quantities is a contingency to be constantly kept in view. A much larger quantity of Tasmanian gold might have been purchased, but the sample exhibited is sufficient to show the characteristics of our gold.

"Our Iron Ores have representative samples, from various localities, some of the specimens being of great richness, and may possibly yet be profitably worked.

"Our Building Stone, which has been extensively used in constructing the public edifices of other colonies, is fairly illustrated. The valuable collection of Mr. Calder, who has taken an active interest in this branch of our industry, contains specimens from numerous quarries; yet so abundant is this valuable material that this ample collection represents only a portion of the quarries now in work. A church font, worked in stone from Point Venteuat, illustrates in a striking manner the admirable adaptability of this stone to this and various other purposes to which it has not previously been applied. Amongst these latter may be mentioned some grindstones, exhibited, of great size and fine quality, and also some smaller ones

said to be eminently suitable for glass-cutting. Some of our Marbles, which have hitherto been used only for the making of lime, and which cover a considerable portion of Tasmania, have been discovered, when properly polished, to be eminently beautiful and suitable for internal decoration. Whilst on this subject, I cannot refrain from directing your Excellency's attention to some specimens of Flinder's Island topazes, the splendid appearance of which, when suitably mounted in articles of jewellery, as they are now exhibited, cannot fail to strike every spectator. The products of our fields, our orchards, and our gardens, deserve a passing notice. Our autumnal fruits are represented in admirably executed wax models from casts of last year's fruit in plaster of Paris. English Horticulturists will find amongst them many well known superior sorts, which have been greatly improved since their introduction into this country. Indeed, our climate seems peculiarly calculated for the growth of English fruits, which are exported hence to other colonies in vast quantities.

"The skins of the opossum and other Tasmanian animals will be sent to England in considerable quantity and variety. When it shall become known to European furriers that skins so well adapted for railway travelling as those of the opossum may be purchased in almost unlimited number at five shillings per dozen, this circumstance can scarcely fail to ensure their general use. Among the novelties of our exhibition will be found an extensive collection of the barks of Tasmanian trees. Some of these—as the bark of the blue gum and stringy bark trees—have been reduced to fibre by a process with which Your Excellency is familiar, ready for experimental trials of their suitability for paper-making, &c. Should they be found to answer that purpose, a vast demand may be created for a material which Tasmania could supply at a moderate cost in any quantity.

"I cannot venture to detain Your Excellency by a particular reference to many objects of interest which this collection comprises. A desire to conform as closely as possible to the directions of Her Majesty's Commissioners in England has induced the Commissioners here to confine this selection to articles which directly represent our material resources; and those which either have, or possibly soon may have, a positive commercial value in the world's market. Had they chosen to have converted the exhibition into a collection of mere curiosities, these might have added to its varied attractions, but such a collection would not have harmonized with the objects of the forthcoming international exhibition. Although many of our colonial manufactures form important items of our exports, such as carts, furniture, colonial axes, splitting knives, &c., yet these are not such articles (excepting cabinet furniture for the purpose of showing our ornamental woods) as would excite much attention in England. It is mainly on our capacity for supplying valuable and abundant raw produce, to be moulded to their varied purposes of elegance and utility, by the manufacturing industry and artistic skill of older communities, that Tasmania must for the present be content to rest her celebrity.

"In conclusion, the Commissioners would beg to impress on your Excellency the fact, that in the hurried collection which they have been able to make, they have included no article of an exceptional character, but have kept the one object in view, of giving a faithful and honest exemplification of what Tasmania can really furnish out of her ordinary resources, and what she can immediately reproduce should the occasion require it.

"I have the honour to request that your Excellency will now be pleased to declare the Exhibition to be opened.

"His Excellency replied—

DR. CROWTHER,—

"The interesting details which are set forth in your comprehensive Address as Chairman of the local International Exhibition Commissioners, established for you, for them and for your indefatigable and intelligent Secretary, a claim not only to my thanks, but to the thanks of the whole community.

"The difficulties you have overcome, with comparatively speaking, so little of the aid which was expected from the general body of the colonist, greatly enhance the merit of the success of the Commission.

"I desire too, to observe, that had the indiscriminate zeal and profuseness of voluntary contributors made the collection as universal in its character as the contents of an Economic Museum, the unique, definite, and most appropriate Exhibition, now before us, would be less strikingly conspicuous and suitable.

"The direct faithful representation of Tasmania's material resources, of commercial value, actual or prospective, as raw produce; and deserving of the attention of British and Foreign Manufacturies; is truly a fulfilment, so far as this island is concerned, of the special design of an International Exhibition.

"The sight before us, is a very gratifying one. In common with others, I am desirous of allowing no further delay to take place in its examination.

"I thank you for the flattering consideration which has induced the Commissioners to give me opportunity, amongst the closing acts of my administration, to take part in this pleasing ceremonial.

"I now declare the Exhibition to be open.

"The Vice-regal party accompanied by the Chairman then proceeded round the building, and spent a considerable time in examining the various productions. The Exhibition will be open gratuitously to the public during the remainder of the week.

PRODUCTS AND RESOURCES OF TASMANIA,

AS ILLUSTRATED IN THE INTERNATIONAL EXHIBITION, 1862.

ALTHOUGH the International Exhibition of 1862 will probably form a more complete collection of the World's produce than either of its progenitors of 1851 and 1855—the occasion seems to have been generally recognised, by new and consequently little known communities, as a legitimate opportunity for supplementing its educational utility—by the publication, for presentation with their contributions, of a condensed epitome of well authenticated, historical, statistical, and descriptive information, which no collection of illustrative products can supply. The Tasmanian International Exhibition Commissioners have (in common with the other Australian Colonies) directed their Secretary to prepare such an epitome.

The visitor to the Great Exhibition, who, like Layard at the ruins of Nineveh, may, in idea, stand face to face with a people of whom

he knows little—but who have here reproduced themselves to a great extent in their works—may desire further information respecting them; but his inquiries will be greatly modified by his personal interest, objects, and predilections. The Statesman and Politician may inquire into the genius of the people who have produced these works. Are they still identical in blood, in language, and in religion, with the energetic race from whom they sprung? Have they struggled for, won, and do they really appreciate the privilege of Constitutional Government? Is their liberty of speech and action tempered only by the decent restraints of self-moderation, mutual forbearance, and abstinence from infringement on the freedom of thought, word, and deed of their fellow man? Do they carry out the system of local self-government in Municipal and Parochial organization, which has formed the nursery as it forms the safe-guard of English rational liberty? Will they stand by "Old England" in the event of a possibly impending war? Do they volunteer? Are they learning to handle great guns? Did they subscribe liberally to the Patriotic Fund for the relief of the wives and families of our brave fellows who fell in the Crimea? Do they take readily to the Englishman's natural accessories—the ship, the steam engine, the horse, and (now) the rifle? Are the Cricket Match, the Horse Race, the Regatta, the Rifle Match, the Ploughing Match, the Cattle Show, accepted amongst them as established Institutions? Are they "sailors to the manner born" in matters of whale fishing, boating, and yachting? Do they appreciate the value of intelligent co-operation in forming Companies for Gas, Steam Boats, Mining, Railway, and other purposes?—If they can answer these questions satisfactorily, and if the sterling character of their contributions offers a fair illustration of their country's capabilities and their own energy and enterprise, an honorable future lies before such a country and such a people; whose "manifest destiny" it may be—to work out an original phase of social, moral, or material progress from the new conditions of race, climate, position, and productiveness in which they fortuitously find themselves combined.

But (the Man of Business will more briefly demand) do they give us any practical proof of this capability? Do they offer us new raw material—for our mill-board or our paper mills—timber superior to oak, or equal to oak at a lower price, for building our ships and constructing our railways? Can they coal, provision, and refit our long-voyaged steamers, and merchant ships?

Very different still may be the range of inquiry of the man into whose mind the project of emigration has perchance constantly obtruded itself amidst the cares and embarrassments of old world competition. He may possibly anticipate increased anxiety as age creeps over him, and his children advance in turn to fight the Battle of Life in fields of employment already over crowded—and in contests requiring, day by day, a higher standard of physical energy and intellectual qualification. Heart-sick with the weary up-hill struggle, he may sigh for some new home, where his family, now sorely perplexing, may prove a source of happiness, where he may rear "an independent shed" on his own land, and pass his remaining years under the shade of his own vine and his own fig tree. In his earnest examination of the evidences of material prosperity which he will find in the English Colonial Department, he may be arrested by the Wheat, or the Wool, or the Timber Trophy, and will ask himself—is the country where these came from the place where an honest and industrious man, with little capital, save the labour of his thews and sinews, and the

skill of his hands, may hope to better his own condition, and that of his family? Does it contain or produce the main necessaries of life—abundance of wood and coal for timber or for fuel—plenty of good water for irrigation, manufactures, machine power, and domestic use—animals for labour and for food—corn, oil, English crops, and English fruits—wool and furs, for clothing and for export? Is its climate suitable to the Englishman's constitution—and will it keep "the English rose" on the fair faces of his children? Is it English in its population, its laws, and its habits? Does it offer land worth the buying suitable for an English home, in lots to suit purchasers of moderate means, which may be selected without auction, and paid for by easy instalments—out of which he and his children can work out a present livelihood, and future competence? Is the country exempt from peculiar diseases—from dangerous wild beasts—from hostile Aborigines—from the unnatural and appalling contingencies of civil war?

These suggestive queries combine so many of the essential elements of human happiness and progress, that a writer may fairly apprehend a charge of exaggeration who should venture to claim them for any one country. Yet, it will be found, on referring to official statistics and notorious fact,—that there are very few of these queries which may not unhesitatingly be answered in the affirmative—on the part of Tasmania.

PHYSICAL GEOGRAPHY.

Tasmania, formerly known as Van Diemen's Land, is a somewhat escutcheon-shaped island, nearly as large as Ireland, lying about 120 miles south of the south-eastern corner of the Australian Continent. Its area comprises about 16 millions of acres, or about 25,000 square miles. It is of 165 miles average length, and 155 miles average breadth,—and has 700 miles of coast line, exclusive of small islands and indentations. The central part of the Island consists of a table land, averaging at least 3,000 feet above the level of the sea—on which are seven lakes, varying in size from 2,500 acres to 50,000 acres, and containing an aggregate of nearly 112,000 acres of freshwater. These lakes form the sources of many considerable rivers. The Derwent runs 120 miles, and its estuary is navigable to and above Hobart Town, where it is three miles wide, for forty miles from the open sea. The Tamar is navigable 40 miles to Launceston from the North Coast. The Huon, running a course of 110 miles, is navigable for steamers nearly 30 miles. These, and eleven other rivers, meander, summer and winter, through the mountain ranges, (some of them 5,000 feet high) and gently undulating hills, which intersect the Island—giving an aggregate course of ever-flowing water of 900 miles. Thirty-one smaller rivers run for considerable portions of every year, whilst thousands of creeks, rivulets, streams, and springs glide, leap, and dash through the wild ravines and rocky cascades of the country in romantic variety, forming a plentiful and continuous supply of the great essential of life and health—pure water, which frequently serves to keep the face of the country fresh and green, long after those of the neighbouring colonies have been parched with drought—and affording an amount of constant motive power for mills or for irrigation, perhaps unequalled, within the same distance from the sea, in any country in the world.

The bold green-stone and basaltic mountains of Tasmania—their heads for many months of the year capped with snow—form striking objects,

from whatever quarter the Island is approached. Its undulating intervening surface, mostly covered with forests of gigantic trees extending from the hill-tops down to the water's edge; its singular intersections of land and sea, particularly about the south-eastern coast,—offer to the admirer of Nature's works, scenery of the most wild and picturesque beauty, in lake-like bays and estuaries, fertile islands, rugged cliffs, romantic head-lands, and curious peninsulas. Here and there the crop of a settler reach down almost to the water's edge, and the waves carry the tidal pulses of the vast Pacific Ocean to within fifty yards of the farm-house door.

POLITICAL.

The political institutions of Tasmania secure the utmost latitude of rational freedom. By the Constitutional Act of 1854 the colony is governed by two elective bodies—the Legislative Council (15 members), and the House of Assembly (30 members). The members of the Legislative Council, who bear the prefix "Honorable" *ex officio*, are elected for nine years. This Chamber is indissoluble. Its constituency consists of £50 freeholders, graduates of universities, barristers and solicitors on the roll of the Supreme Court, legally qualified medical practitioners, officiating ministers of religion, and retired military and naval officers. The House of Assembly is elected for five years, and is dissoluble at the will of the Governor. Every Money Bill must originate in this House. No member of either House must be a judge of the Supreme Court, nor a minister of religion. Those who elect the House of Assembly are £10 householders in town and country, £10 pastoral licensees and lessees, persons receiving an annual salary of £100, and all the classes entitled to elect the Legislative Councillors. At elections—nominations are not made openly on the hustings, but are addressed, signed by the prescribed number of voters, to the Returning Officer, so as to be published by him some time before the election. Every man votes by ballot, striking out of a list the names he opposes, in a room by himself, and depositing his folded paper openly in the ballot-box. Further to secure every man in the secrecy of his vote, all distinguishing party badges, colors, flags, and bands of music are prohibited. Any person "giving or providing, receiving, or wearing cockades, ribbons, or other mark of distinction" is subject to a penalty of £50. Severe penalties are also prescribed for bribery, treating, and "undue influence." The results of this system of election are most satisfactory. In Tasmania there is no "putting on the screw." An "election riot" is unknown. The excitement and turmoil of an election are almost forgotten in a week. A more quiet, practicable, and business-like system of collecting the real political opinions of a constituency probably no-where exists. The Tasmanians have not derived this system from Imperial or foreign legislation, but have framed it for themselves. So far, the political constitution of Tasmania has worked well, whilst those of some of the sister colonies have had to be constantly altered from their original form. The Tasmanian Statute Book, under Representative Government, may bear comparison with that of any other colony. Few changes of Ministry, and no violent changes of policy, have yet impeded the political progress of Tasmania, since she has possessed the inestimable privilege of self-government. In any country translated within a few years from a form of Government essentially despotic to one comparatively free, an excess of

party feeling may be expected to show itself occasionally—but such ebullitions, if not permitted to impede public business or to disturb the public peace—may be taken as healthful indications of the interest taken in public affairs. With a very few exceptional cases (which have been made the most of in disparagement of Tasmania) nothing has hitherto occurred to disturb the harmonious progress of her Legislation; and those few cases have served the useful purpose of showing that the political power of the colony is really in the hands of the intelligent and orderly portion of the community, of whatever class—whenever they choose to exercise it. Of the loyalty and good feeling of the population, generally, many proofs might be adduced. It has more than once happened that nearly all the Queen's troops have been suddenly taken away to quell disturbances elsewhere. At present there are scarcely regular soldiers enough in Tasmania to mount guard at Government House, and the Imperial establishment of Port Arthur, yet in no country does there exist a more confident sense of security for person and property.

THE TASMANIAN TIMBER AND WHALING TROPHY.

This structure, which has been designed to illustrate two of the most important branches of Tasmanian industry, will, it is believed, furnish information as to the abundance, variety, and lasting qualities of Tasmanian timber, which may prove acceptable to all persons interested in Ship-building, Railways, Public Buildings, and other purposes to which timber is applied. It will, probably, not less clearly illustrate the peculiar adaptability of Tasmanian Cabinet Woods, from their beauty of colour and marking, for Ornamental Furniture and other requirements of modern elegance and refinement. The fact ought to be mentioned, however, that the greater proportion of the Woods now exhibited was growing in the Tasmanian Forests but a few months since, and consequently may be found to be affected by "shakes," "sun-cracks," &c., which will not be discovered, in the same sorts of timber which may have been cut in the Autumn and seasoned under cover. In juxtaposition with the "green" specimens will, however, be seen—specimens which have been fully seasoned; and again, specimens which have undergone the severest tests to which timber is ever subjected during periods approaching to half a century. To render this Trophy a temporary Museum of the more useful Tasmanian Woods, specimens have been procured from the oldest Public Buildings of the Colony, each of which is fully labelled, and will tell its own tale. The Old Gaol and the Old Court House of Hobart Town, have furnished sleepers, door-posts, flooring-joists, boards, window-lintels, and architraves—of Huon Pine, Blue Gum, and Stringy-Bark, which are as sound as when built in forty years ago. These relics of the past, had they power of utterance, might relate legends of human trial, suffering, and adventure of early Colonial days, which would now be deemed incredible. But the evidence which they offer of their own durability must be taken as incontestible and complete. Nearly all the timber of the Old Hobart Town Court House has been found to be sound, and has been used in the erection of the New Post Office just completed on the same site. But the Builder and the Railway Engineer may ask, "Will Tasmanian Timber resist equally well the atmospheric influences of the open air?" The Naval Architect will inquire into its "behavior" under water. Let the old piles, and planks, and posts, in the Trophy supply the answer. Some of these old piles, which have been split down longitudinally

in order to facilitate inspection, have been partly submerged daily, as the tide rose and fell, for periods up to Twenty-one years, whilst forming part of the Wharves of Hobart Town. Blue Gum and other planks from the Wharf Platform will shew their power of resistance, for the same period, of copious showers, hot sunshine, dry winds, and heavy traffic. Other material witnesses to the durability of Tasmanian Wood have been summoned from a Colonial-built vessel, which has been stranded for Fourteen Years, in the shape of planking, timbers, trenails, &c., which also fully attest this fact. A Tasmanian schooner built of Blue Gum—the "Flying Squirrel," 97 tons—has twice been thrown by the surf above high-water mark—and on being got off did not exhibit the slightest defection in her lines, or a sprung trenail, and has never even required to be pumped since undergoing this severe ordeal. Veteran posts from the earliest fences of the Colony, of Peppermint and other Woods, which have stood faithful sentinels over the crops and herds of the settlers of the last generation, here invite inspection of their almost unimpaired condition. What further proof can be required of the lasting and useful properties of Tasmanian Woods?

That these Woods, particularly the Blue Gum, may be seen in all conditions—the Ship-yards and Coach-factories of Hobart Town have furnished specimens as usually seasoned imperfectly, and as seasoned carefully. The specimens of Ship-timber, from Mr. Macgregor, have been ten years, and that from Mr. Ross has been twelve years, lying in an open Ship-yard, exposed to all weathers. With these specimens of rough seasoning may be compared the Blue Gum plank of Mr. Burdon, Coach-maker, which has been carefully seasoned under cover for seven years; and other specimens of Dr. Crowther's, which have been seasoning for ten years. This comparison will serve to shew that much depends on the seasoning of the Blue Gum; that it is a most valuable Wood when fairly seasoned, and that even when roughly prepared, this Wood is unsurpassed for all out-door purposes requiring strength and stability. Another variety of the Eucalypti—the Gum-topped Stringy Bark—nearly, if not quite equal, to Blue Gum, and procurable in greater abundance, a straighter grain, and of more free working character, has more recently become an object of considerable attention. Its durability and general quality are well illustrated by a plank which with the old piles has been exhibited by Mr. Oldham, that has been in use twenty years in the Platform of the Hobart Town Wharf.

In inviting all persons interested in the supply of the best Colonial Timber for the Dock-yards and Railways of the United Kingdom to examine these well-authenticated and varied specimens, it may be well to lay before them the result of scientific experiments which were tried ten years since, with a view to test the qualities of the Woods of Tasmania with the best Woods of India, of Europe, and of British America.

It is well known in engineering circles that Professor Barlow, in his "Essay on the Strength and Stress of Timber," gives the details of an experiment in England on the English and Indian Woods. These experiments, as also those of Captain H. C. Baker, on the Indian Woods, will be found in the article "Timber," in the *Encyclopædia Britannica*. Mr. Mitchell, D.A.C. General, made some similar experiments on the Woods of Tasmania, and (in 1851) detailed the results in a paper read before the Royal Society of Tasmania, which is published in the Society's Transactions, (Vol. 2, P. 1,) the object being to institute an impartial comparison between the Woods of Tasmania and those of India and Europe—as given in the tables of Captain Hall and Professor Barlow. The experiments had been thus performed:—

A piece of each Wood, two inches square, was laid with its ends resting on supports, seven feet apart. Weights were gradually increased in a scale, suspended from the centre of the piece of quartering so placed. Its elasticity was ascertained by increasing the weights till the Wood would no longer recover its straightness, after they were removed. Its strength was proved by increasing the weights till it broke asunder, and by observing its amount of deflection immediately before it broke. A portion of the broken Wood then had a cross bolt passed through each end, and was suspended, to try what weight it would bear before it could be pulled asunder length-wise. To facilitate the experiment, a portion of the middle of this two-inch piece was turned down in a lathe, and afterwards filed to a quarter of an inch square. It was by estimate determined after it broke—what was its direct cohesion on the square inch.

The trials were made on Blue Gum, Swamp Gum, and Stringy Bark—on green specimens, and on others which had been seasoned under varied circumstances, and for different periods. The following is a condensed synopsis of the mean of all these experiments:—

No. of Expts.	Woods.	Spc. Gravity.	Weight and Deflection. * lbs.	inches.	Breaking weight lbs.	Ultimate Defection. Inches	Direct Cohesion in sq. in. lbs.
31	Morung Saul	947	349	1.09	881	1.128	
3	Teak	745	360	1.151	938	4.32	15.550
3	Poon	579	150	.822	846	5.91	14.787
3	English Oak	969	150	1.390	450	5.90	9.836
3	Ditto	934	200	1.280	637	8.10	10.853
3	Canadian Oak	872	225	1.080	673	6.	11.428
3	Dantzig Oak	756	200	1.590	560	4.86	7.386
3	Adriatic Oak	993	150	1.430	526	5.73	8.808
3	Ash	760	225	1.266	772	8.92	17.337
3	Beech	696	150	1.026	593	5.73	9.912
3	Elm	553	125	1.685	386	6.93	5.767
3	Pitch Pine	660	150	1.134	622	6.	10.415
3	Red Pine	657	150	.755	511	5.83	10.000
3	New England Fir	553	150	.931	420	4.66	9.947
3	Riga Fir	753	125	.870	422	6.	10.707

MR. MITCHELL'S EXPERIMENTS.

45	Blue Gum	1031	492	1.650	1031	6.30	29.743
3	Ash or Swamp Gum ‡	978	366	1.50	784	5.91	17.954
9	Stringy Bark	991	417	1.625	867	5.07	23.443

* Whilst elasticity remained perfect.
‡ Only used for Splitting Timber.

By this table it will be seen that Blue Gum will sustain about double the weight of English Oak before it breaks, and will even recover its elasticity after bearing a weight at which Oak will break. Its mean cohesive power beyond Oak is nearly, but not quite, in the proportion of 3 to 1. Mr. Mitchell states in his paper that, "The specimens experimented upon, were chosen because their ages were vouched by the Gentlemen supplying them, and not on account of their being specially calculated to sustain great weights. Pieces could I have no doubt be found capable of bearing greater weights than any I have recorded;" and

adds as the result of his experiments, "The strength and elasticity of the Blue Gum exceeds generally those of all woods hitherto tested." There are probably many such superior pieces to be found in the Exhibition collection.

The result of these carefully conducted experiments has been completely borne out by observation in these colonies, whenever that wood has been severely tried, which fact the used and seasoned specimens now in the Trophy will go far to demonstrate. It is to be regretted that the same tests have never been applied to some other Tasmanian woods, such as She Oak, the light and tough Huon Pine, (of which the Whaleboats are built) and the Peppermint wood, both of which latter appear to be nearly impervious to atmospheric influences. The British Government possesses in the International Exhibition ample means of testing practically the Blue Gum, and comparing it in various shapes and conditions with other woods of first-class character. It may not, perhaps, be improper here to suggest that the appointment of a Commission of Enquiry to examine and report on the various woods in the Exhibition, might possibly eliminate results of even National importance, now that a supply of British Oak can no longer be relied on. In another quality for which British Oak is distinguished, it is believed that Blue Gum excels. It has been said that Oak is "less likely to rend, to break across, to splinter with common shot, than any other wood." Blue Gum is essentially a tough wood, the maul-heads, wheel-fellies, and boat-keels made of it, appear to be almost indestructible, and it is believed that it would stand the shot test well. In the possession of the Tasmanian Commissioners in London, is part of the head of a Blue Gum pile, of which about two inches deep of the bruised head was sawn off after the pile had been driven into the earth. This portion of the pile had received 200 blows from a driving ram weighing 21 cwt., 27 feet drop; and the toughness of the small portion which had to be cut off will fully attest its suitability for such purposes. A wood so tough and elastic, which splinters so little, *must* be valuable for constructing railway carriages. It is constantly used for making ordinary carriages and other vehicles in Tasmania.

The superiority of Tasmanian woods, particularly the Blue Gum, having thus been carefully demonstrated by experiment, and amply corroborated by the experience of their durability; it remains to be determined whether they can be supplied of the large size, and shapes required—say for ship-building? The structure of the Trophy, which is mostly formed of ordinary market timber, or of such sample timber as can be supplied in almost any quantity—will afford an answer to this question.

The Octagonal column, is formed of eight spars of Blue Gum, Stringy Bark, White Gum, Silver Wattle, Blackwood, and Sassafras.* The eight sides of this column are formed at the base by eight large planks set on end, of Blue Gum and Stringy Bark, from Dr. Crowther's Timber Establishment, at Oyster Cove. The thickness of the Trees from which these planks have been taken will be seen at once by persons conversant with timber. The heart of Tasmanian trees is nearly always unsound. In these planks, as in

* The Botanic names of these woods, which are here omitted for the sake of brevity, will be found in the Appendix, in a paper on the Vegetable products exhibited by Tasmania, by the Hon. W. Archer, M.H.A., F.L.S. Specimens of the leaves and blossoms, &c., can be referred to in an Herbarium in the Exhibition, prepared by James Boyd, Esq., Civil Commandant, Port Arthur.

all planks used in the Colony for ship-building, the heart is cut off, and the width of the plank shows the size of the tree—outside of the heart. To show the length of which Ship timber can be obtained, planks have been sent home of Blue Gum, measuring 90ft., and of Stringy Bark, measuring 80ft. in length, of equal width and soundness throughout.

Samples of other ship timber form the base of the Trophy—which is thus constructed:—Five planks, (20ft. long) of Blue Gum, Stringy Bark, Blackwood, and Myrtle, the two former being fitted for ship-building, and the two latter for cabinet work, are first laid down. Placed across these, are ship's keel-pieces (10ft. long, squared,) of Blue Gum, and Stringy Bark. Immediately on these lie, transversely, joists of Stringy Bark, covered with ordinary flooring boards of the same wood. The frame-work of the Pedestal placed on this floor is composed of Blue Gum, White Gum, and Stringy Bark. The joists, quartering and flooring boards of the Pedestal platform are also of Stringy Bark. The centre piece of the spiral staircase is formed of a spar of plain Huon Pine, the stairs being made of this free-working and almost imperishable wood. These samples will show what Tasmania can supply of plain timbers. Of large ship's knees—the want of which has even caused a modification of British naval architecture—an unlimited supply can be obtained from Tasmania, where the stumps of the large trees which might supply them are left to rot after the tree has been cut up. These are also shown, in the angles of the Pedestal frame, of various conditions as to seasoning. A large Blue Gum knee, and also a Blue Gum crook have been exposed to the open air nearly ten years, in the ship-yard of Mr. McGregor. In other angles of the frame are three very fine ship's knees from Tasman's Peninsula, exhibited by Mr. Boyd. There are also three smaller knees, a Blackwood crook (for curved bannister work), and a fine Huon Pine knee, in other angles of the Trophy. In the interior of the Pedestal are also some railway sleepers of Blue Gum and Stringy Bark and pieces of White Gum, or Gum-topped Stringy Bark, 12 x 6, 12 feet in length, contributed by Dr. Crowther, from Oyster Cove, and by Mr. James Boyd, from Tasman's Peninsula—together with some sleepers of Blue Gum and Peppermint shown by the Commissioners. The split palings and roofing shingles here displayed are also fine specimens, varying in length from 5 feet to 15 feet, and in breadth from 6 inches to 24 inches. These are specimens of the ordinary splitting qualities of Swamp Gum, which is very valuable for this purpose, but is never used for any other. A longitudinal section of the Swamp Gum plank from Port Arthur, exhibited by Mr. Boyd, will serve to show the extraordinary length and size of Tasmanian Timber. The plank from which this section was taken measured 230 feet in length. No available ship could be got to take it to London, whole. The section has consequently been divided into 20 feet lengths, in such a way that the brand cut across shall in each case bear evidence of the former connection of the pieces severed. These large specimens, and some others which could not be sent in time, prove that Tasman's Peninsula with its tramway and excellent harbour at Port Arthur, and its large forests of these valuable timbers—is well calculated for a timber supply station to the Imperial Dockyards in England. The finest specimens of ship's knees are all from Port Arthur, which, together with Dr. Crowther's establishment at Oyster Cove, have supplied nearly all the best shipping and railway timber now exhibited.

The attention of Railway Engineers is particularly invited to these durable woods, which it is believed can be supplied at a price which

would render their use much more economical than the softer woods which have so frequently to be renewed. By the estimate of the late Robert Stephenson 2,800,000 railway sleepers required renewing (in 1854) every year, out of the 36 millions of sleepers in use in Great Britain. A Blue Gum, or Stringy Bark, or Gum-topped Stringy Bark, or Peppermint wood sleeper, would, under the most trying circumstances, last from fifteen to twenty years, and under ordinary or favourable circumstances might last three times that period. The sleepers now in use require renewing, according to Mr. Stephenson, every twelve or fourteen years. It is estimated that this quantity requires the wood of 7,000 acres of English forest land annually, whilst better woods are growing in the wild lands of Tasmania as common as weeds.

Of Ornamental Woods the Trophy furnishes a great variety suited for cabinet work. The Myrtle tree (so-called) of which Tasmania contains immense forests, from its richness of tint and varied venation is well suited for this purpose. Other woods, as Blackwood, Muskwood, Huon Pine, Dogwood, Sassafras, Pinkwood, Native Laurel, She-oak, &c., offer a variety of selection in tint and figure, in which the ingenious cabinet-maker will find ample scope for tasteful innovation. The specimens of these woods exhibited by the Commissioners are the following :—

	Specimens.
Muskwood (*Eurylia argophylla*)	30
Silver Wattle (*Acacia dealbata*)	24
She-oak (*Casuarina quadrivalvis*)	25
Native Cherry (*Exocarpus cupressiformis*)...	4
Ironwood (*Notelea ligustrina*)	8
Dogwood (*Bedfordia salicina*)	8
Sassafras root (*Atherosperma moschata*)	10
Native Laurel (*Anopterus glandulosa*)	15
Native Box (*Bursaria spinosa*)...	6
Stringy Bark Root (*Eucalyptus gigantea*)...	5
Blackwood (*Acacia melanoxylon*)	30
Gum Root (*Eucalyptus globulus*)	10
Native Pear (*Hakea lissosperma*)	2
Honeysuckle tree (*Banksia Australis*)	6
Pittosporum (*Pittosporum bicolor*)	10
Prickly Wattle (*Acacia verticillata*)...	10
He-oak (*Casuarina suberosa*)	3
Huon Pine (*Dacrydium Franklinii*) (planks in cases)..	4

THE COAL-FIELDS OF TASMANIA.

Coal exists in nearly every part of Tasmania, of which a valuable collection has been made by Mr. C. Gould, Government Geologist, which will be found amongst the Tasmanian products. The main portion of the fuel used in Hobart Town is derived from Mines at New Town, in the close vicinity of the Capital, and from Tasman's Peninsula; but it is generally believed that Coal Beds of far greater value than those which have been worked, principally on account of their easy accessibility, exist in other parts of the Island. The series of specimens from Mount Nicholas will illustrate the Coal Bed to which public attention has recently been most particularly directed. The seam of Coal

which crops out at various points on the side of Mount Nicholas, locally known as the Killymoon Seam, overhanging Break o' Day Plains, at a height of about 500 feet—can be worked at an adit level, is distant nine miles from the Port of Falmouth, is highly bituminous, and it is believed is well suited for steam, gas, and domestic purposes. The same Seam crops out near Fingal and at various other parts, but the main Seam is that now illustrated by samples from different portions of it. This Coal Bed is estimated to occupy an area of about 14 miles, on the Northern side of the Break o' Day Plains. Various other portions of the Bed are equally accessible, but although they are mostly bituminous, they are inferior in thickness to the Killymoon Seam. Bituminous Coal samples are also furnished from the Coal Bed of the Douglas River and from Long Point, both on the East Coast. The Coal from both these Districts is good, and the Coal Bed from which they are taken is said to extend over an area of about 15 miles, and the seam at the Douglas River to be above eight feet thick. At Long Point it is 6 ft. 10 inches thick, very bituminous, and within an easy distance of the shipping place. This Coal is rapidly rising in public estimation, and a Company has just been formed to work it. Beds in the Mersey River have also been found, and, although limited in quantity, have been profitably worked, as they are easy of access. The coal is very bituminous, is used by the coasting steamers and in Launceston, and has been recently exported to Victoria.

The bituminous Coal from Hamilton is said to be very good. It lies about 40 feet deep, in a seam 4 ft. 6 in. thick, and has been used, and favourably reported on, by the Derwent steamers, from the shipping place of which, at New Norfolk, it is about 20 miles distant.

The anthracite Coal is abundant on the southern side of the Island, and specimens are exhibited from New Town, Tasman's Peninsula, Adventure Bay (Bruni Island), Three Hut Point in D'Entrecasteaux Channel. Four collieries are represented in the specimens from New Town, near Hobart Town. The Coal at Tasman's Peninsula has been worked for 25 years and largely used in Hobart Town. The seam is from 3 ft. 6 in. to 4 ft. 6 in. thick, is worked by a shaft 25 yards deep, and within about 100 yards of the water's edge.

The Coal formation on the South side of the Island extends round the mouth of the Huon to S. W. Cape, within which range many deposits have been discovered. With a supply so varied and extensive, some localities will probably be soon found to possess coal of first-rate character, easy of access. Private capital is seldom sufficiently in excess in the colonies to admit of its being relied on as the source of development of the mineral wealth which Tasmania doubtless possesses. The matter is one of national as well as colonial importance, now that steam vessels may be expected to take a very prominent part in any future maritime war, and the attention of the Colonial Government has of late been specially directed to it. The labours of Mr. Gould, the Government Geologist, have been almost concentrated on this matter recently, the Parliament have voted a sum of money for its investigation, and a Commission has just been gazetted (March, 1862) to take charge of experiments on, and the selection of some of the best specimens, easily and abundantly procurable, to be tested in bulk, by the Admiralty authorities in England.

WHALE FISHERY.

This branch of Colonial Industry, which the Trophy is also intended to illustrate, has nearly regained the prominence in Tasmanian estimation which it occupied before the derangement of all industrial pursuits by the Gold Discoveries. The Fishing Ground of the Tasmanians reaches from their own shores to the Antarctic Regions—and is sufficiently well stocked to attract a large number of American Whale-ships, who frequently discharge, provision, and refit, at Hobart Town. There are now 25 vessels, with an aggregate tonnage of 5,746 tons, engaged in Whaling, from the Port of Hobart Town. The amount of Sperm Oil and Head Matter from the Southern Whale Fishery exported in 1861 amounted to 710 tuns, worth about £85 per tun, or £60,350. The greater portion of Tasmanian-caught Oil is sent to England, *via* Melbourne, and thus appears amongst the Victorian exports. The number of whale-boats attached to these 25 vessels is 81 in use, and 131 including spare boats. The boats suspended from the Trophy are two such boats—perfectly fitted with all gear, except line and oars, as when starting to capture a whale. Nobody who has not experienced the capabilities of the Tasmanian Whale-boats, manned with a good crew, can form any just conception of their behaviour in a rough sea. Each boat, such as those exhibited, when fitted with line, oars, &c., complete, costs about £70. The 131 boats of the little Tasmanian Whaling fleet represent a capital of £1,750, and find employment for about 700 men. Specimens of the Oil of the Sperm Whale, Black Whale, Black Fish, Porpoise, &c., together with the Head Matter of the Whale, will be found in the Trophy. The jaws of the Sperm Whale forming the apex of the Trophy (from two of Dr. Crowther's ships) will give some notion of the size of the fish which the crews of these boats have to capture. One of the Whales to which those jaws belonged, produced £1,150 worth of Oil, and the other £900 worth. It is not a very unfrequent occurrence for a whale to bite asunder one of these boats, when it is approaching to harpoon him—an operation requiring considerable nerve, strength, and skill, in boat management. Dr. Crowther recently had two boats destroyed in this way, by the same fish.

Whaling ships are usually fitted out on what is called the "lay" or share system—by which every man connected with the venture profits in proportion to the extent of his risk, and his more or less onerous position among the crew. The owner risks the ship and the outfit for a cruise of twelve or thirteen months. The officers and crew risk their lives, their time, and their labour. A ship of 250 tons register, with three boats in work, will be worth when fitted for sea, about £5,000. Should this vessel obtain 50 tuns of Sperm Oil, worth say £4,000, at £80 per ton, this sum of £4,000 would be thus divided :—

	£	s.	d.
Share of Captain	290	10	0
First Mate	187	8	0
Second Mate	80	0	0
Ship-keeper	31	0	0
Cook	31	0	0
Steward	31	0	0
3 Boat-steerers, £31 each	93	0	0
18 Men, £25 each	450	0	0
	1,193	18	0
Outfit, provisions, &c	1,500	0	0
Owner's risk, and wear and tear of ship	1,306	2	0
Total	4,000	0	0

This pursuit is not probably more remunerative to able seamen on the average than the common rate of wages, but to "ordinary" and "green" hands it is a good naval school, and offers the chance of something much better. Sixteen whales, yielding an aggregate of 1,400 barrels, or 140 tuns of Sperm Oil, value £11,200—were recently taken in one day (December 7th, 1861), in the vicinity of the Chatham Islands, by American and Colonial Whalers. This single day's work would have averaged nearly three times the profit above stated to all engaged. On the other hand, in adverse seasons, Whalers occasionally (but very seldom) come home "clean," or altogether destitute of oil. Whale-fishing is sometimes attended with great hardship—but being looked on as a colossal aquatic sport, and combining the excitement of bold and perilous adventure with the contingency of a good prize, and promotion according to merit, it has always been a favourite pursuit with the young Tasmanians—from whom might be selected some of the smartest boatmen in the world. It may not improperly perhaps be mentioned, as an instance of the occasional demand in the emergencies of new communities, for business habits and self-reliance—that nine of the above twenty-five whalers belong to a lady,—who, having some years since succeeded to the Whaling business of her late husband, has subsequently conducted it with consummate skill—and it is gratifying to add, with commensurate success.

It would seem that the Southern Whale Fishery, now that the Whales have become more wild and shy, is destined to fall into the hands of the Tasmanians, from the favorable position of this island as regards the Southern Ocean. No Whaling ships now hail from Adelaide, Melbourne, or New Zealand. In 1860 twelve Whaling ships belonged to Sydney, of which only three are now engaged in the trade. The Americans have to incur the increased expenditure of provisions, &c., of six unprofitable months out of the voyage—three months in reaching the Whaling Ground, and three months in returning, and are consequently at great disadvantage as compared with Tasmania.

MINERALS AND METALS.

The general character of the building stone of Tasmania may be ascertained from inspection of the series of illustrative specimens from different parts of the Island—which Mr. J. E. Calder, Surveyor-General of Tasmania, has been at great pains to collect. Tasmanian stone has been used in the erection of Public Buildings in Melbourne, as the best and most available in this part of the Globe. The church-font, grindstones, &c., of the stone of Point Ventenet, Taylor's Bay, Bruni Island, will shew the qualities of the stone which was exported in 1860 to the value of £5,095, principally to Melbourne. Amongst the mineralogical collection, some black and white marble from the Florentine Valley and from Chudleigh, where it is burned for the common purposes of lime—show by their texture and polish that Tasmania is not without the means of ornamental architecture. The Topazes from the Islands in Bass's Straits, when properly mounted, show great clearness and brilliancy. Some specimens of Serpentine veined with Asbestos from the Asbestos Hills, are found to bear a high polish.

GOLD.

The small portion of Tasmanian Gold exhibited has been collected by Mr. James Grant, of Fingal, within a few months, from the few diggers

who are surfacing and prospecting about Fingal. More Gold from that District is in the Hobart Town Banks, and might have been purchased for exhibition, but although, according to geographical and geological analogies, Tasmania *ought* to possess the precious metal in abundance—it has not yet been discovered in paying quantities, and the portion exhibited will give a fair notion of all the gold hitherto found. To stimulate exploration the Colonial Government has just offered a reward of £20,000 for the discovery of a payable Gold Field. Gold has been found, principally of the character of that exhibited, in many parts of the Island which are widely distant from each other. There are abundance of Quartz Reefs in the Fingal district more or less auriferous, some of which will probably eventually be found to pay for the crushing. Even if Gold should never be found in paying quantities in Tasmania she need entertain no mean jealousy of the superior auriferous productions of the neighbouring Colonies, as a fair portion of their Gold will probably ever find its way to Tasmania in exchange for products which Australia cannot produce. The prosperity of the Gold Colonies must be indirectly, if not directly, reflected on Tasmania, who is thus bound up in her material interests with their continued progress and success. Judging by the rate of production which has latterly prevailed, and the enormous extent of surface yet untried in the auriferous regions of Australia, it will be long before the supply of Gold shall be exhausted. But even Gold may be purchased too dearly. The discovery of a Gold Field attracts population only in proportion to the facility by which individuals may become rich; but if new Gold Fields are not continuously discovered—to keep up this standard of easy acquirement—the Gold-mining population soon over-run the average remunerating point, and the possession of a Gold Field may, in such case, prove rather "a mockery, a delusion, and a snare," than an element of solid and enduring prosperity;—necessitating heavy taxes and extravagant expenditure—and entailing individual loss and public debt. Happily, both Australia and Tasmania possess, in unsettled Districts and undeveloped resources, ample means of employment, more profitable than Gold-digging—to which the surplus population of the Gold Fields may advantageously apply themselves. The Gold-miner, ever on the move, now at Ballarat, now at Port Curtis, now at Dunedin, feels little interest in anything beyond the canvas of his tent, or the bounds of his "claim"—which does not relate to Gold.

The average profit of Gold-mining will be shewn by the following comparison of the number of miners employed, with the Exports of Gold at different periods, from Victoria, the most productive Gold Country in the World,—and the amount which fell to the share of each individual miner. These returns are taken from the Official Statistics of Victoria:—

Year.	Miners.	Gold Exported.	Each Miner.
		£	£ s. d.
1853	75,626	12,600,083	288 0 3
1857	132,167	11,046,113	99 12 4
1860	144,596	8,626,642	59 14 9½

A gold digging population wholly, is greatly dependent on the yield of the precious metal, and must always be a restless, irresponsible, and unsettled one. Some years since (1857) in Victoria no less than 140,892 persons out of a population of 410,766, or upwards of one-third, were living in

tents. In the election of 1860 in New South Wales, 3300 gold-miners were qualified to vote for the Western Gold District, of whom 398 only went to the poll. Within 25 years 543,261 persons (rather more than its present population) came into Victoria, and during the same period 264,390 persons, more than one-half the immigrants, went out of that Colony. That Victoria has managed to retain one-half of her visitors speaks well for the colony, which has given them profitable employment more lasting than gold-mining, and which can advantageously set to work any further number of diggers who may find themselves "redundant" in the more settled occupations of rural industry, which have recently experienced a healthful impulse in Victoria. That most important Colony seems to have a better chance of sound progress, now that the population is rapidly undergoing the process of sifting and settling, than it had probably at any former period. The result of the above table as to the individual yield of gold will hereafter be compared with the result of an equal amount of labour applied to Agriculture, Stock-keeping, and Horticulture.

OTHER METALS.

Galena and Copper Ore have been found in different parts of Tasmania but not hitherto in any considerable quantity. Iron ore abounds all over the Colony. At Ilfracombe, eight miles from the Tamar, there are immense masses of rich ore, similar to that now exhibited, which will doubtless, some day, prove highly advantageous to the colony, in connection with the vast coal-fields of the East Coast. It is said to be nearly identical with the Brown Hematite of Mittigong, in New South Wales, the working of which has recently been discontinued in consequence of the great expense of transporting it over some seventy miles of land carriage to the sea. A Tramway is already in operation at Ilfracombe from the vicinity of the ore to the water's edge, which circumstance may possibly enable these "hills of iron," as they have been called, to be profitably worked, when the same description of ore, less favourably situated could not be made to pay.

Commissioner Biggs, who was deputed to report on the resources of these Colonies in 1823, and whose report was printed by the House of Commons, thus writes on the iron ore of Ilfracombe:—

"At the distance of eight miles from Port Dalrymple (the Tamar) in "Van Dieman's Land, considerable quantities of iron ore have been dis- "covered on the surface, which upon analysis in this country, have been "found to consist of pure protoxide of iron (similar to the black iron ore "of Sweden) and furnishing a very pure and malleable metal."

PASTORAL, AGRICULTURAL, AND HORTICULTURAL PRODUCTS.

Count Strzelecki in his excellent work on New South Wales and Van Dieman's Land, draws a comparison between the Agricultural capabilities of the two countries on scientific data, founded on the origin of their respective soils. Exploration and analysis had shown that the crystalline rocks (such as granite) as compared with the sedimentary rocks formed in the area of N. S. Wales a proportion of 3 to 1, whilst in Tasmania they were 7 to 1. Of rocks containing more than 60 per cent. of Silica as compared with rocks having less than 60 per cent., N. S. Wales has a proportion of 4·1 to 1, whilst in Tasmania the case is

reversed, the sixty per cent. rocks forming a proportion of only 1 to 3. Strzelecki traces this difference to volcanic agencies, which have been more prevalent in Tasmania than on the Australian Continent. He adds :—

"Indeed, the torn, rugged, furrowed, and contorted surface of the former colony bears ample witness to the formidable revolutions produced by the eruptive greenstone and basalt, overwhelming in succession different members of the series, which then composed the consolidated crust, and sweeping away and burying a vegetation, of which no living traces are now left on the island.

"But these changes have served only to render this island one of the most eligible spots on the face of the globe for the pursuits of agriculture: the irrupted greenstone yields an excellent soil, and the zigzag course of the chain of mountains forms naturally flat-bottomed valleys, between which rises a table-land about 3800 feet, enclosing in crateriform lakes five reservoirs of water, covering, if the surface were united, an area of 200 square miles, and capable of irrigating all the adjacent lands available to cultivation."

After describing the Pastoral character of N. S. Wales, Strzelecki states :—

"In Van Dieman's Land, the agricultural districts are superior in appearance to those of New South Wales. The details of farms and farming are better understood and defined, and the practical results are such, that no country reminds the traveller so much of the *old one* as Van Dieman's Land. There, the tasteful and comfortable mansions and cottages, surrounded by pleasure-grounds, gardens and orchards, the neat villages, and prominently placed churches, forming as it were the centres of cultivated plains, divided and subdivided by hedgerows, clipped or bushed, and though which an admirably constructed road winds across the island, are all objects which forcibly carry back the mind to similar scenes of rural beauty in England and Scotland."

Those observations, have been very much corroborated by subsequent experience. Van Dieman's Land was for many years subsequent to the settlement of South Australia "the granary of the Australias," and she has continued to export grain in considerable quantities both to Victoria and New South Wales.

The great forte of these Colonies lies in their Pastoral capabilities. The following table comparing the Live Stock with the Population of Victoria, New South Wales, and Tasmania, in 1860, will shew the number (fractions omitted) of Stock per individual in each Colony.

LIVE STOCK, 1860, TO EVERY HEAD OF THE POPULATION.

	Victoria.		N. S. Wales.		Tasmania.	
	Popl.	Live Stock.	Popl.	Live Stock.	Popl.	Live Stock.
Horses	7	1	1	1	4	1
Cattle	1	1	1	6	1	1
Sheep	1	10	1	17	1	18

It will be seen by this Table that in 1860 Tasmania grew nearly double the quantity from a less number of acres than she produced in 1841.

In Victoria where Native Agriculture is greatly fostered and has recently greatly increased, the very best lands only are yet cultivated. New South

AGRICULTURAL PRODUCE, COMPARATIVE YIELD PER ACRE, OF TASMANIA, VICTORIA, AND NEW SOUTH WALES.

Year.	Wheat.			Barley.			Oats.			Potatoes.		
	Acres.	Bushels.	Per Acre.	Acres.	Bushels.	Per Acre.	Acres.	Bushels.	Per Acre.	Acres.	Tons.	Per Acre. Tons. Cwt.
Tasmania. 1841	63,734	881,318	13	9,010	167,458	18	6,471	339,786	14	4,185	14,138	3 7
1860	66,450	1,415,896	21	6,238	126,635	20	30,303	926,418	30	7,621	33,589	4 8
Victoria. 1860	107,093	2,296,137	21	4,102	98,433	24	90,167	2,555,637	28	27,622	48,967	1 1
N. S. Wales. 1860	128,929	1,581,597	12	2,860	39,801	13	6,534	98,814	15	9,228	26,127	3 1

Wales, in Agricultural yield, is about equal to the point reached by Tasmania in 1841. There is, indeed, still scope for the industry of the corn-exporting Colonies South Australia and Tasmania. In 1860 neither New South Wales nor Victoria grew half enough bread-stuffs for her own consumption.

COLONIAL STATISTICS.

The following table compiled from Official Public Documents will shew the position of Tasmania, in some important particulars, as compared with the two neighbouring Colonies.

1860	Victoria.	Per Head of Population.	N. S. Wales.	Per Head of Population.	Tasmania.	Per Head of Population.
Population	548,412	£ s. d.	348,546	£ s. d.	87,778*	£ s. d.
Public Debt	£ 12,196,915	22 2 7	£ 3,830,890	11 0 0	£ 399,560	4 8 9
Taxation	£ 2,938,972	5 13 8	£ 1,880,508	5 7 10	£ 286,957	3 3 9
Mortgages on Land, Wool, and Stock	£ 3,450,573	6 5 1	£ 2,609,120	7 9 8	£ 236,418	2 12 6
Savings Bank Deposits	£ 484,519	0 16 2	£ 557,659	1 0 6	£ 222,107	2 9 4
Acres Cultivated	A. r. p. 338,727 0 2 24		A. r. p. 260,798 0 2 39		A. r. p. 218,315 0 2 0	
Acres Sold (1860)	£ 492,247	0 3 23	£ 109,216	0 1 33	£ 87,004	1(nearly)
Price per Acre	£ s. d. 1 6 11		£ s. d. 1 9 0		£ s. d. 1 4 2	

* The Population of Tasmania by the Census of April, 1861, was 89,977.

CLIMATE, PUBLIC HEALTH.

An elaborate Article on the Meteorology and Sanatory Condition of Tasmania, by Dr. E. S. Hall, will be found in the Appendix.

NATIONAL SPORTS—THE CARNIVAL WEEK.

The genius of a people may generally be judged of by their public sports. The Tasmanians, in December last, offered a prize of £500 for a Champion horse race. To this attraction was added a £200 prize for a yacht race, and £100 for a whale-boat race. Various minor prizes brought up the sum total raised by public subscription to about £2,000, which prizes were thrown open to all competitors, and the public sports lasted a whole week, during which nearly all business was suspended. The interest in the contests of this "Carnival Week" was intense, for Tasmania possesses some of the best English racing blood; a little flotilla of private yachts may generally be seen moored off Hobart Town, and the whale-boat in rough water is to the young Tasmanian as the Desert Horse to the Arab. A clever Tasmanian journalist* did no more than give expression to the genuine enthusiasm of the people when he thus wrote. "Horse-racing is traditionally, and by inveteracy of habit, an English sport, a national pastime; and we are ashamed of the Englishman who is ashamed of it. It has always been a popular sport amongst heroic people, but has never taken root so thoroughly in any national soil as in our own Old Home. * * * * There is another pastime quite as national, and quite as congenial to our habits. If an Englishman is at home on the back of a horse, he is equally so when floating on the waves, dashed by the spray, and tossed about by the rough winds of ocean. We came from a line of old Sea Kings; we are essentially a people of maritime enterprise; we are prouder of Britannia with her trident, than of the Lion and Unicorn. There is no air so pleasant to the nostrils of an Englishman as that laden with the odours of the sea."

The result of these spirited intercolonial contests was not discreditable to Tasmania. The Champion Turf Prize was won by Mr Henderson's "Mormon," a Victorian horse, but two Tasmanian horses "Shelalagh" and "Panic," both owned by Mr. Blackwell, ran second and third—beating the best horses of New South Wales, South Australia, and Western Australia.

In the Champion Sailing Match (prize £200,) for Yachts under 35 tons, two Tasmanian vessels, the "Maggie Laurie" (Ross), and the "Secret" (Chandler), came in first and second—the "Surprise" (belonging to the Sydney Yacht Club) being third. The Tasmanian Prize (£100), for whale-boats—similar to those suspended from the Tasmanian Trophy—was carried off by a fine picked crew from the Sydney boatmen (having a native Tasmanian coxswain) who pulled with light, broad, smooth-water paddles, instead of the heavy oars generally used in rough sea whaling. The following comments on these exciting contests deserve a wider promulgation.

"The reaction that has set in, in favor of open air and gymnastic exercises, which is a curious and interesting phase of the present-age civilization of the mother country, is still more marked in these colonies.

*Mr. Bright, *Hobart Town Mercury.*

There is surely some significance in the fact that the people of Australia, as a general rule, have the leisure and the means to take frequent holiday. Talk as we may about depression and poverty, it is impossible to witness the spectacle of a people wholly given up to enjoyment, not for a day, but during a week: not on one occasion, but on many throughout the year; without feeling that there is an essential difference between their condition and that of the classes corresponding to them in either of the three kingdoms. What impression must have been produced upon the mind of a stranger just arrived from one of the manufacturing or agricultural districts of England, as he saw yesterday from a steamer on the Derwent, the thousands of persons of all degrees who crowded the Domain, on no care intent but to enjoy fine weather and witness pleasant sights; who walked through the deserted streets of the city and saw warehouses and shops closed, and all the operations of industry suspended; and who learnt that it was the Friday of a week almost every previous day of which had been in some way devoted to the same task of pleasure seeking! He would surely conclude that he had come amongst a people with whom the conditions of life were easier, than with the struggling mechanics and laborers of lands where a half-holiday, enjoyed once or twice a year, has to be purchased by long pinching and over-work. No thoughtful mind can doubt that even in this colony, which is held to compare unfavorably with others in point of material prosperity, the severity of toil which leaves little opportunity of recreation is comparatively unknown.

"The time dedicated to public pastimes is a satisfactory proof of our practical interest in that physical education, which tends so much to the development of a true manliness of character."

Cricket has ever been a favourite game in Tasmania, which contains many settlers from the South of England, who talk warmly of the halcyon days of English pastime,

> "When the good old Kent Eleven, full of hope and pluck, began
> The battle with All England—single-handed—man to man."

On the recent visit of the "All England Eleven" to Australia, that instinctive desire to try their mettle against superior odds, which is alike the most healthful attribute of competitive emulation, and the best guarantee for future excellence, urged the cricketers of Tasmania to invite them to a friendly match. They "came, saw, and conquered," as they did in every case, save one; but the Tasmanian Twenty-two made a higher score (250) than had been made by any other twenty-two of any other colony. One of their batsmen—Mr. Whitesides—made the highest score (50) of any single Australasian against All England, and a Tasmanian bowler (Mr. Spicer) brought down the wicket of the celebrated Caffyn, who is said not to have been previously bowled out for several years. The Englishmen expressed themselves pleased with their frank and hearty reception, with the truly English character of the Colony, with its resuscitating climate, and with the fair and manly play of their aspiring competitors.

Enough has been said of Tasmanian *manly* sports. A word is due to the amusements of the more retiring sex. The Whaling enterprise of Mr. Seal has been noticed as illustrative of the more stern occasional requirements of Colonial life—but a reference to the drawings of Mrs. Charles Meredith and Mrs. Allport, the embroidery of Mrs. Burgess, the *bouquets* of sea-weed and shell-work of Miss Collins and of Mrs. Cook, the wax fruit models of Mrs. Luckman, and the ornamental feather-work of Mrs. Crowther, senr., all on purely Tasmanian subjects—will amply prove that

whilst cultivating business habits of practical utility, the fair Tasmanians by no means undervalue those pleasing and elegant accomplishments which diffuse an atmosphere of cheerfulness around the enjoyments of home, and elevate and purify the graceful amenities of social life. On the point of personal attractions the evidence of numerous, trustworthy, though not perhaps impartial, witnesses might be adduced. Colonel Munday thus writes ("The Antipodes," vol. 2) of a ball which he attended here at Government House:—"For an hour or two dancing was kept up exclusively by children, amongst whom were many beautiful specimens of rising Anglo-Saxons, for the rearing of whom the climate is evidently very favourable. The same must be said of human plants of more advanced growth. *I saw in five minutes, this night, more fair faces tinged with the English rose than I had seen in New South Wales in as many years.*"

An apology is due for the brevity with which many interesting points have necessarily been treated in this *brochure*. Had the occasion permitted a volume might have been written on many matters yet untouched. It is hoped, however, that this rapid sketch may convey some idea of the physical characteristics, the material resources, and the moving life and manners of Tasmania. Taken with the collection of Tasmanian Products, it will at least serve to show what a comparative handful of earnest and self-reliant men, with a fine climate and fine country can manage to do, in blending the free and lasting institutions of their forefathers with the energetic habits and improvements of a riper age.

GEORGE WHITING,

Secretary to the INTERNATIONAL EXHIBITION COMMISSION for Tasmania.

P.S.—Unavoidable circumstances compel the postponement till the next Edition of some remarks on the Wheat, Timber, and Wool of Tasmania, (which all gained Prizes at London and Paris in 1851 and 1855,) on Horticulture, Public Education, the Land Selling System, &c.

APPENDIX.

NOTES ON THE VEGETABLE PRODUCTS OF TASMANIA,

AT THE

INTERNATIONAL EXHIBITION FOR 1862,

BY WILLIAM ARCHER, F.L.S.

TIMBER.

The principal timber trees of Tasmania, such as the Blue Gum, Stringy Bark, White Gum, or Gum-topped Stringy Bark, Swamp Gum, and Peppermint Tree, —furnish a hard, close-grained, and strong timber, which is used in ship-building and house-building, and generally for all the purposes to which Oak is applied in England. Huon Pine is very durable, and is employed for boat-building, for which it is peculiarly adapted, and for house-fittings, &c. Blackwood makes excellent naves and spokes, cask staves, &c. Native Myrtle is valuable for house-fittings. Swamp Gum yields the finest palings and other split-stuff in the world. Sassafras affords timber for house fittings, bench-screws, lasts, &c. Celery-topped Pine is chiefly used for masts and ship's spars. The different kinds of timber in the following list are arranged according to their value. The diameter of the trees is measured at the height of 4 feet from the ground.

Blue Gum.—(*Eucalyptus Globulus*, *Lab.*)—The common name is derived from the bluish-grey color of the young plants. Diameter, 5 to 30 feet; average of those felled for use, 6 feet. Height, 150 to 350 feet; sp. grav. about ·945 to 1.055. Abundant in the southern and south-western parts of the Island. Cut for house-building it sells at 8s. to 10s. per 100 superficial feet—for ship-building at 12s. to 14s.

Stringy-Bark.—(*Eucalyptus Gigantea*, *Hook. fils.*)—Common name taken from the coarse fibrous bark. Diameter, 4 to 24 feet; average of those sawn about 5½ feet. Height, 150 to 300 feet. Sp. grav. about ·905. Abundant everywhere upon hilly ground. Price, the same as that of Blue Gum.

Swamp Gum.—White Gum.—(*Eucalyptus Viminalis*, Lab.)—Common names from its growing to perfection in humid situations—and from its gigantic white trunk. Diameter, 4 to 18 feet; average about 5½ feet. Height, 150 to 300 feet; sp. grav. about ·885. Growing in forests with other kinds of *Eucalyptus*, in rather humid localities. A small variety called the Manna Tree, grows abundantly about Hobart Town and in other places, on dry ground. Price, for general purposes the same as that of Blue Gum; 5-feet palings, 6s. to 8s. per 100.

Gum-topped Stringy Bark, sometimes called White Gum.—(*Eucalyptus Gigantea*, *var.*)—A tree resembling the Blue Gum in foliage, with rough bark similar to Stringy Bark towards the stem. It has been found recently that this wood possesses nearly all the properties of strength, solidity, and durability of the Blue Gum—whilst being straight-grained, it is much easier to work. It is very abundant about D'Entrecasteaux Channel. An old plank from the Hobart Town Wharf, which has been twenty years in use, may be seen in the Trophy. Price, about the same as Blue Gum.

Peppermint Tree.—(*Eucalyptus amygdalina*, Lab.)—Common name from the odor of the leaves. Diameter, 3 to 8 feet; average about 4 feet. Height, 100 to 150 feet; sp. grav. about ·895. The Peppermint Tree abounds throughout the Island on gravelly and other poor soil. Price, about the same as that of Swamp Gum.

Huon Pine.—(*Dacrydium Franklinii*, Hook. fil.)—So-called because it was first discovered on the banks of the Huon River. Diameter, 3 to 8 feet; average about 4½ feet. Height, 50 to 120 feet; sp. grav. about ·650. Abundant in portions of the south-western part of the Island. Price, about 16s. per 100 superficial feet, in the log.

Blackwood.—(*Acacia Melanoxylon*, Br.)—So called from the dark-brown color of the mature wood, which becomes black when washed with lime-water. In moist shaded localities the tree grows more rapidly, and the wood is of a much lighter color. Hence this variety is called "Lightwood," (in Hobart Town), to distinguish it from the other. Diameter, 1½ to 4 feet: average, about 2½ feet. Height, 60 to 130 feet. Sp. grav., about ·885. Found throughout the island, but not abundantly in any one locality. Price, about 12s. to 14s. per 100 feet super., in the log.

Native Myrtle.—(*Fagus Cunninghamii*, Hook.)—Common name from the fancied resemblance of its dark-green leaves to those of the myrtle. Diameter, 2 to 9 feet: average, about 3½ feet. Height, 60 to 180 feet. Sp. grav. about ·795. The Native Myrtle exists in great abundance throughout the western half of the island, growing in forests to a great size, in humid situations. Price, about 16s. per 100 feet super., in the log.

Celery-topped Pine.—(*Phillocladus rhomboidalis*, Rich.)—So called from the fancied similarity in form of the upper part of the branchlets to celery. Diameter, 1½ to 2 feet: average, about 1½ feet. Height, 60 to 150 feet. Sp. grav about ·655. Rather common in damp forests in the southern parts of the Island, and in some sub-alpine localities.

ORNAMENTAL WOODS.

The different kinds of wood included in the following list are all in constant use for cabinet and fancy work. They are arranged according to their value. The finest specimens of Native Myrtle, Musk-wood, Huon Pine, and Black-wood, exhibit qualities of the highest excellence, both in tint and variety of venation.

Native Myrtle.—(*Fagus Cunninghamii*, Hook.)

Musk-wood.—(*Eurybia Argophylla*, Cass.)—Named from the musky odor of the plant. Diameter, 6 to 15 inches—the butt enlarging towards the ground to 1½, and even 2½ feet. Height, 15 to 30 feet. Spec. grav. about ·685. Abundant throughout the island in damp localities.

Huon Pine.—(*Dacrydium Franklinii*, Hook. fil.)

Black-wood.—(*Acacia Melanoxylon*, Br.)

Shee-oak.—(*Casuarina quadrivalvis*, Lab.)—A portion of the common name is evidently derived from the resemblance of the markings to those of oak. Diameter, 1 to 1½ foot. Height, 20 to 30 feet. Spec. grav. about ·845. Very common on dry stony hills, excepting in the north-western districts.

He-oak.—(*Casuarina suberosa*, Otto.)—Diameter, 9 to 15 inches. Height, 20 to 25 feet. Spec. grav. about ·855. Common on stony hills.

Honeysuckle Tree.—(*Banksia Australis*, Br.)—Named from the large quantity of honey in the flowers. Diameter, 1½ to 2½ feet. Height, 20 to 40 feet. Sp. grav. about ·645. Abundant on sandy soil.

Dogwood.—(*Bedfordia salicina*, D.C.)—Diameter, 6 to 16 inches. Height, 15 to 25 feet. Sp. grav. about ·985. Common of small size, but rare of large proportions.

Native Laurel.—(*Anopterus glandulosus*, Lab.).—So named from its laurel-like leaves. Diameter 6 to 10 inches. Height, 15 to 22 feet. Sp. grav. about .675. Tolerably abundant in some sub-alpine localities.

Blue Gum.—(*Eucalyptus globulus*, Lab.)—Curly-grained variety.

Peppermint.—(*Eucalyptus amygdalina*, Lab.).—Some specimens of this timber have a fine wavy marking.

USEFUL WOODS.

Silver Wattle.—(*Acacia dealbata*, Lindl.)—So called from the whiteness of the trunk, and the silvery green of the foliage. Used for cask staves and treenails. Diameter, 1½ to 2½ feet. Height, 60 to 120 feet. Sp. grav. about .795. Very common.

Iron Wood (Tasmanian).—(*Notelæa ligustrina*, Vent.)—An exceedingly hard, close-grained wood, used for mallets, sheaves of blocks, turnery, &c. Diameter, 9 to 18 inches. Height, 20 to 35 feet. Sp. grav. about .965. Not uncommon.

Swamp Tea-tree.—(*Melaleuca ericæfolia*, Sm.)—So called, probably, because the leaves of an allied plant (*leptospermum lanigerum*, Sm) with similar bark, are said to have been used as a substitute for tea. Diameter, 9 to 20 inches. Height, 20 to 60 feet. Sp. grav. about .824. Used for turnery chiefly.

Native Cherry.—(*Exocarpus cupressiformis*, Lab.)—So named because the color of the fruit is similar to that of a Kentish Cherry. Diameter, 9 to 15 inches. Height 20 to 30 feet. Sp. grav. about .783. Used for tool handles, spokes, gun-stocks, &c.

White-wood.—(*Pittosporum bicolor*, Hook.).—Wood white. Diameter, 8 to 13 inches. Height, 20 to 35 feet. Sp. grav. about .875. Used in turnery. Probably fit for wood engraving.

Native Box.—(*Bursaria spinosa*, Cav.).—The leaves are somewhat like those of the English Box. Diameter, 8 to 12 inches. Height, 15 to 25 feet. Sp. grav. about .825. Used for turnery.

PINK-WOOD.—(*Begeria viscosa*.—*Croton viscosus*, Lab.)—Diameter, 6 to 10 inches. Height, 15 to 25 feet. Sp. grav. about .815. Used for sheaves of blocks, and for turnery.

NATIVE PEAR.—(*Halva lissosperma*, Br.)—The woody seed-vessel is somewhat pear-shaped. Diameter, 8 to 12 inches. Height, 29 to 30 feet. Sp. gravity about .675. Fit for turnery.

SCENTED WOODS.

TONGA BEAN WOOD.—(*Alyxia buxifolia*, Br.)—The odor is similar to that of the Tonga Bean (*Dipteryx odorata*). A straggling sea-side shrub, 3 to 5 inches in diameter.

NATIVE BOX.—(*Bursaria spinosa*, CAV.) The scent is pleasant but fleeting.

TANNING BARK.

WATTLE BARK.—The bark of the Black Wattle (*Acacia mollissima*, Willd), the Silver Wattle (*Acacia dealbata*, Lindl.), and the Blackwood Tree (*Acacia melanoxylon*, Br.). The first named yields the most valuable bark, and is common on dry stony hills.

F I B R E S.

CUERAJONG.—(*Plagianthus sidoides*, Hook.)—The fibres of the bark are very strong. It is a large shrub, found chiefly on the southern side of the island, in ravines and shady places, and grows rapidly.

LYONSIA.—(*Lyonsia straminea*, Br.)—Fibres of the bark fine and strong. The Lyonsia is met with, rather sparingly, in dense thickets with its stems hanging like ropes among the trees.

BLUE GUM.—(*Eucalyptus Globulus*, Lab.)—The bark of this immense tree yields a fibre which may, probably, be found available for making the coarser kinds of paper.

STRINGY-BARK.—(*Eucalyptus Gigantea*, Hook. fil.)—The fibres of the bark are similar to those of the Blue-Gum bark, but are not so strong, or so fine.

FIBROUS GRASS.—(*Stipa Semi-Barbata*, Br.)—After the seed has ripened the upper part of the stem breaks up into fibre, which curls loosely and hangs down waving in the wind. The condition of the fibre at this time is undoubtedly far inferior to what it would be if rightly prepared. Common in some localities.

G U M.

KINO.—This gum, which seems to have similar properties to those of the East Indian "kino," exudes from the woods of all the Tasmanian species of *Eucalyptus*.

WATTLE GUM, the gum of the Silver Wattle.—(*Acacia dealbata*, Lindl.), is exceedingly viscous, and, probably, quite as useful as Gum Arabic. The gum of the Black Wattle (*Acacia Mollissima*, Willd.), which is often mixed with the other, is very inferior to it, being far less viscous.

SUNDRY PRODUCTS.

PRICKLY FERN TREE.—(*Alsophila Australis*, Br.)—This very handsome Fern Tree occasionally attains a height of 30 feet. It is not, by any means, so common a Fern Tree as *Dicksonia antarctica* (Lab.).

PITH OF RUSHES.—This is the pith of the largest Tasmanian rush (*Juncus caginatus*, Br.) It is not rare. This pith is made up, in Hobart Town, into head-dresses.

GELATINOUS SEAWEED.—(*Gracilaria* sp.)—This Alga, which may, perhaps, be regarded as a variety of *G. confervoides* (Grev.), is occasionally used for making jelly. It abounds on the shores of Sloping (or Slopen) Islands, in Frederick Hendrick Bay.

NATIVE BREAD.—(*Mylitta Australis*, Berk.)—An insipid, under-ground fungus, which sends up no stem, and is generally met with by accident. When growing rapidly it sometimes causes the ground to crack, and may thus be discovered by a careful observer, as it probably was by the Aborigines, who used it as food.

CLIMATE AND HEALTH OF TASMANIA

BY E. SWARBRECK HALL,

Licentiate in the Science and Practice of Medicine, Member of the Royal College of Surgeons of England, Honorary Member of the Medical Society of Victoria, Honorary Corresponding Member of the Statistical Society of London, &c., &c.

"A sound body is better than immense revenues."
"There are no riches above the riches of the health of the body; and there is no pleasure above the joy of the heart."
"Better is a poor man who is sound and strong of constitution, than a rich man who is weak and afflicted with evils.—ECCLESIASTICUS."

THE space allotted to the elucidation of this subject in the Tasmanian Exhibition Pamphlet is too limited to permit me to do more than briefly allude to the endeavour of Medical Philosophers from the earliest ages—beginning with the father of Medicine himself, Hippocrates,—to establish on sound data, the intimate connection between climate and health. In all subsequent times the labourers in this interesting and important research have been many, but only within the last quarter of a century have the enquiries culminated in any remarkable success. From the date of the application of the science of numbers—statistics—to cosmical variations, and vital phenomena and disease, are the grand triumphs of modern hygiene to be dated. The facts and figures collected, arranged, expounded, and disseminated by the Registrar-General of England, and his numerous coadjutors of the medical profession, were the great levers which enabled sanitary reformers to effect their brave and bloodless victories. Dr. William Farr has been the "thaumaturgus"—the wonder-worker—of the age we live in; and the figures he has arrayed, and the centres of disease-breeding he has indicated, with the unsparing exposure of their origin in the neglect of Nature's own sanitary teachings, has opened an entirely new sphere for medical practice. The master-minds of the profession are now assuming the first duty of medical skill to be to prevent disease. The curative department is rapidly becoming a secondary branch in the exercise of medical science. Wherever these new principles—new at least comparatively to any extent in practice—have been fairly acted upon, human lives have been saved by thousands. We now scrutinize suspiciously every mortuary record where the deaths exceed a certain assumed normal standard. No longer can the unphilosophical *ci-devant* safely mask their ignorance and attribute excessive mortality to recondite causes, or take shelter in vague generalities, and the untangible mystic influences of the weather.

Meteorologists, by the use of improved instruments and carefully conducted observations, with accurate long continued records scientifically tabulated, have given invaluable data for sanitarians to reason from, and to aid them in constructing their reforming operations.

Tasmania has had peculiar advantages over most other Colonies, from having been selected as one of the localities for a Magnetical and Meteorological Observatory, at the suggestion of the British Association. From 1841, when the observations were commenced in the immediate vicinity of Hobart Town by Sir James Ross, up to 1854, a continuous series of meteorological facts were registered. For eight years, out of the fourteen, hourly observations both by night and day were made by instruments and observers entitled to the highest confidence. Two large volumes of the records then made, have been edited by General Sabine, and printed, published and circulated. The third volume, now many years overdue, in which the peculiarities and advantages of the Tasmanian climate were promised to be elaborated by Professor Dove of Berlin, is yet wanting to complete this desideratum to meteorological science. To those in Tasmania who have long yearned for its appearance, the delay of publication has been a constant source of regret.

When the Ross-bank Observatory was closed, observations were continued by Mr. Francis Abbott at his private Observatory in an open garden in the central Valley of Hobart City, 37 feet above the sea level, and about quarter of a mile above tidal influence. The best instruments that the most esteemed London makers could furnish, have been used, and the results every month tabulated, and presented to the Royal Society and printed. When 1860 had completed a twenty years' continuous series of Meteorological records, Mr. Abbott zealously devoted much time in compiling and combining all the data into "40 Tables," which, under the patronage of

the Governor Sir H. E. F. Young, and the Council of the Royal Society, have been printed and published at the Government Printing Office, in a manner highly creditable to Tasmanian typography. Having lent my assistance in the preparation of this work, and being familiar with the subject from my twenty-eight years' residence in the Island, and constant study of meteorology in many parts of it, I shall, in this article, make use of Mr. Abbott's Tables as the ground work of my observations on the climatological division of my essay. Sir Thomas Maclear, in charge of the Observatory at the Cape of Good Hope, and so deservedly eminent as an Astronomer and a Meteorologist, in acknowledging the receipt of a copy of Mr. Abbott's work, pronounces it to be:—"A standard of reference, leaving nothing to be desired for the climate of Tasmania."

Situated as Tasmania is in the temperate zone, between the 40th and 44th degrees of latitude, in the Southern Pacific, with an almost boundless extent of ocean on its Southern, Western, and Eastern aspects, and separated from the Australian Continent by a wide Strait; had not the Island enjoyed a highly salubrious climate, it must have arisen from local causes. On the contrary, its local topography tends much to enhance its geographical advantages. The Island has an undulated surface throughout; its highest mountains only attain a height exceeding 5,000 feet in two instances; the Country rises from all its shores gradually to its central water-shed, along which is arrayed a chain of lakes that give origin to the principal rivers of the Island. These rivers generally have a rapid fall, and marshes are entirely exceptional. Nevertheless, as in all Islands of this configuration, there is considerable variety in the meteorological phenomena in different localities. The Northern side of the Colony has a warmer and moister climate than the Southern, and the Western has a more stormy and rainy character than the Eastern shores. But allowing for these, and differences in altitude, Hobart Town exhibits a fair climatic type for the whole of Tasmania. There are no volcanoes, and I have never noted any symptoms of earthquakes, though others have observed slight shocks which they believed to originate in these causes.

The mean atmospheric pressure of the 20 years' records, is 29·808 inches. (The height of the Ross-bank Observatory above the sea level differing only a few feet from Mr. Abbott's). The extremes of annual means, were:—Lowest, 29·696 for 1856; highest, 29·944 for 1860. April of all the months has the highest mean, 29·885; January the lowest, 29·715. The greatest pressure ever noted was 30·812 in July 1846; the smallest 28·518 in July 1857; the extreme divergence in the 20 years, being therefore 2·302 inches. The widest range in any twenty-four hours, 1 p.m. to 1 p.m., within the last eight years, from the present month of March 1862, was a rise of the barometer of + 1·014 inches in January 1856. The extreme range during any month in the same period was 1·649 inches in May 1855.

As every variation of one inch in the Barometer indicates a difference of nearly half a ton of pressure on the adult human body, it is easy to understand that rapid and extensive fluctuations of pressure must have a marked influence on health. In my monthly "Health Reports" I have frequently demonstrated this influence, in its effects upon diseases of the brain, and the organs of circulation and respiration. A continued high atmospheric pressure when accompanied with a stagnant state of the air, is characteristic in this island, as Mr. Glaisher has shown it to be in England, of an epidemic constitution of the air. It is a very unusual occurrence, nevertheless, in Tasmania, but was signally exemplified in June and July, 1860, when an epidemic influenza ravaged all the Australasian Colonies, and proved so destructive to aged and infirm people.

The mean temperature, deduced from the 20 years' observations, is 54.92 degrees. For the 14 years at Ross-bank Observatory only, the mean was 53.09. "The mean annual temperature from the result of eight years hourly observations, 1841 to 1848," Captain Kay, R.N., F.R.S., who had charge of the Observatory, states to be "53.43," and the "Mean Annual Temperature from observations with the max. and min. thermometers in 1849, '50, '51, '52—53.32 degrees." So close an approximation of results have not been noticed at Mr. Abbott's Observatory. The means of the maxima and minima thermometers average about one degree higher than those of the observations, at 7 a.m., 1 p.m., and sunset. Sometimes, as in last month, they correspond within a few hundredths of a degree. Some observers here, and Mr. Abbott amongst them, are inclined to attribute the higher means since 1854 to the place of observation being within the influence of the warmer air in the City. I do not agree in this opinion, for I have remarked a similar increase in the temperature in places, not subject to such influences; and Sir Thomas Maclear's Tables for the Cape of Good Hope, support my view, that we are now subjected to one of the cycles of

higher temperature, which has been spoken of by Sir John Herschel. January has the hottest mean of any month in the year;—63.57. July has the coldest mean;—45.82. 1855 was the hottest year;—58.58, and the coldest was the very unusually wet year 1849, the mean temperature of which was only 50.98. The 20 years' range consequently was 7.60 degrees. The greatest mean for any month was 71.10 for January, 1856; the smallest was 42.57 for July 1841. The highest temperature in the shade for any day ever recorded was 105 degrees in January, 1849. In February, 1847, 100 was noted; in December of the same year, 103; in December, 1859, 102 was recorded. No other registers of 100 or upwards have been made. In the whole period of now 21 years, the thermometer has only risen to 90 and above 44 times. These have all occurred with North and North West winds, coming from the arid continent of Australia, called hot-winds, but much mitigated in their force and heat by the happy insular position of Tasmania. Hot winds have been known to endure for three days in succession, but with a diminution of 20 to 30 degrees during the night. The usual duration, however, in this island seldom exceeds 6 to 12 hours, and is succeeded by cool refreshing showers, with electrical discharges and thunder. The lowest shade temperature ever registered was singularly enough in the same year as the highest, 1849—it was in the month of July, and 29.4 degrees. But in the past 21 years the Thermometer sank to freezing point or below it, only 31 times. In 1861, the Minimum self-registering Thermometer never fell below 34. In England the cold of Winter is the most fatal to human life. In Tasmania the Winter season is the most genial and salubrious. Snow rarely falls in Hobart Town, and was never known to remain on the ground for 24 hours. In a small township on the summit of the Water-shed, where it intersects the Main-road of the Island, I have known it to remain three days, and nearly a foot in depth, but it was in the cold, wet, exceptional year of 1849. In Hobarton ice rarely attains the thickness of a penny-piece, and only once do I remember it to have been thick enough in any of the settled districts of the interior to bear my weight. Agricultural operations, therefore, are scarcely ever suspended by the inclemency of the weather from this or other causes. The daily range of temperature is the only weak point, in the every other respect, generally delightful and salubrious climate of Tasmania. The 20 years' mean of daily range is 18.16 degrees, which, of course, greatly exceeds that of England. January, the hottest month, has also the widest daily range, 20.75 degrees. December, February, and March have all, also, a mean above 20 degrees. May, June, and July have nearly the same mean, 15.50 to 15.35 degrees. The year of greatest range was 1855—22.15 degrees. 1852 had the smallest mean—14.9 degrees. Of months, January exhibits the extreme mean of daily ranges. 1841 had 25.5, and 1856 and 1862, nearly the same. July 1849 had the smallest mean of any month on record, 8.7 degrees. The greatest range of the Thermometer that ever occurred in any 24 hours was 51.9 degrees in January, 1849; and in February, 1856, there was a day that had a range of 51 degrees. Of course the extremes of heat and cold are recorded from the self-registering maxima and minima Thermometers in the shade in the open air. Solar heat has only been registered since the commencement of 1856. The instrument used is self-registering, with the black-bulb Thermometer inclosed in a glass tube. The mean for the six years is 93 degrees. 1856 had 104, and 1858 only 89. January's mean is the highest—111. July the lowest, 76. January, 1856, mean was 127, being much higher than any other on record. June and July 1859, had the lowest—73. The greatest Solar intensity ever noted on any day was in February, 1857, 143, and the next 133, was one day in December, 1859. The day in February, 1857, referred to, was marked by many sudden deaths. It is remarkable that diseases of the "Brain and nervous system" give more deaths, in proportion to the total from all causes, in Tasmania, than in either Victoria or New South Wales. Count Strzelecki long since drew attention to the fact of the Solar-intensity being greater in this Island than even in New South Wales, owing to the greater diaphaneity of the atmosphere in Tasmania. The haze which usually accompanies the intense heat on the continent of Australia very rarely exists in Tasmania. This unimpeded transmission of the Solar rays is beneficial in every way, and only becomes hurtful by the folly of people exposing the head to its direct influence, without covering, or with such as are ill calculated to afford the requisite protection.

Terrestrial radiation has been noted for the same period as Solar-intensity. The mean of the six years is 43.05. 1861 had a much higher mean, 43.81, than any of the five preceding years. The month of January has the highest mean—52.52, and July the lowest of five years, 34.50, which is also that of August, for the six, only in July 1859 and 1860 was the mean lower than in August, 1861. In every other month of 1861, except November, Terrestrial radiation was considerably above the previous five years' means. Mr. Abbott has

this thermometer placed on grass in his garden, clear of all reflected heat from buildings. The lowest reading for any night of the six years was 23·5 degrees in September 1857. The Mean of the 20 years for the Wet-bulb thermometer is 49·95, 1855 had the greatest mean 51·75, 1844 the lowest 48·14; January mean is 56·38; July 43·12; Dew-Point mean for the 20 years is 45·34; 1861 had 47·49, and the opposite extreme, 43·83, was in 1844; January mean is 50·69, and July 39·83, being the highest and lowest means of months. The 20 years' mean for Elastic force of Vapour is 317; 1856, mean 347 was the highest; 1849, 288 was the lowest; January is 380; July 259; Humidity mean of 20 years is 74·75; the greatest mean of any year was 79 in 1849, 1853, 1854. Of months June has the highest mean, 83½; December the lowest, 67. The Rain-fall mean of the 20 years is 21·52 inches, the greatest extreme being 1849 when 33·51 inches fell; and the lowest years fall was in 1845, when only 13·43 inches of rain was precipitated. The largest amount for any month was 10·16 inches in August 1858; February 1854 had 9·15 inches; November 1849, 8·94 inches; March 1854, 7·60 inches; September 1844, 7·14; July 1849, 5·99; October, 5·94 in 1861; April, 5·01 in 1856; January 1859, 4·61; May 1848, 4·38; June 1845, 4·27; December 1861, 3·29. The minima falls have ranged from 0·02 in March 1843 to 0·53, in November 1853. The means for the months beginning with the highest are as follows:—November 2·76, August 2·06, June 1·89, September 1·87, May 1·85, April 1·78, October 1·77, (but the heavy fall in 1861, now puts it on a par with August) July 1·73, March 1·52, January 1·50, February 1·47 (but raised by the heavy fall in 1851 to 1·68), December 1·32. The order and the averages differ greatly from those published by Captain Kay in the "Royal Society's Journal of papers and proceedings, January 1853," as the means of the twelve years, 1841, 1852, in fact every years' additional records has tended to approximate the means for the respective months.

For the last seven years the number of days on which rain fell in each month has been recorded. The mean of the six years is 137·63, but 1861 had 167 rainy days, being eight days more than 1859 previously the highest. The mean for September is the greatest, 15·66 days; February the lowest 7·50 days. The rate at which rain falls is of the utmost importance both in the sanitary and agricultural aspect. For instance, in 1861 28·19 inches of rain fell on 167 days. All the months means, except March, June, August and November, were above the average. The rain never fell so heavily as to cause floods, and yet heavy enough to flush all drains and cleanse the surface. In other years more has fallen, but with less beneficial effect In 1858 there fell an aggregate of 33·07 inches, but restricted to 129 days, and four months out of the twelve had 22¾ inches of the total fall. Much of this caused heavy and destructive floods. 1858 was one of our most unhealthy years, 1861 one of the least so; not however that the rains only was the cause of this disparity. Nevertheless in my monthly analyses of health, I have always had to comment upon the beneficial effects of frequent moderate rain-falls, when such have occurred. In a climate like this their influence on health is much more marked than in England. Ere long, Hobart City will have the means of artificially imitating Nature's sanitary operations in this respect. Mr. Joseph N. Gale's engineering skill will soon supply us with an unlimited amount of the purest water from one of the finest "gathering-grounds" in the world, and then most of the evil effects of long continued droughts on a city population can be easily averted. The northern capital, Launceston, has been for some time reaping the benefit of a good and copious supply of water. The heaviest fall of rain ever noted in Hobart Town was on the 26th and 27th of February, 1854, when within thirty-four hours, 8·63 inches fell, doing great injury to life and property, 6¼ inches of this rain was precipitated in thirteen out of the thirty-four hours; or at the rate of nearly half an inch per hour. I have however, recorded, short sharp showers, where it fell for a quarter of an hour, at the rate of one inch per hour. In the great rain-fall of August 1858, the rain was continuous from the afternoon of the 9th until that of the 13th, and there was measured from the rain-guage 8·96 inches. Hail-storms are unfrequent in Tasmania. Snow rarely shows more in Hobart Town than as a coating on Mount Wellington (upwards of 4000 feet above us,) during the winter months, and adding variety to the charming scenery by which this young city is encircled. In the midst of summer too, occasionally the mountain for a few hours puts on its wintry garment of snow.

Spontaneous evaporation has been recorded for five years past, but I do not feel confident in the accuracy of the means adopted to measure its amount. Of course in a climate with the air ever in motion, and plenty of sunshine and warmth, evaporation must, as the records show, greatly exceed condensation and precipitation.

The extent of cloudy sky has been registered for 21 years, and the mean is 5·65. The mid-winter month of July is the least cloudy. Often in the months of April, May, June, July, August, we have a week at a time, with a bright cloudless sky. This is the pleasantest season of the year, and a delightful contrast to the bleak pinching winters of the north. Ozonometrical records have been kept since April 1859. The annual mean is 6.87 by Schonbein's chromatic scale, and by far exceeds any records for the adjoining Colonies, or those at home, which have fallen under my observation. Those months which have the greatest rain-fall, and the largest number and force of ocean winds, exhibit the greatest amount of free Ozone.

Atmospheric-Electricity has been registered for the last three years, but I am not altogether satisfied with the Electrometers. Negative electricity greatly preponderates, both in tension and frequency, and so far, I am inclined to think it is mostly associated with, winds from the Australian Continent (N. and N.W.), deficiency of ozone, and an asthenic or typhoid type of disease. On the other hand, when the pure ozonised breezes from the sea prevail; health is at the highest, and the type of disease is sthenic or inflammatory, and positive electricity is in the ascendant. Though I treat of winds the last, I feel assured that scarcely any other atmospheric phenomena, more powerfully influence health. The prevailing character of aerial changes is that of moderate but almost incessant movement. I have contributed to Mr. Abbott's work, a four years calculation of averages, as to number and force of winds. The observations from which I compiled them, were recorded by Mr. Abbott daily at 7 a.m., 1 p.m., and sun-set. The annual average force of all the winds is, 703·69½ lbs. (on Lind's wind-guage scale), pressure to the square foot. October is the windiest month, and in succession follow December, November, September, January, February, March and April, May, August, July, June. Out of the 1095 observations annually, the four years means show, N.W., to prevail 279 times, with 207·11¾ lbs. of force; N., 222½ times, with 112.08 lbs. of force; S.E. 199½ times, with 90,90½ lbs. of force; S.W., 97¾ times with 76·22½ lbs. of force; S., 89½ times, with 57·74 lbs. of force; W. 79½ times, with 122·67½ of force, being therefore much the strongest winds we have; N. E., 67¼ times, with 23.54½lbs. of force; and E. 60 times with the small force of 13.40½ lbs. All but N. and N.W. are ocean winds, and come well charged with Ozone; saturated with it, if accompanied by rain from the S.E., S., and S.W. During the summer months a cool South-East sea-breeze may be expected to set in about 11 a.m., and is very bracing and refreshing. Sometimes it is chilling, when it suddenly overpowers an oppressive wind from the N.W., and those people grumble hard at the variable climate who do not dress judiciously. Light coloured woollen tweeds are the safest kind of garments here for all seasons. Such violent storms as I have seen in England, I have never noticed here. In the 1095 Wind Records, Calms were noticed at the hour of observation 291½ times, but such an event as a day of continuous calm is exceptional, and almost unknown. This Climate is a decidedly breezy and invigorating one, for after the hottest day we may calculate on having a cool night, as the daily range I have before alluded to testifies.

Invalids from India, China, and the hotter Colonies of Australia, if not past recovery, speedily rally in Tasmania, and the increased appetite for food is the first and most surprising change. With such clear skies, abundance of ozone, bracing sea breezes, the lamp of life burns quickly, as well as brightly, and demands a much more abundant and nutritious supply of food than suffices elsewhere. Food of the best and most varied kind is plentiful, and the actual consumption per individual greatly exceeds the highest European calculations. Tasmanians spend much of their time in the open air, and many of the diseases which afflict European communities are unknown. Others have a minimum of intensity. Over-crowded, ill ventilated, and badly victualled ships have at different times brought to this port dangerous types of fever, but the contagious emanations arising have speedily been neutralized by the disinfecting power of our highly ozonised air, and beyond a few who came directly in contact with the first sufferers landed, the disease has not spread. Even eruptive fevers, scarlatina, and measles, though frequently imported, and at times severe, have speedily worn themselves out, only re-appearing at long intervals and in mild type.

In 1854 measles were epidemic. At the beginning of last year we had another visitation, but so much was it mitigated in this island, that out of a population of about 25,000 persons in the Registration District of Hobart Town only 55 persons of all ages died of it. The children under seven years of age, alone, and therefore all liable to the infection, amount to nearly 6000—but many above that age and adults were attacked, and some of the deaths were of these. The zymotic proportion of the deaths in Tasmania is greatly below that of the neighbouring Colonies and

England. The Tasmanian born are comparatively little subject to pulmonary consumption, except where the hereditary tendency is strong. The colony is not yet old enough to show what age the native born may attain to, but there is reason to think it will be high. Numerous instances of centenarians who have resided in the island from its first colonization, or other very long periods, have come under my notice.

Though adult males have always so much exceeded adult females in number, the increase of population, by excess of births over deaths, has been at a rate much greater than prevails in Europe. Last year the increase was about 2000 in a population of less than 90,000. The children of Tasmania are as plump and rosy as the finest specimens in England, and the rosy cheek does not disappear in adult life.

At the Census of 7th April, 1861, there were enumerated for all Tasmania :—

	Males.	Females.	Total.	
Under 1 year of age.....	1,612	1,505	3,117	
Above 1 to 5 „	6,027	5,855	11,882	
„ 5 to 10 „	5,545	5,563	11,108	
„ 10 to 15 „	4,182	4,058	8,240	41,649
	17,366	16,981	34,347	
„ 15 to 20 „	3,384	3,918	7,302	
„ 20 to 30 „	5,965	7,157	13,122	
„ 30 to 40 „	7,976	5,644	13,620	
„ 40 to 50 „	7,322	3,769	11,091	44,162
„ 50 to 60 „	4,504	1,825	6,329	
„ 60 to 70 „	2,270	822	3,092	
„ 70 to 80 „	631	226	857	
„ 80 to 90 „	154	39	193	4,166
„ 90 to 100 and above	21	3	24	
	49,593	40,384	89,977	89,977
Married	15,893	15,616	31,509	
Single	33,700	24,768	58,468	

A slight examination of the foregoing table will show that one-half of the population is under 24 years of age. The total registered births in 1861 were 3,207, but the probable number of living births would be about 3,530. Still-births are not registered. The mortuary tables for 1861 record died :—

	Males.	Females.	Total.
Under 1 year of age	179	144	323
Above 1 to 2 „	68	66	134
„ 2 to 3 „	24	29	53
„ 3 to 4 „	12	15	27
„ 4 to 5 „	20	20	40
„ 5 to 10 „	30	37	67
„ 10 to 20 „	36	26	62
„ 20 to 30 „	45	60	105
„ 30 to 40 „	89	62	151
„ 40 to 50 „	105	64	169
„ 50 to 60 „	103	43	146
„ 60 to 70 „	78	29	107
„ 70 to 80 „	45	15	60
„ 80 to 90 „	19	9	28
„ 90 to 100	3	0	3
„ 100 and above	0	2	2
Age not known	9	3	12
	865	614	1479

1479 deaths out of a population of 89,977 persons is at the rate of 16·43, or less than 16½ per 1000, so that the mortality rate of all Tasmania is less than that of the 63 healthiest registration districts of England and Wales—17 per thousand—which the Registrar-General of England adopts as a normal standard for death rates. In the purely rural population of Tasmania, counting exclusive of those associated with the urban districts of Hobart Town and Launceston—53,667—the deaths in 1861 amounted only to 619—being at the rate of 11.53, or 11½ per 1000. Glendale, in Northumberland, which has the smallest death rate in the English returns, has 15 per 1000. But even this contrast, favourable as it is to Tasmania, does not exhibit the whole superiority. For, though our population when compared with that of England, has not as large a proportion of persons above 60 years of age, it has a very much larger proportion of those under 15 years of age. Again, the smallest rate last year in any district of Tasmania was in that of Oatlands, which in a population of 2,353 had only 17 deaths, being at the rate of only 7.28 per thousand, or less than half of the healthiest district in England. Oatlands is in the centre of the island, and 1308 feet above the sea level. It is an axiom now in sanitary science that the rate of mortality in children, under five years of age, gives the most delicate and surest test of the salubriousness of any climate. In England the death-rate under this age is 65.18 per 1000. In Tasmania not quite 38 per 1000, or 37.93. Did my limits permit I could for every disease in our mortuary records give the rate as compared with those in the English Tables. In an elaborate article on the Vital Statistics of Tasmania, published in the April number, 1858, of the *Australian Medical Journal*, I made such a contrast for 1855 between Hobart Town and London. The additional facts I have stored since that period have fully confirmed, and in many respects strengthened the very favourable report I then made of the natural salubrity of this island. I by no means wish to convey the impression that the laws of hygiene may, in this auspicious climate, be trifled with with impunity any more than in other countries. Indeed, I have frequently published indubitable proofs to the contrary. In this picturesque island and genial climate, it must be man's own fault if the best health, and the highest "chances of long life" are not attained. The meteorological, statistical, and sanitary facts I have compiled in this paper, briefly condensed as they necessarily are, give convincing proof of the correctness of the statement which concluded a paper of mine to the London Statistical Society some years ago, that few countries in the world, whose medico-vital statistics have been published, can equal this beautiful isle of the south-sea—young Tasmania—as an abode where the human race may dwell comfortably, healthily, and to a ripe old age, without deteriorating either physically or morally from the elevated position their British progenitors hold among the nations of the earth.

E. S. H.

Hobarton, Tasmania,
March, 1862.

ON THE

TORSION OF ARTERIES

AS A MEANS OF

ARRESTING HÆMORRHAGE,

WITH EXPERIMENTS.

BY

THOMAS BRYANT, F.R.C.S.,

ASSISTANT SURGEON TO GUY'S HOSPITAL.

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1868.

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Received April 15th.—Read June 9th, 1868.

On the 16th of July, 1829, M. Amussat read before a meeting of the Académie Royale de Médecine a paper on his new method of arresting hæmorrhage from large blood-vessels without the aid of the ligature, the plan having been, as he tells us, suggested to his mind by the long recognised fact that "torn wounds do not bleed."

He supported his suggestions by relating the details of some experiments he had made upon animals, as well as upon the human subject, and quoted four cases of amputation of the thigh, and one of the arm, in which hæmorrhage had been readily and permanently arrested by simple torsion.

His practice was at once adopted in Paris by MM. Boyer, Dupuytren, Velpeau and Thierry: also by Lieber of Prussia, Fricke of Hamburg, and Schrader of Dresden. It received also the unqualified support of Majendie, who described it as one of the most brilliant discoveries in modern surgery.

In the periodicals of the day many cases are also related in which these surgeons had practised torsion of the arteries with immediate and permanent success, even to the divided extremities of large vessels; and amongst these are cases of disarticulation of the shoulder-joint, amputation of the thigh, leg, arm, and forearm; castration, extirpation of the breast, and other tumours.

The surgeons of this country, however, took little or no notice of the practice for some years; and it was not till the year 1834, five years after Amussat's paper had been published, that the subject was clearly brought before the notice of the profession: when Mr. W. B. Costello read before the Westminster Medical Society a paper "On the Torsion of Arteries for the purpose of arresting Hæmorrhage," which was subsequently published in the 'Lancet' of March 8th, 1834.

In this paper Mr. Costello gave the results of M. Amussat's practice, and detailed the particulars of five successful experiments which he had made upon dogs under that surgeon's direction.

The paper was well received, and some notice was taken of it at the time, but the practice was never followed, and, from that day to this, torsion, as a means of arresting hæmorrhage in large vessels, has never been practised, although for small ones it has been occasionally employed. An explanation of this apparent want of attention to this new method of arresting hæmorrhage may possibly be found in the fact that it was suggested before its time; that is, before the introduction of chloroform, by the use of which the surgeon is enabled to take up all vessels with care and precision, and there is no object in hurrying over any of his proceedings—a condition of things which can hardly be said to have existed under previous circumstances, when the surgeon's anxiety was to complete his operation as speedily as possible, and it was a source of satisfaction to know that a stout ligature was on the end of a large vessel.

Within the last few years, however, the attention of the profession has been much directed to the subject of hæmostatics; and it would seem that many surgeons have become clearly dissatisfied with the practice generally adopted of ligaturing divided vessels, and of leaving the ends of the ligatures within a wound. It being stated, as a broad objection to their use, that they, by their presence, prevent a rapid or primary union of a wound; that they keep up if they do not excite suppurative action within the parts, and thus add to the danger of an operation by postponing recovery and rendering a patient more prone to that fatal scourge pyæmia than he would be under other circumstances; to these another objection may still be added, that the ligatures on their separation from the artery are apt to be followed by secondary hæmorrhage.

To Sir James Simpson unquestionably our thanks are due for having specially directed our attention to this subject, and for having suggested a plan of treatment which, to his own mind and that of others, aims at rendering more simple our mode of arresting hæmorrhage, and at the same time does away with some of the objections which have been adduced against the use of the ligature.

It is not my intention to inquire into this question on the present occasion. It has able advocates in the person of its distinguished author, and in Messrs. Keith and Pirrie; it is, moreover, now under trial by the profession. It has doubtless advantages over the ligature, and disadvantages which have to be comparatively examined by the grand test of experience, by which it will stand or fall. I have practised it myself, and seen it practised in many ways, but regret to say that neither my observation nor experience have been of the most satisfactory kind.

It has, however, physiologically considered, one point of weakness which has some bearing on my present subject, for the value of the practice of acupressure rests on what has hitherto been looked upon, and what must still be described, as being a temporary mechanical obstruction to arterial hæmorrhage; the permanent arrest of bleeding depending in this practice, as in others, on natural processes; now, in acupressure the permanent arrest of hæmorrhage depends

entirely upon the clot which forms in the vessel, for no evidence has yet been adduced to show that any change occurs in the inner tunics of the vessels which have been subjected to the pressure of an acupressure needle, such as is well known to take place after the use of the ligature, and such as also occurs after the application of torsion in large vessels. In these last two forms of practice the two inner coats are divided, and subsequently unite, the permanent arrest of hæmorrhage depending materially on such a process; in acupressure there is no evidence whatever to show that any such union takes place between the two surfaces of the vessel which are brought in contact; as a consequence the permanent success of acupressure depends upon the coagulating power of the blood in the occluded vessel, the needle acting as a temporary mechanical obstruction to the flow of blood during the brief period of its presence.

Physiologically, therefore, acupressure is an uncertain process, and when contrasted with the ligature and torsion stands condemned; for its success depends only upon the temporary processes which nature adopts for the purpose of arresting hæmorrhage, and not upon the permanent hæmostatic changes which nature employs in other cases.

When Professor Syme, therefore, in a short note published in the 'Lancet' of January 4th, drew the attention of the profession back again to the subject of torsion, I must confess to feeling a sense of satisfaction, for it seemed tolerably clear that, if it could be practically proved that hæmorrhage from a divided artery could be safely and permanently controlled by such a method, we should have a means at our disposal which would be entirely free from all the objections which the strongest objectors to the use of the ligature could possibly adduce, and which in its simplicity and value would without doubt bear favorable comparison with acupressure as well as with the ligature.

It was under these circumstances that I was thus led to examine into the question, to try it in practice, and to prove it by experiment; and I now propose to lay the results of my inquiries before the Fellows of this Society, with the hope

that they will be induced to test the practice for themselves, and by the aid of experiment gauge its value.

I propose to relate seriatim the experiments I have made upon the dog, horse, and human subject to test the value of torsion, and to observe the process by which the vessels so treated become permanently sealed; having previously described the two methods by which torsion has been practised.

I shall pass on to describe the physiological changes which have taken place in the arteries which have been twisted; and draw attention to such special points as it seems necessary to attend to in the application of the practice. Some brief comparison will then be made between the value of torsion and the ligature, and some general deductions drawn up from the consideration of the subject as a whole.

I must add that in most of my experiments I have had the benefit of Mr. H. Howse's able assistance; that he has given me valuable aid in examining the vessels of the animals after death, and that the descriptions of the physiological conditions of the arteries are chiefly from his pen, receiving from me only such slight alterations as I deemed necessary. I am also indebted to him for the drawing of some of the preparations.

It would be well, however, *in limine*, to premise that there are two modes of applying torsion; one described by Amussat as "free" torsion, the other as "limited."

In *free torsion* the end of the artery should be fixed by a pair of clasp forceps and twisted freely.

In *limited torsion* the artery, having been drawn out of its sheath, should be fixed *transversely* about three quarters of an inch from its divided extremities by a pair of clasp forceps and held steadily; whilst with a second pair the free end of the vessel should be twisted freely as in the former, the object of the first pair of forceps being to fix a limit to the twisting of the vessel and prevent the artery being separated for any distance from its vascular attachments.

Experiments on the Dog.

Exp. 1.—February 4th, 1868.—I divided the left *femoral* artery of a dog just below Poupart's ligament, and twisted the cardiac end by "free" torsion *four* times with success. During this time the distal end was held by forceps, and when these were removed hæmorrhage occurred; the bleeding extremity was, however, seized by forceps and twisted *four* complete revolutions, all bleeding at once ceased, and by the seventh day the wound had united.

The dog was killed on the eleventh day after the operation.

Exp. 2.—February 8th, 1868.—I divided the right *femoral* artery of a dog and twisted its cardiac end *three* times by "free" torsion; hæmorrhage, however, at once occurred, the end was accordingly twisted *four* times more, when all bleeding ceased. *Four* twists to the distal end of the vessel at once succeeded. On the third day the dog appeared as if nothing had been done to him. The wound looked very healthy.

It must be noted that the blood from the lower part of the vessel came out quite black, like venous blood; the contrast between it and that from the cardiac extremity was very marked.[1]

The dog was killed on the seventh day.

Exp. 3.—February 8th, 1868.—I divided the left *femoral* artery of a dog high up, and twisted its cardiac end *three* rotations with success, not a drop of blood escaping. The same treatment was also applied to the distal end, with a like result.

On the third day the dog was well, and the wound healing.

The dog was killed on the tenth day.

[1] This fact has been observed in the human subject, particularly by Guthrie, but is not generally recognised. It does not appear, however, to be constant.

Exp. 4.—February 11th, 1868.—I cut down upon and divided the right *common carotid* artery of a dog. I applied "free" torsion to its cardiac end, making *three* revolutions, without success, and accordingly seized the vessel again and twisted it four times more. Hæmorrhage was at once arrested. *Three* complete twists were then given to the distal end of the artery, and no bleeding followed.

On the second day the dog was quite well, he had taken his food as usual, and appeared in no way disturbed by the operation. On the following day the animal was destroyed.

It must be noticed that in this case, as in the second experiment, three rotations of the artery were not sufficient to arrest bleeding; four proved successful in both cases.

Both the distal and cardiac ends of this artery have been drawn (see Plate VIII, fig. 2).

Exp. 5.—February 11th, 1868.—Cut down upon and divided the right *common carotid* artery of a dog. Twisted the cardiac end *four* times, with immediate success, and likewise the distal end. Hardly a drop of blood was lost. On the second day the dog appeared to be as well as he was before the operation. On the fourth day the wound had nearly healed.

The animal was destroyed on the seventh day.

Exp. 6.—February 15th, 1868.—I cut down upon and divided the left *common carotid* artery of a dog. I applied free torsion to the cardiac end of the vessel, making *four* complete revolutions of the forceps; all hæmorrhage ceasing. The distal end was firmly pinched by a pair of forceps both at its free extremities as well as one inch up the artery; no bleeding took place.

The animal was killed on the third day.

Experiments on the Horse.

Exp. 7.—March 17th, 1868.—I cut down upon and divided the left *common carotid* artery of a horse; applied two pairs of torsion forceps transversely to the vessel, and divided the artery midway between them, leaving an inch of artery on the distal side of each pair of forceps. With a third pair of torsion forceps I then seized the extremity of the artery at its cardiac end, and twisted it *seven* complete revolutions. I then removed the instrument that fixed the vessel, and not a drop of blood escaped; the pulsations in the vessel were very strong. The same treatment was then applied to the distal end with a like result. It was certainly somewhat astonishing to see the great vessel fill out and pulsate after the operation without one drop of blood escaping; and although the animal plunged somewhat during and after the operation, the success was most complete.

The animal was allowed to live for forty-eight hours, and then killed.

The condition of the vessel will be described in another page (see Plate VIII, fig. 3).

Exp. 8.—April 2, 1868.—I cut down upon and divided the left *common carotid* artery of a horse. I applied a *ligature* to the distal end, and *twisted* the cardiac, employing in this instance, for a definite object, a different method to that which I had used in the former experiment. In both, about one inch of the divided artery was left beyond the point at which the vessel was fixed by the forceps, which were applied transversely; but in the former successful experiment the orifice of the vessel was alone seized before the torsion was applied; in the latter, the extremity of the vessel was taken hold of nearly its whole length, the twisting of the artery being confined to the spot at which it was held; in the one case about one eighth of an inch was allowed for the purposes of torsion, in the other half an inch. *Three* complete twists were alone given, but by those the external coat was so

twisted as to appear hardly larger than a crowquill, and I must confess to feeling somewhat alarmed lest I had ruptured the vessel. On removing the forceps that fixed the artery no bleeding took place, and I hoped all would have been well; within a minute, however, signs of bleeding occurred, and on opening the wound it was clear that blood escaped from a small laceration of the external coat at the point of twist, the twist having remained unaltered. It being apparent that the violence of the torsion had been too much concentrated at one spot, I accordingly seized the vessel lower down, cut off the injured end, and applied limited torsion as in the last experiment, holding the orifice of the artery alone, and giving *six* complete revolutions of the forceps to the free inch of the vessel. No bleeding followed the removal of the instrument, complete success having been secured.

The horse was killed on the fourth day—eighty-seven hours after the operation. No single bad symptom had shown itself. The animal had taken his food ravenously during the interval.[1]

The appearances found on dissection will be described further on.

Mr. Towne has made a model of this preparation, showing the physiological changes which have taken place in the artery after the application of a ligature and torsion respectively.

The design for the model was shown when the paper was read, and a drawing from it (see Plate IX).

Effects of Torsion on the artery of a patient to whom it was applied during life.

I have only one observation to make bearing upon this point, but it is of value, for it well supports practically and physiologically the results of the experiments I have already given upon the horse and dog.

[1] In these experiments on the horse I had the kind and able assistance of Mr. Moss, M.R.C.V.S., of Vauxhall.

On January 13th, 1868, I applied "free" torsion to the brachial artery of a woman, æt. 68, for whom amputation was demanded in the upper third of the arm for a compound comminuted fracture of the elbow-joint, and extensive laceration of the soft parts. The artery was twisted *four* revolutions by "free" torsion, one blade of the forceps being introduced at least half an inch into the vessel, and no bleeding followed, although the pulsation of the artery was very strong. The patient died thirty-five hours after the operation from thoracic complications, and thus I had an opportunity of examining the changes which had taken place in the vessel. I should add that some bleeding took place from the stump twelve hours after the amputation had been performed, from a vessel which had not been seen at the time; and, to this, torsion was successfully applied by the House Surgeon, Mr. Morris, who stated that when the stump was opened, the brachial artery was seen to be pulsating powerfully, but not a drop of blood escaped.

The changes found in the vessel will be described with the other cases, and seen in a drawing (see Plate VIII, fig. 1).

A DESCRIPTION OF THE PHYSIOLOGICAL CONDITION OF THE ARTERIES WHICH HAD BEEN SUBJECTED TO TORSION, AS SEEN IN THE BRACHIAL ARTERY OF THE HUMAN SUBJECT, AND SEVEN FIRST EXPERIMENTS IN ANIMALS.

Mode of preparation.—The vessels were all hardened in spirit immediately after removal from the subject, and then longitudinal sections cut.

Condition of the human brachial artery.—The artery was removed from the innominate downwards. The aorta and innominate were very atheromatous, but this did not extend to any very marked degree to the brachial.

The diameter of the artery was about a quarter of an inch where the clot existed; of the cavity about one sixth of an inch; elsewhere not quite so much. The twist, which was quite local, though free torsion had been practised, was about an inch from the amputated extremity of the artery. The

distal end of the artery was empty. The *cardiac* end contained about two inches of clot; where this ceased a small artery came off. The middle and internal tunics of the artery had clearly ruptured and retracted, they also were completely *incurved* as seen in Plate VIII, fig. 1, meeting in the middle line of the artery; beyond this spot was a small quantity of firm defibrinated clot, which would serve to maintain the incurved tunics in position, and which was covered by the twisted external coat. At the *distal* end of the artery the middle coat was not incurved, the ends merely coming into contact in the middle line.

Experiments on the Dog.

To save repetition, it may be stated that in all this series of experiments, although free torsion was performed, the twist in the vessel was found to be localised to a spot a little beyond the bite of the forceps, never spreading up the artery as described by Amussat.

Exp. 1.—Left femoral artery examined on the eleventh day after the experiment.

The *cardiac* end was pervious to rather more than half an inch from the point operated on. The parietes of the pervious portion were thickened, as if the original, comparatively speaking, thin-walled artery had contracted down upon the cavity. The obstructed part had an ampulla-like appearance, was filled with firm fibrous clot, in which were one or two cavities, containing grumous matter, as if from the commencing softening of the centre of the clot. At the point of torsion, the divided middle coat was perfectly continuous with the other side, so that the cardiac end of the artery formed a perfect cul-de-sac containing fibrin. From the cul-de-sac two branch arteries were given off: one joined the main trunk again beyond the point of operation, the other ended in the surrounding muscles, both were perfectly obstructed by fibrin. Of that part of the cardiac end of the

artery actually seized by the forceps, no trace remained, it seemed to have all atrophied and become absorbed.

The *distal* end of the artery presented none of the appearances above described; it was thin-walled and pervious, nearly up to the point operated upon, where it was obstructed by a small clot which had become much shrivelled.

Exp. 2.—Right femoral artery examined on the seventh day.

The *distal* end was in every respect similar to that of the vessel just described. It was thin-walled, as if the parietes had contracted a little upon the cavity, and was obstructed by scarcely a quarter of an inch of clot.

The *cardiac* end was also like that just described; such complete contraction of the muscular parietes had not, however, taken place in the pervious part of the artery, the wall being thinner and the cavity larger.

The changes in the clot had not advanced so far in either end as in the last experiment; they were not decolorized, nor were there any spots in which it was breaking down.

The part of the artery actually seized by the forceps, although withering, was more distinct in the present case than in the last, but there was no indication of any sloughing of the part in either case.

Exp. 3.—Left femoral artery examined on the tenth day.

Nothing very distinct could be made out in the dissection of this artery, the occlusion and wasting of the vessel had proceeded too far; what remained of it seemed to agree with the other femorals.

Exp. 4.—Carotid artery examined on the fourth day.

The *cardiac* end of the artery was taken out from the innominate. It was obstructed with clot for an inch and a half. The end of the vessel, where the twist had taken place, was dilated into a kind of ampulla, but not nearly so markedly as in the distal end next to be described. The walls of the artery were rather thick, and remained so

to about one sixth of an inch from the twist, where they abruptly became thin from the sudden lessening in diameter of the middle coat, which ran forwards and was lost between the clot and tunica cellulosa or external coat, just at the point of torsion where the ends seemed to rest against a small decolorized plug of fibrin. The part of the artery actually seized by the forceps remained very distinct, though much contracted. The fibrin in the vessel was firm, and with the exception of one or two spots in the ampulla, was not decolorized. A small branch was given off from the ampulla, which was obstructed.

The *distal* end of the vessel was obstructed with clot for the space of three inches. The ampulla-like dilatation in this case was remarkably distinct for half an inch below the point of obstruction; its walls were thin, this being clearly due to the difference in thickness of the middle coat; and its cavity was double in diameter to the cavity of the remaining portion of the artery.

No distinct incurvation of the middle coat of the vessel could be traced.

Half an inch of old withered artery remained above the point where the obstruction commenced.

Both the cardiac and distal ends of this vessel have been drawn (see Plate VIII, fig. 2).

Exp. 5.—Right carotid artery examined on the seventh day.

The vessel seemed in every respect similar to that already described, although the clot was smaller, and the artery seemed more contracted and withered.

The *cardiac* end contained about two inches of clot; where it ceased a small artery came off. The middle and internal coats were completely *incurved*, meeting in the middle line of the artery; beyond this was a small quantity of firm defibrinated clot, which would serve to maintain the incurved tunics in position, and which was covered by the twisted external coat; and, finally, came the distal end of the artery, the middle coat of which was not incurved, the ends merely coming into contact in the middle line.

Exp. 6.—Left carotid artery examined on the third day.

Of the *distal* end of the vessel nothing need be said; it seemed in most respects similar to the others already described.

The *cardiac* end was as usual dilated into a kind of ampulla. The middle tunics seemed to have met and united, but it is somewhat difficult to distinguish them from the fibrin or lymph effused beyond the point of union. The external coat was, however, capable of being dissected from the middle, and there seemed to be some degree of incurvation. About three quarters of an inch of clot had formed in the ampulla and artery leading to it; this was partly decolorized.

Experiments on the Horse.

Exp. 7.—Left common carotid artery examined forty-eight hours after the operation.

Nearly six inches of the cardiac end of the artery were removed, and about two inches and a half of the distal end.

The diameter of the widest part of the *cardiac* end, close by the twist, when in a measure shrunken by spirit, was about three eighths of an inch, the cavity being proportionally large. From the point of torsion, the size gradually diminished towards the cardiac extremity. No branch was given off in the whole of the part taken out.

There was about four inches of continuous clot in the artery from the point of torsion, then came an empty space, and beyond this about three quarters of an inch of semi-detached clot. A piece of fibrin about two inches long, which existed in the middle of the continuous clot, had contracted no adhesion to the walls of the artery; thus it fell out on making the section (see part marked in Plate VIII, fig. 3).

The middle and internal tunics at the point of torsion are turned in and somewhat clubbed, the clubbed ends meeting. Beyond this point comes the twisted external coat; next, a *curious swelling* covered only by the external coat which is

twisted beyond it; and finally, the empty end of the artery where seized by the forceps. The middle coat at this point does not incurve, but merely meets, as in the distal portion of the human brachial artery before described.

The *swelling* already alluded to, which was covered only by the external coat, to the naked eye appeared to contain either defibrinated clot, or lymph; but examined microscopically, it was found to consist of distinct lamellæ of elastic tissue mingled with defibrinated clot. It appears likely, therefore, that it is the middle and internal coats of that part of the artery which had been actually seized with the forceps transversely—for it must be remembered that in this case "limited" torsion was practised—and which had rolled up in this form by their own natural elasticity, or by the twisting; some serum remaining and coagulating in the interstices.

The *distal* end of the artery contained about one inch and a half of clot. The middle coat was turned in and overlapped in the median line, otherwise there was nothing very remarkable in this point.

Exp. 8.—Left common carotid artery examined eighty-seven hours after the operation.

All the soft parts, from the angle of the jaw to the thorax, were removed including the trachea. Directly after their removal, a careful dissection was made, the following conditions being observed.

The *cardiac end* of the artery appeared to be quite empty, it contained only a little liquid blood. At its extremity, where it had been twisted, a mass of lymph existed which had to be dissected off. The twist in the vessel then became very clear. Its free end showed no evidence of having lost its vitality; below the twist a firm clot existed for about a quarter of an inch, and below this a large branch was given off from the vessel.

The *distal end* of the vessel to which a ligature had been applied showed nothing unusual. There was the usual linear division of the middle and inner coats. Both can be well seen in Plate IX, figs. 1 and 2.

On making a section of these parts subsequently it was observed that, in the *cardiac end* which had been twisted, the same changes had taken place as have been already described in other cases. The middle coat had been ruptured and had retracted, its free end having approximated above the small clot which had formed in the vessel. This clot was hardly larger than a pea; at its circumference it was partially decolorized. Below this clot a large branch was given off from the artery. Beyond the clot was the twisted vessel. It was a question whether the small clot in the artery was not placed between the divided inner and middle tunics; this splitting of the tunics taking place after torsion in some cases.

In this case it is tolerably clear that the twisted cellular or external coat must have been the chief obstacle to the arterial flow, the retraction and approximation of the divided inner tunics giving valuable aid. The clot was clearly too small to have much influence, unsupported by the other conditions of the vessel.

On making a section of the *distal end of the vessel* to which a ligature had been applied, it was clear that at the point of ligature ulceration had taken place, nearly separating the end; that the middle tunic of the vessel had been divided and had apparently united. No retraction of this tunic, however, had taken place, nor was any clot found in the vessel.

At the *distal* end of the ligature there was a small clot enclosed by the middle coat, and it will be observed that beyond this point the artery had again contracted, clearly by its own natural elasticity.

To explain the presence of this clot at the cardiac side of the ligature, it should be stated that the ligature was applied to the artery after it had been exposed, and that with my thumb and finger the blood was squeezed backwards before the vessel was fixed by the forceps applied transversely. The artery was then divided and twisted. This clot must have formed at this time, some portion of blood remaining near the ligature and being caught by the divided middle coat.

Experiments upon the arteries of the dead subject.

I have made a large number of experiments on the arteries of the dead subject, healthy and diseased, having generally selected the common iliac and external iliac vessels, and have found that in all the same changes have taken place as have been already described. In every instance the retraction and incurvation of the middle and inner tunics were well marked, and in some the latter was most remarkable; it appears also that in the atheromatous vessels this incurvation is equally well seen.

Indeed this incurvation of the inner tunics of an artery, to which torsion has been applied, appears to be a point of peculiar interest, and from a large number of experiments on the dead subject it may be stated to be a very general result of well-applied torsion.

The amount of incurvation in different instances will, however, be found to vary; in some it will show itself more as an irregular crowding together of the divided and retracted tunics; whilst in others it appears as a complete valvular incurvation of the divided coats, the incurved portions appearing within the vessel as nipple-like projections; under these circumstances, the incurved portions form the most perfect valves it is possible to conceive, being not unlike the semilunar valves of the heart and closing as perfectly. In some cases, again, the middle and inner coats appear to split, and thus to form an additional means for causing coagulation of the blood and obstruction to the artery.

This incurvation is clearly a physical act, and is due to the natural elasticity of the coats of the vessels; it may consequently be confidently expected to take place in all the larger vessels.

The preparations and drawings well demonstrate these points (see Plate X, figs. 1, 2, 3).

I have found also that when a vessel has been efficiently twisted, no legitimate force that can be employed with a syringe, introduced into the vessel above, will unfold the twist in the cellular coat, or undo the retraction and incurvation of

the inner tunics, although the artery will frequently rupture above the part which has been twisted; when the extremity of the vessel has been twisted off, leakage, however, frequently follows.

It should be stated that this incurvation of the inner tunics seems unknown after the ligature; indeed it should be stated that in a large number of experiments which I have made, in which a ligature has been applied to an artery, the only change that takes place in its coats is an imperfect and irregular division of its middle and inner coats; in rare cases this division is very complete, in many others it does not take place at all.

There is never any retraction worth mentioning, and no incurvation. I may refer to Dr. Jones's work on 'Hæmorrhage,' published in 1810, to further illustrate this point.

Résumé of the physiological effects of Torsion on the vessels.

The results of the experiments made upon animals, and the single observation I have had an opportunity of making on the human subject, singularly accord; for in the cardiac and distal ends of the arteries which had been treated by torsion, I found the middle and internal coats of the vessels had been divided; that these coats had retracted in the direction opposed to the blood stream, approximated and overlapped; that at the cardiac end in several instances the coats had become partially incurved, as shown in the preparations and drawings of the carotid of the horse, and the brachial of the human subject; and I found also that every vessel contained clot, from the giving off of the first branch to the point of contact of the two inner divided coats; that lymph or organizable blastema was poured out around the divided extremities of the coats, and between them and the external cellular coat; also that a second smaller clot often existed between the distal end of the two divided inner tunics, and that portion of the cellular coat which had been twisted.

I found, moreover, that the twist which the cellular coat had

sustained was clearly permanent, and that it did not untwist (this can be shown on the dead body). That in no single instance was there any evidence to indicate that the portion of vessel which had been twisted had lost, or was likely to lose, its vitality; or that the parts about the vessel had received any material injury.

That in most cases a kind of ampulla tends to form in the cardiac end of the artery, and sometimes in the distal end. The appearance which this presents varies in every case, and seems to depend on the rapidity with which coagulation takes place in the end of the artery, and upon the amount to which the artery, beyond the point where the clot forms, contracts. In those arteries, therefore, in which much muscular fibre exists, and in which it is healthy, it will be most apparent; thus it is scarcely visible in the brachial artery from probable atheroma, and in the carotid of the first horse which was an old worn-out creature.

It is not necessary, therefore, to suppose that the force of the heart actually dilates the end of the artery. The diameter of the ampulla is in fact something less than the original cavity of the artery. Fibrin forms here first and prevents that close contraction of the parietes which goes on in other parts, and thus an apparent dilatation is formed. The middle coat in the artery is always much thinner than that in the contracted part of the artery (see Plate VIII, fig. 2 n).

Thus the appearance of an ampulla is rather due to unequal contraction than to dilatation.

That though "free torsion" was practised in every case except in the horse, yet the twist in the vessel was local, not extending high up the artery.

That torsion when applied to large vessels immediately above the giving off of a large branch may be successful (see experiment No. 8, on the horse, and Plate IX); and that when applied to diseased vessels in old subjects it may likewise succeed (see torsion of brachial artery, Plate VIII, fig. 1; and preparations of vessels twisted after death, Plate X, figs. 1, 2, 3).

Remarks on the Experiments made on Living Animals.

It is to be noticed that in the experiments upon dogs "free torsion" was employed; in the two upon horses "limited torsion" was used. In all the operation was ultimately successful.

In several on the dog bleeding took place when the torsion had been imperfectly carried out; three revolutions of the vessel being clearly insufficient; in all, however, on the dog four revolutions at once succeeded.

But the arteries of dogs are not large, and although the experiments upon them, as far as they go, must be regarded as satisfactory, they would not be to my mind of sufficient value to prove the power of torsion unsupported by others of greater importance.

The experiments on the horse I cannot but refer to with unmixed satisfaction, for no one can look upon the dilated pulsating carotid artery of such an animal during life, without a feeling of astonishment that such a simple act as that of torsion should be found sufficient to arrest hæmorrhage from its divided extremity; and yet in both the cases related complete success followed the operation when it had been properly performed.

The temporary failure in the second case which followed upon the imperfect application of the practice must be looked upon with favour, for it went to prove what I confidently anticipated would have been the case—that torsion of the external coat when too much concentrated to one spot must end in its rupture, and consequently in failure: but the ultimate success of the torsion when carried out in an efficient manner was most satisfactory, for it tended to show that the means employed were such as could be relied on with some confidence.

The fact that torsion was successfully performed on the carotid of a horse, immediately above the giving off of a large branch is a point of great value, (see experiment 8); for if the permanent safety of torsion depended upon the mere

coagulation of the blood in the vessel, success could not have been thus acquired—for as the drawing, model, and preparation well show, there was no room for such an obstruction to the arterial flow to take place between the twist in the cellular coat, and the point at which the branch artery was given off.

It would thus appear that the twist in the cellular coat was the chief cause of the arrest of the arterial hæmorrhage in the experiment referred to, and that this twist with the adhesion of the split, *retracted*, and approximated middle tunic forms the true permanent occluding medium of a divided vessel; that upon such points the main safety of the practice of torsion really rests, the coagulation of the blood in the vessel acting a part of secondary importance.

As mere experiments, these operations on the horse must be looked upon with favour; for they prove practically that torsion of such a large artery as the carotid is to be relied on; and consequently it does not appear unfair to believe that the same practice applied to any smaller vessel would be equally successful. As physiological experiments, however, the observations I have been enabled to make must be regarded in a higher light, for they show that nature's well-known hæmostatic processes act at a far greater advantage when torsion has been applied, than they do after the use of the ligature; and, what is of far greater importance, they are allowed to go on undisturbed in their conservative action, for there is no foreign body to set up ulcerative action in the vessel in the seat of its occlusion; nothing to undo at a late period of the case what nature, assisted by art, has done at the beginning for the prevention of arterial hæmorrhage. The twist in the vessel remains permanent; the coagulation of the blood in the meshes of the retracted, approximated and incurved middle coat goes on undisturbed; and the whole becomes, subsequently, rapidly condensed into one homogeneous mass by the effusion of lymph from the exposed surfaces of the divided tunics.

In the application of torsion some care is needed, and as two methods have been described, the "free" and the

"limited," it may be well to point out as far as possible the conditions under which they should be employed.

"Free" torsion appears to be the more applicable to small vessels, and even to the large trunks of the extremities; the "limited" torsion to such arteries as are unsupported by muscles and loosely connected.

It will have been observed that in all my experiments upon dogs, in which both carotid and femoral arteries were treated by torsion, the "free method" was used; and in the single example I have quoted in which I adopted the practice in a large vessel on the human subject—amputation of the arm high up—free torsion was also employed; for in that case I passed one blade of my forceps into the humeral vessel for about half an inch, and, with the other outside, after four complete revolutions the operation was successfully performed. I have, since this paper was written, applied free torsion to the femoral artery of three adult patients with complete success. On the dead subject also this mode of torsion proves successful, particularly on the femoral, brachial, and carotid arteries. It should also be stated that Amussat in his last years employed the *limited* torsion in all except the very small vessels; whilst Thierry employed the *free* in every case.

Three or four revolutions of the artery are required for small arteries, five or six for large: when the vessels are atheromatous the former number (three or four) is amply sufficient under all circumstances.

The orifice of the artery alone should be held by the forceps which twist the vessel in both cases.

In no case does it appear necessary, or even prudent, to twist the vessel till the end is twisted off: for by so doing we do away with the chief safeguard against bleeding, we run the risk of breaking up the valvular incurvation of the inner tunics, and disturb the clot which forms between the retracted ends of the two inner tunics and the twisted cellular coat. In very small vessels this point is not of so much importance. It is probably due to this error of twisting off the ends of the vessels, that the practice of torsion has failed to hold its ground, for in the few cases in which

it has been employed, such a mode has been generally, if not universally, adopted.

It seems to be a good rule in every case of torsion, whether free or limited, to hold the end of the vessel for a second or two after the twists have been made, to allow of the parts becoming plugged with blood, and the divided tunics to retract and come in contact.

It appears also to be a matter of great importance in twisting large vessels that the whole orifice of the artery should be seized and firmly held; this cannot be well done with the forceps ordinarily sold, but can be by the forceps I have had made for the purpose by Mr. Millikin of Southwark Street, the ends of which are broad, and firmly hold the artery, and not having sharp ends do not tear it. The blades are closed by a simple catch. With a small pair of forceps the surgeon is very apt to tear out a piece of the end of the vessel and not twist it securely. I have proved this on many occasions on the dead body.

The forceps I have had made for holding the vessel are very simple, they fix it firmly with flat surfaces without injuring the external coat, which the sharply-teethed forceps are apt to do; they are also very well adapted for the twisting of vessels of moderate calibre.

Comparison between Torsion and the Ligature.

If we compare the effects of torsion on the arteries with those of the ligature, it appears that the changes the two inner coats of the artery undergo are in a measure similar under both circumstances; that the same plugging of the vessel by the temporary clot, and permanent sealing of the extremity of the vessel by the organization of effused lymph, take place in both—in the one case the twisted cellular or external coat mechanically arrests immediate hæmorrhage, and in the other the ligature. But between the two methods there is this great difference, that with the ligature we have a foreign body, applied only for a temporary purpose, which,

when it has served, can only be regarded as a source of irritation and of some danger; but with the torsion no such foreign body exists, for, when the extremity of the vessel has been once fairly twisted, it is twisted for ever, and what was at first only a temporary obstruction to the arterial flow becomes a permanent one.

In the second experiment on the horse which has been modelled (see drawing from model, Plate IX), all these changes may be seen, and from this it would, moreover, appear that the twisting of the vessel, together with the adhesion of the orifice of the two inner tunics, is amply sufficient of itself to be both a temporary and permanent obstruction to the arterial flow; the formation of a clot being of quite a secondary importance.

It should be stated, however, in this comparison that in the ligature there is no incurvation of the ruptured middle or inner tunics, and but little retraction. It would thus appear that when torsion has been thoroughly and efficiently performed, hæmorrhage from the small, and even from the largest vessels, may be arrested with some certainty; and that, what is of still greater importance, when this effect has been produced, the fear of secondary or any subsequent bleeding is apparently groundless: for when once the inner tunics of the arterial walls have been divided, and as a consequence have retracted, incurved, and approximated, and when the cellular coat has been completely twisted upon itself more than once, the knot formed by such a twist does not seem to be capable of unfolding, and there is no foreign body about the vessel, as there is when a ligature has been used, to set up a fresh inflammatory or ulcerating process to destroy the permanent sealing of the twisted or occluded artery, and thus give rise to secondary hæmorrhage.

It is in this point, I would respectfully suggest, lies one of the great advantages of torsion over the ligature, for when once bleeding has been successfully arrested by well-applied torsion, and no signs of hæmorrhage occur within a few seconds of its application, there need be little fear of a subsequent bleeding—in a healthy subject at least—or of a

secondary hæmorrhage, for there is nothing to interfere with the physiological processes which nature invariably adopts to seal permanently the divided vessel; there is no foreign body to set up ulcerative action, which must undo to a degree, and may undo altogether, the work that nature has performed to guard against bleeding.

In the use of the ligature no such certainty exists, for such ulcerative action must take place for the purpose of its liberation, and this ulceration, or sloughing of the ligatured extremity of a divided artery, is the most common cause of secondary hæmorrhage; we all know, also, too well how frequent and how serious secondary hæmorrhage from a large artery always is.

I might add that of all the cases recorded, in which torsion has been used, in none is secondary hæmorrhage mentioned to have taken place.

It may be objected, however, that torsion is not applicable in every case. I would perhaps grant the objection; but because a practice is not applicable in every case, there can be no objection to its use in such as it can be applied. I believe it will be found that the practice can be carried out in by far the majority of cases of divided vessels, if not in all, whether healthy or diseased; but that in the latter the number of twists required will be far smaller than in the healthy subject, for when arteries are diseased it is in the middle and inner tunics that the mischief is situated, and it will be found that these coats readily break under the influence of torsion, and as readily retract and approximate; the cellular coat is rarely involved in the disease, and may be twisted with care.

Again, should torsion fail it will fail at once, and the surgeon can then repeat the same or adopt other means of arresting bleeding; but should it succeed, it will probably succeed unto the end, for there is no local exciting cause to set up fresh action, there is no influence going on in the part to undo at a later period of the case what has sufficed to arrest the flow of blood at the beginning.

By way of summary the following conclusions may be drawn up.

1. That hæmorrhage may be arrested by torsion from even the largest vessels.

2. That it is a safe and judicious practice in all cases in which the vessels are small or of moderate calibre; and that, as far as experiments and practice yet prove, it is equally so in arteries of the first magnitude.

3. That torsion may be "free" or "limited:" the *free* method being applicable to vessels of moderate size, and even to the largest of the extremities; *limited* torsion being more adapted for the large and loosely connected vessels.

4. That in *torsion* as in the *ligature* the permanent hæmostatic processes are alike due to the sealing of the divided inner and middle tunics; but that in the ligature there is only an irregular division of these tunics, whilst in torsion there is a complete division, separation, retraction, and valvular incurvation.

5. That in torsion the *twisted cellular* coat forms, with the retracted and incurved middle coat, the direct mechanical obstacle to the flow of arterial blood, in the same way as the *compressed cellular* coat does in the ligature; but that in torsion the twisted cellular coat and incurved middle coat become subsequently a permanent means of occluding the end of the artery; whilst the ligature of necessity becomes subsequently a source of irritation, and too often a means of undoing what has been done by nature's own hæmostatic processes.

6. That in *torsion* the twist in the cellular coat of an artery; the division and subsequent retraction, incurvation, and adhesion of the middle coat; and the coagulation of the blood in the vessel down to the first branch, are the three points upon which its temporary as well as permanent safety depends; whilst the permanent safety of *acupressure* rests only upon the last point alone, and its temporary effects upon the pressure produced by the needle.

7. That there is every reason to believe that when torsion has been successful on its first application, the fear of subsequent hæmorrhage is altogether groundless; for there is nothing, as there is in the ligature, to interfere with the physiological processes set up by nature to occlude the divided vessel; and, unlike acupressure, the temporary obstacle to the flow of blood becomes a permanent one.

8. That upon physiological grounds torsion has decided advantages over the ligature and the acupressure needle; and that if subsequent experience confirms what has been hitherto observed in the experiments on animals and the application of the practice in the human subject, we shall have gained a point of no mean importance and simplified surgery in no slight degree.

Conclusion.

I have thus, as tersely as I could, brought forward all the facts of which I am cognisant bearing upon torsion as a hæmostatic agent, and some of the arguments by which it may be commended to your consideration. I trust I have adduced sufficient to prove it to be well worthy of extended trial.

That it is a reliable practice in many cases when efficiently performed can hardly be disputed; in how many, can only be proved by the ultimate test of all knowledge—experience. It is not a crude idea based upon a theory spun out of a fertile imagination; for it had its origin in observation of nature's own processes; it is based on the well-recognised physiological principles of natural hæmostatics; and it is artificial only so far as the surgeon's art is employed in rendering these processes most available.

Nearly forty years have now passed since its distinguished originator brought it before the notice of our foreign brethren; but I trust before another decade has passed it will have been tested to the full, and that when weighed in the balance of experience it will not be found wanting, for I entertain a high opinion of its capabilities, and believe that in the future it is destined to be a handmaid to the surgeon of no secondary importance.

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J. F. D. Jones on 'Hæmorrhage,' 1810.

DESCRIPTION OF PLATE VIII.

Fig. 1.—Brachial artery from a case of amputation, in which hæmorrhage was arrested by torsion (see pages 207–9). Mode of preparation—artery slit by scissors up to dot; then hardened in spirit, and a longitudinal section made with a sharp knife. Drawn to natural size.

A. Tunica adventitia; at A′ twisting.

B. Tunica media and tunica interna, without visible line of distinction.

B′. The same, at point of torsion, ruptured and retracted towards the cardiac end of the artery, at B″ towards distal end, but not so perfectly incurved.

C. Clot. C′ between tunica media and adventitia at point of torsion. C″ in part of artery beyond point of torsion.

D. Small artery coming off above dot.

*** The arrow shows the direction of the blood current.

Fig. 2.—Carotid artery of a dog, showing the effects of torsion (magnified one third). Experiment No. 4. (See pages 210–11.)

A. Brachio-cephalic artery, dividing into subclavian and carotid.

B. Part of artery distal to the cut.

*** The arrows show the direction of the normal flow of blood.

d, d. Middle and internal coats; at *d′ d′* very little incurvation; at *d″* much thicker than elsewhere by contraction.

e, e. External coat; at *e′* twisted.

f, f. Clot, here and there decolorized.

g. Ampulla.

h, h. Portions of artery seized with forceps, much shrunken.

Fig. 3.—Effects of torsion on the living carotid artery of a horse. Experiment No. 7. (See pages 212–13.) Mode of preparation—hardened in spirit and a longitudinal section then cut. Drawn to natural size.

A. Portion of artery on the cardiac side of the cut.

B. Distal portion.

C, C. Corresponding ends of the artery where it was cut and twisted.

*** The arrows represent the normal direction of the current of blood before the artery was touched.

d, d. Middle and internal coats turned in so as to meet at *d′*, with a kind of knob-head at *d″*, the same merely overlapping each other.

e, e. Internal coat; at *e′* separated from the middle by a small quantity of decolorized clot; at *e″ e″* points of twisting.

g, g. Portions of artery seized by the forceps: these show no appearance of sloughing, but rather of atrophy.

h, h. Clot, in spots decolorized; from *h′ h′* a piece which had contracted no adhesion to the arterial walls, but which fell out in making the section.

x. Pouch-like swelling containing decolorized clot, and elastic lamellæ from middle coat of artery (?).

DESCRIPTION OF PLATES IX AND X.

PLATE IX.

Illustrating Experiment No. 8 on the horse. Taken from Mr. Towne's model.

*** The arrow indicates the course of the blood. (See pages 213–14.)

Fig. 1.—Carotid artery of a horse to which torsion had been applied.

A. The external coat which had been twisted.
B. The retracted and adherent middle coat.
C. Clot in the meshes of the split middle coat.
D. Large branch which was open.

Fig. 2.—Carotid artery of a horse to which a ligature had been applied.

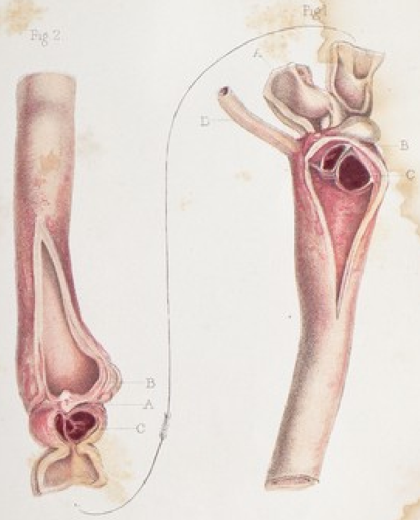
A. Ligature which had nearly ulcerated through the vessel.
B. Divided and adherent middle and inner tunics.
C. Clot in the free extremity of the artery which has contracted upon it.

PLATE X.

Figs. 1, 2, 3.—Arteries laid open to show the valvular incurvation and splitting of their middle and inner coats the result of torsion (see page 215).

A. Twisted external coat.
B. Valvular incurvation of middle and inner coats.
C. Splitting of middle coat.

H G Howse del. G H Ford chr. W West chr lith



G. H. Ford. chr.

W. West. clx. lith.

Fig. 1

Fig. 2

Fig. 3

G.H. Ford del.

W. West chr. lith.

A REPORT

OF A

SANITARY TOUR.

To the Under Secretary of State for India.

From Surgeon T. G. Hewlett, Health Officer of Bombay.

Sir,

I have the honour to report to you, for the information of the Secretary of State for India, that in accordance with the permission granted to me in your letter, dated June 3rd, 1869, I have visited the Towns marginally noted with the view of inspecting works of Main Sewerage, Water Supply, and Sewage Irrigation.

Banbury
Warwick
Coventry
Rugby
Bedford
Leicester
Birmingham
Liverpool
Wigan
Preston
Blackburn
Manchester
Bradford
Leeds
Lancaster
Penrith
Carlisle
Hexham
Sunderland
Tynemouth
Alnwick
Berwick on Tweed
Edinburgh
Glasgow
Swansea
Portsmouth
Worthing
Hastings
Dover
Croydon

These Towns embrace the following classes—

1st.—Those situate in purely agricultural districts, such as Banbury, Warwick, Rugby, Bedford, &c.

2nd.—Inland centres of Manufacture, such as Birmingham, Manchester, Leeds, &c.

3rd.—Seaport Towns, such as Liverpool, Glasgow, Swansea, Portsmouth, &c.

The moral, physical, and economical conditions in each class vary, and had I proposed to have undertaken a statistical and special enquiry, embracing all the causes that affect the Sanitary standard of each particular Town, such conditions would have had to be specially considered and reported upon; but such an analysis would have necessitated a long residence in each place, and would have been beyond the scope of the present enquiry.

It therefore appeared to me desirable to trust to the Local Authorities for a description of the various

works and facts relating to Sanitation in each particular Town, and I accordingly append statements which have been compiled from extracts from reports and from information given me by Local Authorities.

I can never be sufficiently grateful for the kindness which Mr. Rawlinson's introduction ensured me at most of the Towns under report, or for the very liberal manner in which I have been supplied with printed reports, plans, maps, etc., etc.

My especial thanks are due to Mr. Newlands, the Borough Engineer of Liverpool, who furnished me with copies of his own and Dr. Trench's reports, besides those on all other matters concerning the Municipal Administration of that City.

I am also much indebted to Mr. Till and Mr. Gray of Birmingham, to Mr. Filliter of Leeds, to Dr. Little and Mr. Lynde, of Manchester, to Mr. MacPherson of Edinburgh, who gave me Dr. Littlejohn's admirable report on the Sanitary state of that City, to Mr. Carrick and in an especial manner to Dr. Gairdner of Glasgow, whose reports are particularly valuable, to Mr. Cousins and Dr. Davies of Swansea, to Mr. Latham of Croydon, as well as to other gentlemen with whom I was brought in contact.

The literature pertaining to Sanitation, embodying the varied experiences of all the most skilful Engineers and Officers of Health in the United Kingdom, would be of incalculably greater value if it were more easily obtainable, and it seems to me to be a matter of regret that all such reports are not forwarded to a central office for distribution not only to other Towns in the Kingdom but to the Colonies, as at present they are beyond the reach of the public, being only circulated among the members of the particular Municipality to which they refer.

In this sketch I shall confine myself to summarizing those lessons I have learnt which appear to me to be

more especially applicable to India, and shall venture to make suggestions regarding those points which seem to me might be advantageously entertained for adoption in India.

I would premise, however, lest it should be thought that I at all depart from matters more immediately connected with my profession in giving an opinion as to certain details of Sanitary Engineering that I would ask for indulgence on the plea that as the origin of certain diseases is undoubtedly to be traced to the faulty construction of Works of Sewerage, etc., I, as a Health Officer, must be necessarily interested in seeing, and should fail in my duty if I did not see, that all those avenues through which, in my opinion, disease may be entailed on a people committed to my charge are efficiently defended in the only way I believe they possibly can be, in the introduction of those works which, if constructed on true hygienic and common sense principles, are among the greatest blessings engineering science has conferred upon communities, but which prove the entire reverse if the principles I allude to are neglected.

Viewing then the question of Sanitary Engineering as a border land in which Engineers and Officers of Health are both equally interested, and in which they may both freely express their opinions, I would state my conviction that any system must fail if it is not *universally* adopted in the inhabited place to which it is applied.

In Manchester, Liverpool, Birmingham, etc., only a portion of the houses are fitted with water-closets. In the remainder, and in Manchester, (where the Corporation discourages their use,) in the larger portion there are middensteads, or receptacles both for nightsoil and ashes, which are in my opinion doubly objectionable, as they have to be periodically cleaned at a great expense; but as they necessarily entail the accumulation of nightsoil in the vicinity of human habitations, are sources of danger, however carefully constructed or ventilated they may be.

As far as I can see, water-carriage appears to be, under existing circumstances, the most convenient vehicle for the removal of all refuse from large Towns in England.

This system has not yet been tried in India, and it remains to be seen whether it is the one best suited to the local habits of the people,* and whether a sufficient supply of water can be provided to carry the sewage to its outfall before decomposition has set in.

I will not in this paper discuss the question, whether in India it would not be better to exclude nightsoil altogether from the sewers, but, on the supposition that both the above conditions are fulfilled and that a general water-closet system has been determined upon, I hold that works of Main Sewerage to be effective should essentially embrace the following points, which have been so concisely expressed by Mr. Newlands, the Borough Engineer of Liverpool, in his Report of 1848, that I copy them from it,—

First.—The removal in covered conduits from the houses (Mr. Newlands adds "and of streets" but this I object to) of all refuse capable of suspension or solution in water, as fast as it is produced, in such a manner as shall prevent the generation of noxious gases.

Secondly.—The perfect underground drainage of the whole strata to such a depth as will keep the lowest parts of the buildings free from damp.

Thirdly.—The disposal of the refuse so that it may not pollute the natural drainage outlets, the streams or rivers in the vicinity, or vitiate the atmosphere, but may be applied to the legitimate use of increasing the fertility of the surrounding country.

The first condition, especially in a country like India where the rain only falls during certain months of the year, would, in my opinion, be best attained by the adoption of the separate system and by a strict observance of the rule that sewers should invariably be laid in straight lines, and be only of a size sufficient to remove the sewage matter, whilst the rainfall should be allowed to flow away into its natural channels.

* Since the above was written, I have heard from Dr. Sutherland, that an apparatus suitable for the manners and customs of Oriental races has been contrived by an Officer of the Royal Engineers, who has had great experience of the requirements of the natives in Turkey, and that the Turks are now introducing drainage, and similar latrines on their own account.

The success of such an apparatus would remove one of the objections to a water-closet system for India.

The towns sewered under the direction of Mr. Rawlinson attracted my immediate attention by the observance of the common-sense rule of sewers laid in straight lines.

The introduction of stoneware or earthenware pipes as channels for the conveyance of sewage matter has effected a complete revolution in Sanitary Engineering, and I am fully satisfied that immense good would result if Government was pleased to send out to India men competent to instruct the natives in the manufacture of them.

While leaving the main sewers to be laid by the Engineer, I think that the Health Officer should still see that at their points of connection with inhabited houses no danger to health is likely to accrue.

The mode of laying the subordinate sewers which seems to me to be best, is the common-sense one which obtains at Swansea, and which from the existence of sweepers' passages would be peculiarly adapted to Bombay.

This, to quote from the Report of Mr. Davies, the able Medical Officer of Health of Swansea, is carried out as follows:—"Houses are not drained directly into the main sewer but into subordinate sewers at the rear of houses on both sides of the street. The sewers are easy of access, and the drainage of back premises is not carried under the houses. Each house is connected independently with the subordinate sewer, which is finally connected with the main."

Perfect ventilation of all the sewers is essentially necessary. I have seen many methods adopted to effect this most difficult but all important question. Either as Mr. Rawlinson always orders with so much success—to quote again from Dr. Davies—"by ventilating shafts in connection with every manhole along the course of the main sewer, at an average distance of 40 yards from each other, each ventilating shaft being fitted with trays filled with finely broken vegetable charcoal through which the gases must pass before they escape into the street."

I would here remark that some Engineers, especially

in Manufacturing Towns where there is a great escape of steam into the sewers, object to the use of charcoal for the reasons given by Mr. Newlands in his evidence before the Liverpool Mortality Sub-Committee, published in 1866, page 56, where he says "Charcoal in the concrete state is a very good condenser of gas, but I have always found it fail when brought into contact with watery vapour, as when it is put over a sewer. The action of the charcoal is mechanical—it acts as a sponge, and as its affinity for watery vapour is greater than for any gas it does not act so well as a deodorant in damp as in dry situations."

I was shewn however at Croydon, by Mr. Baldwin Latham, a charcoal ventilator lately invented by himself, which from its mechanical ingenuity will, I think, prove to be perfectly successful in its action, as all danger of the charcoal being in any degree wetted is entirely prevented.

At Liverpool and other towns the rain-water spouts, where the tops open above the level of the highest windows, are used to ventilate the sewers.

I cannot but think such a method is a hazardous one, though Mr. Newlands, whose great experience of course is extremely valuable, thinks they are safe; yet I do believe that in certain conditions of the atmosphere the sewer gases would be likely to be brought down into the sleeping apartments, and that therefore this method should not be adopted.

In Liverpool, Mr. Newlands has used for the last 18 years, and has lately greatly extended the introdution of the Archimedean Screw Ventilator. This consists of a pipe carried from the top of sewers to the summit of any high building adjoining; the pipe terminating in the Archimedean Screw Ventilator; and he proposes to apply these at the dead ends of sewers and where sewers and drains change their direction and gradient.

This invention appears to me likely to be of infinite use in India, not only for ventilating sewers but also

buildings, as it ensures a rapid exhaustion of the air below, and will act incessantly whenever there is, as in Bombay, a continuous current of air.

Ventilation by the connection of sewers with furnaces would be applicable in but a very few places in India.

The flushing of Sewers is effected in various ways—both by flushing chambers over the line of sewers filled by connections with the water mains; by self-acting tumbler receptacles, as at Swansea and at Leicester; by a moveable flushing tank, capable of holding upwards of 1,000 gallons of water which is suddenly discharged into the sewer. All of which methods are applicable to India.

Regarding the sanitary defences requisite to protect the interior of houses from the entrance of sewage gas, I think that all house drains should, just before their connection with the sewer, be fitted with a syphon trap, as at Swansea, Leeds, &c., and that all water-closets of course should be fitted with syphon traps. That the sink pipes from sculleries, kitchens, baths, etc., should —as recommended at Manchester and Swansea—not be carried direct into the house drain, but be led outside the houses and there fall from a height not less than 1 foot into a covered receptacle, capable of being cleaned and fitted with a syphon trap, which should communicate with the house drain, and that the house drain itself should in all cases be fitted with a special ventilating pipe to be carried 6 feet above the top of the house.

As a still further and most important protection of houses, I would insist on every water-closet being fitted with an especial ventilating shaft, which should likewise be carried above the roof of the house.

The measures above-mentioned severally appear to me to be necessary to prevent the entrance of Sewer gas into houses, and I do not think that any one of them

could safely be dispensed with, especially in the case of house connections with Sewers conveying nightsoil.

The evidence of most Engineers I have asked seems to prove that the house drains as a general rule should not be of a less or greater size than 6 inches.

The trough water-closets in use at Liverpool, and the self-flushing tumbler water-closets at Leeds, where they answer remarkably well, appear to me to be the best kind for use in poorer districts, especially for closets which are frequented by more than one family.

As regards the disposal of sewage, I am certain that any attempt at rendering the effluent water pure by the separation of the mechanical impurities held in suspension must prove abortive, whether by the use of filters as at Coventry, or by precipitation with lime as at Leicester, or by simple settling tanks as at Birmingham, or by the A B C process as at Leamington, or by the use of chemical agents, as it is hopeless by either one or any of these operations to render the effluent water anything else than sewage.

All these plans appear to me to fail in meeting the requirements of the case, and the continued practice of allowing the effluent water to pollute running streams, as at Coventry, Birmingham, etc., seems to me to be exceedingly wrong.

Being quite convinced that, in the course of a few years, the question among practical farmers will be, not whether sewage can profitably and without danger to the public health be applied to land, but which farmer can succeed in getting even a share of the much-coveted sewage, I will first notice what appeared to me to be the best plan for effecting the separation of the solid matter from the sewage before its application to land, for this I consider, especially for India, to be a necessity. At Bedford, where the separation was only partially effected, there was in parts of the fields where the sewage had settled a dried

black scum, which under the hot sun of India would have given off an offensive odor.

In India, from the habit of the natives using water after defæcation, there will not be nearly as much solid matter as in the sewage in England.

The means that I have seen used for effecting its separation are, as I stated above, by simple mechanical deposition; by filtration through coarse gravel and stones; by precipitation with lime; by the use of other ingredients, such as in the A B C process (animal charcoal, blood, alum, and clay.) And the general plan adopted is to have at the outlet, extensive masonry beds, either covered as at Coventry, or uncovered as at Birmingham, etc., in which these operations are conducted, and from which an offensive smell is liable to be given off during the process of cleaning.

I believe all these plans will be entirely superseded by a simple but most ingenious contrivance invented by Mr. Baldwin Latham, and which I saw being experimented upon at Croydon.

In the middle of the stream of sewage at the outfall has been erected a turbine, which, acted upon by the cleansed sewage water, revolves between itself and the main stream of sewage an iron wheel about 14 feet diameter and about 2 deep, which is divided from the outer edge to the centre into compartments which intercept the solid matter, (consisting of all kinds of filth, among which I saw a dead dog, a tin biscuit box, road drift, etc.,) which is carried up until the compartment is over the central line, when the solid matter falls over the central axis which is furnished with an Archimedean Screw which worms it to a point outside the end of the axis, where another screw conveys it to wagons standing ready to receive it and by which it is periodically removed: while the side of the wheel furthest from the incoming sewage is covered with galvanized iron network, through which the strained water passes.

The next point to be considered is the quantity of land which would be necessary for a given population.

I do not think that this question can be answered off hand. At Barking and Croydon from 5,000 to 6,000 tons of sewage, or a quantity equal to 100 persons per acre, have been applied to every acre. At Banbury I was told this was too strong a proportion, and that 80 persons per acre would be a better dilution; but so much depends on varying conditions of population, soil, etc., that I believe this question will in each place have to be settled by the consideration of local peculiarities.

Regarding the, to me, most important question of how near to the inhabited place may a sewage farm be established without danger to the public health. I cannot say that from any evidence I have been able to collect I have arrived at any very definite conclusions based upon facts.

I enquired into the alleged outbreak of disease at Carlisle in consequence of the sewage farm, and the result will be found in the statement compiled from information kindly given by Mr. Morley.

As regards the Craigentenny meadows, near Edinburgh, Dr. Littlejohn says—"Under the influence of the improved agriculture of the present century, extensive swampy tracts which existed to the west of Edinburgh have been reclaimed, and it is to be regretted that the sewage of the inhabitants should now be employed to create an evil from which we have so recently been delivered. * * At present there is no control over this irrigation. No one can inspect it in operation without seeing that it is carried in the cheapest and most slovenly way, and the smells complained of arise chiefly from the foul state of the larger channels. * * * Edinburgh, from its situation, is peculiary exposed to suffer from the effects of the emanations from these meadows. The easterly are our most prevailing winds, which pass across these meadows before they sweep over the new and the more elevated portions of the Old Town; and it has been plausibly conjectured that the insalubrity of these winds depend largely on this contamination. But, at any rate, a city surrounded by swamps cannot be regarded in a sound sanitary condition, and it is highly probable that a great

part of the mortality of the Abbey and some of the poorer districts of the Old Town is in a great measure owing to the unhealthy character of these breezes which blow so continually during many months. It is difficult otherwise to account for the high death-rate of the district of the Abbey, in which there is little overcrowding and where only a small population can be said to belong to the poorer class."

Complaints have also been made regarding other farms, especially when they are first formed; but much of these complaints may be due to prejudice. Certainly during my visits I did not discover in any farm anything offensive to the sense of smell; but it is at present impossible to say what the effect may be on persons habitually exposed to currents of air passing over a farm whose success depends on irrigation with matters in solution which are readily putrescible.

Having then due regard to the dampness of soil, evaporation from surface, and increased vegetation consequent on irrigating land with sewage, I think that the question of distance from the inhabited place must depend to a great degree on the number of population, on the quantity of water carried to the outfall, and the capacity for absorption of the soil to which the sewage is applied.

For a population of upwards of 200,000 persons, with a quantity of sewage equal to 30 gallons per head, my impression is that a less distance than 3 miles would not be safe; but, as I said before, more evidence is required on the subject before a definite conclusion could be arrived at.

Engineers, Ratepayers, and Farmers would all be interested in reducing the distance as much as possible; but Health Officers would, in my opinion, view with anxiety any scheme proposing to put large volumes of sewage on land nearer inhabited places than I have mentioned.

Regarding the best method of applying sewage to the land, for England as well as India, I am convinced the simpler the means used the more surely will success attend the experiment, whether from a sanitary or pecuniary point of view.

The first thing is to have the land—as at Aldershot—scrupulously levelled on a slope. This may entail a heavy outlay at first, but such an expenditure will be amply repaid by the power of

utilizing equally every part of every field. Common sense should have prevented the adoption of the ridge and furrow system, as it stands to reason that the sewage matter must lie in the furrows for unequal distances, and that the ridges could get but little sewage; and yet I saw land at some farms in the ridge and furrow.

Of course the sewage would be delivered, whether by gravitation or by pumping, at the highest level of the farm, from whence main carriers which it is advisable should be covered, (as at Norwood) can be laid so as to command the areas below them, and these areas can be divided into panes by simple earth trenches, of course according to the contour of the land, but generally at about a distance of 70 feet from one another.

The expensive arrangements connected with these communicating carriers that obtains at Worthing are very unnecessary; a simple piece of board puddled in with earth being all that is requisite; but, as Mr. Clifford says in his most excellent report on the Warwick Farm, and to which I beg to call especial attention, the natives of India are all "skilled irrigators," and I have no fear but that they will, under supervision, lay out the ground to the best advantage.

All crops are improved by sewage, but, as Mr. Clifford says, Italian rye grass is a "gross feeder" and will take "any quantity" of sewage. After the 3rd year, however, it is advisable to plough up and re-sow either with rye grass or a root crop such as mangold wurzel.

Italian rye grass seems peculiarly well adapted for the supply of food for the cattle of a large city like Bombay; and though I have seen celery, broccoli, etc., etc., growing under the application of sewage, yet for India, knowing, as I well know, the childish fears and superstitions that the natives hold with regard to European interference with anything connected with their food, I should advise that at first sewage be applied only to food grown for cattle or to cotton fields, leaving the natives themselves, as doubtless they would when they find it would pay, to apply it for the growth of esculent vegetables.

About 5 or 6 crops of Italian rye grass, weighing from 16 to 20 tons per acre, seems to be the average annual yield of land irrigated by sewage.

I also directed my attention to the requirements of isolated places in rural districts beyond the reach of main sewers. The method I

think suitable for them may be perhaps best illustrated by relating the conditions I found on a small property I was consulted about and the measures I took to cure them.

The house, with garden attached, was situated within its own fence enclosing about 2 acres of land, and having only one cottage in the immediate vicinity.

In the garden was the servants' privy, which consisted merely of a seat over a bricked cesspool, which was within 40 feet of the stable well, the water of which was used for drinking. I had the cesspit thoroughly cleaned out, lime-whited, and the seat nailed up, and a Moule's Earth Closet placed inside. The pail being emptied every day into a trench in the garden.

Inside the house was a water-closet, which discharged into a cesspool 8 feet from the house, into which the water from the scullery also flowed, and the drain from both passed alongside a well used for drinking purposes, the cesspool being only 15 feet distant from, and on a higher level than, the well. The gravel between the cesspool and well was black and stinking. I had the cesspool cleaned out and lime-whited.

An earth closet was inadmissable within the house, so I placed within the cesspool one of Chessyre's Intercepting Tanks. This is almost hermetically sealed, as it is double syphon trapped. The solid matter, paper, etc., is arrested by a screen which permits the passage of water, which flows away through a syphon-trapped glazed pipe, and eventually discharges itself at a distance from the house beyond the property into a surface drain. The smell both inside and outside the house, before much complained of has entirely disappeared. The iron tank will require cleaning periodically, the patentee states once in 6 months, but this is a matter for experience to decide.

In order to secure the Drainage of subsoil, I would in all cases insist on the condition laid down by Mr. Chadwick, in his Paper on the Sanitary Principles of Cottage Improvement, and published in the Journal of the Society of Arts, viz., that the Water Table shall be lowered not less than 3 feet. I hold this to be of the greatest importance, especially in the malarious soil of India, where too often residences consist of one floor only, elevated above the ground by a plinth of a few feet high.

I would certainly prefer that the subsoil water was carried away by the rainwater drains; but if that cannot be done I recommend

that all subsoil drains shall, before their junction with the sewers, be not only syphon-trapped but ventilated between the syphon and the sewer, otherwise sewer gas may find its way into the house.

As regards the Water Supply of Towns, I hold that the Medical Officer of Health should direct his attention primarily to the purity, and secondly to the sufficiency of the quantity of the water supplied to his people; and that then, leaving the purely engineering questions of collection and stowage to those best fitted to deal with these matters, should see that by its distribution no injury was entailed on the Public Health. From the evidence I could collect, it appears to me that when a sufficient quantity of pure water is stored it should be at all hours of the day and night at the disposal of the people; that in its passage from the Reservoir to the houses in the Town it should be guarded against any possibility of being tainted by any foreign matter whatsoever, and that the water used for domestic purposes should not be stored in any cisterns, which are always liable to be fouled, but that it should be drawn off direct from the mains.

If cisterns for water-closets are necessary to prevent waste, that only those on the principle of Messrs. Guest & Chrimes waste water preventers be adopted, as these provide a sufficient quantity of waste to flush the soil pipe on each occasion of the closet being used, but have no overflow into the sewer.

All house taps should be of the best possible construction, and obtained from the best makers such as Messrs Guest & Chrimes, or Messrs. Kennedy, as cheap fittings have been well described as the curse of water-works.

The waste of water should be prevented as it entails an unwholesome wetness of the subsoil, and consequently exposes the people to evils arising from damp.

To give some idea of the extent to which such waste may prevail, Mr. Latham in a recent report to the Croydon Board of Health, estimates that nearly 1½ million gallons are daily lost by leakage or illegitimate use.

The best kind of water-waste preventer for stand pipes in streets that I have ever seen is that made by Messrs Kennedy, and in extensive use in Birmingham. This will only supply water as long as an iron cone, which allows the water to escape, is turned by the

hand. It cannot get out of order or be kept open by improper means, and would be especially useful in Bombay.

I cannot but think that the water supply of Towns should be at once removed from the hands of Companies, and placed under the control of the sewer authorities.

But, few places in India would however be for years to come supplied by water brought in from a distance. The present supply is too often obtained from the village tank, which is almost invariably filled with the debris of vegetation.

Much I think might be done to improve the condition of this water by the use of the usual sand and gravel filters, but the filtered water should not, as at Rugby, etc., be exposed to the liability of being tainted by the floating impurities of the air, but be received into covered reservoirs from whence it might be drawn off as required.

As an Executive Health Officer I was much interested in seeing the way in which the scavengering of Cities is performed, and especially in the arrangements adopted in Edinburgh and Liverpool, for I am convinced that however well a Town may be sewered, yet, that the removal of the surface filth is a matter of equal importance. In India almost all the filth that can be collected is from the surface.

The faithful persistent cleansing of the surface can only be effected at a great cost, and in India we cannot at present reduce this, as in the United Kingdom, by the sale of the refuse as manure.

No one can peruse the earnest and invaluable reports of such men as

Dr. Gairdner,	the Medical	Officer	of Health	for Glasgow,
Dr. Littlejohn,	"	"	"	Edinburgh,
Dr. Trench,	"	"	"	Liverpool,
Dr. Little,	"	"	"	Manchester,
Dr. Robinson,	"	"	"	Leeds,
Dr. Davies,	"	"	"	Swansea,

without feeling that the very greatest amount of sanitary knowledge is placed at the disposal of the various communities to which they belong. In the reports of these Officers are many hints which would be of the utmost value to the members of the Medical Services in India. "The Cholera Instructions" issued by Dr. Gairdner in 1866 are of infinite importance, and should be more generally known; but from these reports the lesson may be learnt, that a good sewerage system, a pure water supply, a scientific application of the sewage to the land, combined with a proper cleansing of the surface will be

inefficient as long as the tenements of the inhabited place are overcrowded, illventilated, and shut out from fresh air and light;—as long as the refuse and waste products of negligent traders are allowed to vitiate the atmosphere, as by the deadly arsenical and sulphurous fumes given out from the copper smelting furnaces of Swansea, or by the horrible bronchitic giving smoke belched forth from the chimnies of Lancashire, where earth, air, water, and animals are alike fouled by the shameless waste of coal. And here I would speak of what has indeed been told me by Municipal Officers in many Towns —that local self-government uncontrolled by the supervision of a central authority is, and must be a fatal bar to the sanitary improvement of that kind of property which stand most in need of it, and that the liberal minded men of such boards are out voted by the petty shopkeeper class whose only desire is to keep down the local rates, careless so long as they save their own pockets, whether the sanitary requirements of the poor are uncared for. It would, in my opinion, be a sad day for the welfare of India if the control of sanitary improvement were to be vested in the hands of local authorities, without the State exercising a due supervision in order to compel the sanitary requirements of the masses receiving that care and attention which they have a right to expect from a wise and provident Government.

I have the honour to be, Sir,

Your most obedient humble Servant,

T. G. HEWLETT,

Surgeon Bombay Army,
Health Officer & Coroner
City of Bombay.

October 15th, 1869.

Brook Cottage, Sunning Hill, Berkshire.

Information from the Towns of WIGAN, LANCASTER, TYNEMOUTH, and DOVER, was not received in time for publication.

BANBURY.

The following Statement is copied almost verbatim from a valuable Report, kindly placed at my disposal by the Author, THOMAS PAIN, ESQ., Clerk to the Local Board at Banbury. Certain Extracts from the Municipal Corporation Directory have also been embodied in it.

The district of Banbury comprises the corporate borough of Banbury, and the non-corporate township of Neithrop, in the county of Oxford, and Grimsbury, in the county of Northampton.

In 1852, the provisions of the Local Government Act were applied to Banbury, and a Local Board of Health formed. It is composed of 13 members, 6 selected from the Town Council, and 6 elected by the non-corporate parts, whilst the Mayor for the time being is ex-officio a member of the Board.

The principal trade consists in the manufacture of girths and webbings for exportation to the Continent; there is also an agricultural implement manufactory, and the Town is a centre for the sale of agricultural produce.

The population of the district in 1861 was stated to be 10,238; it is now (1869) estimated at about 11,000. The area is 4,000 acres, and the rateable value £39,227 17s. 6d.

In 1868, the rate in Banbury was 1s. 11d. in the pound.
" " Neithrop 1s. 9d. " "
" " Grimsbury 2s. 4d. " "

Shortly after the formation of the Local Board of Health, a system of drainage was commenced, the greater part of which was executed in 1855 and 1856. It carries away both the storm water and the sewage, and originally had its outfall in the Cherwell, a small river or stream which flows past the Town.

Complaints soon after arose from parties living further down the stream that the river was poisoned. Deposit and filtration tanks were erected at a cost of about £500, with a view of remedying the annoyance complained of; but as these works did not prove effective, the Board subsequently spent about £800 in making additional tanks, and first applied carbolic acid and lime, and afterwards perchloride of iron and lime, with a view to deodorize and disinfect the sewage, before it passed into the stream, but with the like unsuccessful result.

The owner of Twyford mill, 3 miles off, moved for an injunction in the Court of Chancery, which was granted, forbidding the further discharge of the sewage into the river, so as to cause annoyance and injury to the plaintiff. A writ of sequestration followed but was not put in force, as the Local Board determined to try the effect of the application of the sewage to the land, and accordingly a Farm was obtained at about a mile's distance from the Town.

The fresh sewage of the Town is conducted by a main sewer into the above-mentioned tanks, which may be described as deposit, filtration, and stowage tanks.

Filtration is effected through an upward filter composed of small stones and gravel.

After passing through the deposit and filtration tanks, where the solid matter, paper, etc. is arrested, the liquid sewage passes into a tank from a well connected with which, it is pumped by a condensing engine of 18-horse power up to the highest level on the north west corner of the farm.

The deposit and filtration tanks contain together an area of 510 superficial yards, and are capable of holding in the aggregate about 130,000 gallons, whilst the stowage tanks are of sufficient space to hold about 100,000 gallons—the amount of a night's flow; and this large tank space has been found advantageous, not only for the purpose of deposit and filtration, but in rendering any night pumping unnecessary.

The deposit and filtration tanks are in duplicate, and each set is emptied about once a month, and the deposit mixed with the sweepings of the streets and ashes, and other refuse collected from houses, is then conveyed in boats along the Oxford Canal which adjoins the sewage works, and sold to the occupiers of land on the banks of the Canal.

The farm contains about 60 acres of arable and 76 acres of pasture including one acre of roads. The soil is generally of a very stiff loam though in parts gravelly. During the winter of 1866, and the spring and part of the summer of 1867, the arable land was levelled, and with the exception of 2 pasture fields, containing 24 acres, which are in ridge and furrow, the whole of the farm has been also levelled. The part in ridge and furrow is irrigated, but is found not to be so suitable for sewage irrigation as the levelled part, inasmuch as the sewage is not so regularly distributed over all parts of the land; the sewage flowing from the two ridges gives too much to the furrows.

The sewage from its outlet on the highest level flows by gravitation through carriers or trenches cut in the earth on raised embankments, and from the main carriers is conducted by smaller ones to any part requiring irrigation, and after having passed over the land is discharged free from smell into the river Cherwell.

The principal crop is Italian rye grass; there is also an acre of cabbage, and a small quantity of carrots and parsnips, and about 14 or 15 acres of mangold wurzel. For all these root crops the sewage is applied to the land before sowing, and not whilst they are growing.

The following is an account of the Receipts and Expenditure in respect of the Farm for the year 1868:—

RECEIPTS.

	£	s.	d.
Amount realised for sale of Rye Grass	561	16	6
Do. for Mowing Grass	347	18	2
Do. for Oats	198	0	0
Do. for Aftermath	166	11	8
Right of Shooting over Farm and Sundries	6	1	6
	£1380	7	10
Deduct Payments	£1190	13	1
Profit on Farm ...	£89	14	9

PAYMENTS.

	£	s.	d.
A year's rent less property Tax ...	605	3	1
Rates and Taxes for the year ...	57	4	7
Coals for Engine	111	16	9
Labor on Farm, including Engine-driver's wages	216	2	0
Seeds, Implements, etc.	82	0	6
Manager's salary	45	0	0
Auctioneer's expenses of Sale, including Commission	73	6	11
	£1190	13	1

The adoption of the irrigation works cost £4,000, and £1,500 had been previously borrowed for the erection of tanks, etc., or £5,500 in all. This amount is to be paid off in 30 annual instalments of principal and interest at 5 per cent. The instalment therefore of principal and interest in respect of the loan of £4,000, borrowed to carry out the Irrigation Works would be £250 (£200 interest of £50 principal). If therefore the profit on Farm has to be deducted from this, there would be a loss of £160 5s. 3d., which would be about 3¾d. per head of the whole population (estimated at 11,000) for the removal of all of the excreta of the inhabitants.

The death rate has decreased since the introduction of the Public Health Act, when it was 26 per 1,000 of the population.

In	1859	it was	20 per 1,000.
	1860	,,	18½ ,,
	1861	,,	14 ,,
	1862	,,	14½ ,,
	1863	,,	17 ,,
	1864	,,	17½ ,,
	1865	,,	20 ,,
	1866	,,	17 ,,
	1867	,,	19 ,,
	1868	,,	20 ,,

so that the average of the last 9 years is 18 per 1,000.

The drinking water supply of Banbury is in the hands of a company. Its source of supply is from the river Cherwell, and the works are situated on the river, about a mile above the Town. The river water flows into two filtering beds, which are of the usual construction: the water filters through a layer of about 15 inches of fine sand, thence through about 12 inches of fine and 9 inches of coarse gravel, and lastly through about 6 inches of large rubble stones, which are laid in covered bricks with apertures at intervals. The filtered water passes through these brick drains to a centre drain, which opens into the bottom of the pure water well, from whence it flows into a suction well, and is pumped by a 16-horse power engine to a reservoir on the top of Hasington Farm, from whence the Town is supplied. This reservoir holds 248,000 gallons; but only about 190,000 gallons are pumped daily.

WARWICK.

The following Statement embodies information kindly given me by J. Fenna, Esq., Borough Surveyor; and also a most valuable report by W. Clifford, Esq., under whose able management the sewage Farm has obtained so much success. Extracts have also been made from the Municipal Corporations' Directory.

The Town of Warwick has water communication with many Towns by means of the river Avon on which it is situated; and also by means of the Warwick and Birmingham, and the Warwick and Napton Canals. The Oxford and Birmingham branch of the Great Western Railway also runs through the Town.

Population, according to the census of 1861, 10,570.
Estimated in 1869 to be about 11,000.
Inhabited houses in 1861, 2272.
,, ,, 1869, 2390.

A main drainage system was carried out in 1851. District sewered covers 1270 acres. The street gulleys and the roofs of the front of Houses are connected with surface drains, which convey the water from them to the river

Avon. The water from the back yards and from the roofs at the back of houses finds its way into the sewers. The main sewers are glazed earthenware pipes, varying in size from 18 in. at the outlet by 15 in., 12 in. to 9 in. at the top levels. There is a flushing pipe with a 2 in. cock at the head of every main pipe. Ventilation is effected through the rain water pipes.

About 200 houses in the Town are not connected with the sewers; at these there are cesspools, but they are being gradually abolished; so that in a short time all the houses will have water-closets. Every water-closet is fitted with a syphon trap.

The scavengering of the Town is performed by men employed by the Corporation.

Mr. Clifford's Report.—

The sewage flows by gravitation from the Town to the pumping station, which is situated on the Stratford road about ¾-mile from the Town. It empties into two reservoirs, each 76 ft. 6 in. long, and 17 ft. 6 in. wide at bottom.

112 ft. 6 in. „ 33 ft. 6 in. „ at top.

The depth of these reservoirs is 9 ft. 6 in., but they fill only to 8 ft.

At about 12 ft. from the entrance of the sewer, a screen composed of wooden planking perforated with holes about 1 inch in diameter, and separated by about 6 inches from each other extends across each reservoir. This screen is let into brickwork, and at the bottom and in the centre of each screen is a sluice. The paper and solid matter are arrested by the screen and periodically (about once in 12 months), are taken out, mixed with ashes, and sold as manure.

The sewage is then pumped by two engines, made by Gimson & Co., Leicester, each of 25-horse power. Each engine works a double acting pump, 18 in. diameter, 30 in. stroke; maximum speed 25 revolutions, minimum 20. Each pump forcing 1,080 gallons per minute. They pump the sewage through a rising main of 16 in. to a point 73 feet above the bottom of the well, on the Farm ¾-mile distant.

The Warwick Farm consists of 102 acres generally of heavy clay land. It is about a mile from the Town. It is taken on lease of 21 years on a rental of £300. The tithes and taxes amount to about £100, making a total of £400. The lease dates from Lady-day, 1867. It was then about half arable, half pasture on the old ridge and furrow. With the exception of 1 field (12 acres) of old pasture, all the land was broken up, got into shape, and seeded down with Italian rye grass within the year. The sewage was first delivered in the last week of July, 1868; but there were frequent interruptions until December, since which time the delivery has been constant.

The upper portion of the Farm (25½ acres) is undulating, falling on two sides at different inclines, (which cover about 40 acres) to the flat land, containing about 36½ acres.

The irrigation is by catch-water pane and gutter, ridge and furrow, and bed, and the sewage is conveyed by open runs. The arterial drainage in 2 fields is perfect, on others very defective, some not at all.

The plant virtually lost its first year's growth, and suffered great injury from the heat and drought of 1868. No produce was obtained until the autumn of that year.

This year (1869) 4 and 5 crops have been cut to date (September). With

the exception of the 2nd spring crop all have been light. The yield of our best fields is as follows to acre—in tons:—

No. 1.	2.	3.	4.	5.	Time of cutting.
2.2	3.	2.12	1.18	3.16	Feb., March, and April.
12.8	10	3.8	6.16	5.8	May and June.
6.0	4.17	10.10	6.7	8.4	June and July.
3.4	3.16	4.10	4.7	3.10	July and August.
		3.0	2.16	2.13	August and September.

No. 1 is now (September) ready for cutting and No. 2 will be shortly.

The plant is becoming thin, dying out fast in many fields, and is largely replaced by natural grasses.

Owing to the nature of the soil, breaking it up is a serious and expensive matter, it can be only worked at certain seasons; in fact when it can be caught,—to use a homely but apt expression.—the land is either "all bricks or all mortar." We have tried ploughing and skim ploughing and burning, but found both alike unsatisfactory and costly. The loss of time is frequently great, and the horses stalk and puddle the ground to an injurious extent. We are now trying the experiment of spade digging.

Grass Demand.—Last year the grass was almost unsaleable, as the greatest possible prejudice existed against the use of sewage grass. The prejudice has fled in the face of experience; the demand this year has been quite equal to the supply. Prices varied from 12/- to 16/- per ton. We cut the grass ourselves, and allow carts to go on the fields when possible, otherwise we convey it to the roads.

The field of old pasture, 12 acres, is ridge and furrow, with considerable fall on one side. It has been brought under irrigation.

The May crop was sold off in June, realizing £4 17s. 6d. per acre. Since then I have cut an aftermath for £30, and a second aftermath is forward.

Exclusive of loss in rental the cost of laying out the Farm has been about £10 per acre. Little or nothing has been done to the roads which are in a bad state: to put them into working order would cost at least £5 per acre.

There is a brook running round two sides of the Farm, into which the drainage of the surrounding land falls. We are not allowed to use the brook or any of the ditches that drain into it, therefore we have a catch drain surrounding the Farm which conveys our drainage to the outfall, when it passes under the brook by 2 16in. pipes acting as syphons; it then runs down common watercourses into the Avon ¾-mile distant. Being on clay our effluent discharge is large.

We have grown a few beans and potatoes which have done well. Virtually the Farm is in grass, and we shall continue it, as no other crop is of so little trouble and pays so well when the demand is good, as with us at present. We purpose laying out 3 acres with mangolds next season. The sewage of about 2,050 houses mixed with about 600,000 gallons of water comes into the Farm.

The delivery of sewage is very unequal, falling as low as 400,000 gallons daily in very dry weather, and rising over a million and a half of gallons daily in very wet weather. Everything is pumped up and the sewers flushed out once a week; when this is done the sewage is pumped direct from the sewers, passing by iron pipes under the bed of the reservoir to the pumping well.

Most people anticipated nuisance from the working of the Farm; for a time some fancied there was, but truth has convinced every one now, that a

sewage Farm is no nuisance, that it creates in fact less nuisance than often arises on an ordinary Farm when manuring the land. Sewage fresh and fresh has at the worst but the aroma of cabbage water, and in that state is harmless. When allowed to stand for 24 hours, decomposition sets in and noxious gases are given off, especially sulphuretted hydrogen, the presence of which may be known by the smell of rotten eggs, so common in the lanes and gullies of Calcutta.

The marvellous effects of sewage on land in developing its productive powers is shewn in the fact of its giving 6 and 7 crops of grass in a climate like ours, where only one could be had without it. Sewage holds in solution and suspension the constituents necessary for the growth of the plant; water is the vehicle of supply. When a crop is cut the constituents are returned to the land and a fresh crop springs up. In the climate of India, which I know very well, after 27 years' sojourn there, I should anticipate marvellous results from the skilful application of the sewage to the land. In the natives themselves you have skilled irrigators; but I should imagine that their religious prejudices would prevent them from applying sewage to their own crops; but this would yield in time, when they saw the wonderful results. Whether rice will stand sewage treatment, will need experience to decide: to some extent it certainly would, if not to that of rye grass, which is a gross feeder and will take "any quantity" of sewage without injury. At all events the land could be treated with sewage for the next crop, and thus the area of its usefulness would be largely extended.

The application of sewage to all crops has been satisfactorily demonstrated that it can be usefully and profitably so employed in India I am as certain, as I am of my own identity. Time, experience, patience, and skill, are required, and these we can command to carry the measure to a successful issue. One has but to see the Warwick Farm to see how readily it is done, and how satisfacterily and successfully sewage irrigation works.

The Warwick Waterworks were carried out the same time as the Drainage Works. The water drawn from the river Avon flows through an earthenware pipe 18in. diameter into a settling tank

100 ft. long by 50 ft. 6 in. broad at top, sloping down to
60 ft. long by 36 ft. broad at bottom.

Here the floating impurities are arrested and the water flows into 2 filtering beds, one being 100 ft. long by 78 ft. broad at top, sloping down to
66 ft. long by 44 ft. broad at bottom.

2nd.—110 ft. long by 88 ft. broad at top, sloping down to
78 ft. long by 46 ft. broad at bottom.

Down the centre of each bed runs a pipe with 5 cross branches. The water entering at the top filters through sand, 12in.; fine gravel, 6in.; coarse gravel, 3ft.; large stones, 18in.

The filtered water passes to a well from whence it is pumped by an engine a distance of 1¼-mile, to a service reservoir in the Town, a height of 128 ft. from the bottom of pumping well.

The main is 12in. House connections for drinking purposes are laid direct from pumping main. The supply is intermittent, but the pumps are in action from 6 a.m. to 9 p.m. The Corporation insist on having one of Messrs. Guest & Chrimes' water-waste preventors fixed to every closet, because the water by them is economized, and a better flush is secured. Lambert's screw taps are used in the houses. About 56,000 gallons are kept in the reservoir on the top of the water tower, which is 70 feet in height, in case of fire. The average daily supply amounts to 310,000 gallons.

The cost of the execution of the drainage and water supply works amounted to £25,000. This sum was raised by a mortgage of the general district rates (3/- in the £1), and is repayable (principal and interest at 4½ per cent) by 30 annual instalments. This loan was advanced by an Insurance Company.

This loan of £25,000 does not include the cost of the Sewage Farm, which amounted to £11,000 in addition, which was raised by mortgage of same rate at 4½ per cent interest, repayable in same number of years.

COVENTRY.

The following information is gathered from a Memorandum supplied to me by the Borough Surveyor, E. J. Purnell, Esq., and I have also made extracts from the Municipal Corporations' Directory.

The Town of Coventry is an important manufacturing City in Warwickshire, the manufactures include silk fabrics and ribbons, lace, carpets, watches, and machinery.

The Public Health Act was applied in the year 1849.

Statistics:—Population estimated at 42,000; inhabited houses, 10,400; rateable value, £99,664; acreage 1,690 acres, of which 600 are built upon; number of streets, 171; length of streets, 27 miles; average annual mortality for the 10 years 1851-1860, 25 per 1,000. The sewerage carries off both rainfall and sewage. The main sewer is about 2 miles long, and varies in size from 3 ft. 6 in. by 2 ft. 6 in. to 4ft. by 3ft. at outfall; it is built of brick, eggshaped, invert set in cement; 4 or 5 miles of the subsidiary sewers are glazed earthenware pipes from 6in. to 12in. in diameter; the number of water closets, 3,813, but many of these are double making the agregate nearly 5,000; there are numerous cesspools in the Town. The main sewers and subsidiary drains are flushed by perpendicular shafts charged with water from the nearest hydrant.

The sewers are ventilated principally by down spouts, there being 1,230 connected in the Town.

Total cost of sewers, £35,000, this includes £6,000 for constructing works, purchase of water power, etc. The main sewer cost per yard about 23/-.

The outlet of the sewers is distant about a mile from the Town, and by it the sewage is conducted to the tanks which are in duplicate.

The tanks are brick-work enclosures divided on either side into two partitions, each communicating with a central drain. They are 124 ft. long and the 1st tank is 18 ft. broad, the 2nd 9 ft., and the central drain 6 ft., they are 14 ft. deep. Between No. 1 and No. 2 tank, and between No. 2 and the central drain are filter beds which are enclosed by perforated planks of wood 7ft. 6in. high. The filter beds consist of large stones at the top, gradually diminishing in size until there is a layer of coarse gravel at the bottom.

The sewage water entering No. 1 tank, filters through the 1st filter bed into No. 2 tank, and any solid matter which may pass through No. 1 filter bed is arrested by No. 2, after passing through it escapes into the central drain, by which it is conducted through a culvert into the river Sherborne. About 1,800,000 gallons per day passes through the tanks.

The tanks are covered by brick arches, and over each tank are 5 iron gratings, over which a travelling crane runs upon rails, to this is attached a bucket holding about 28 gallons. The tanks are cleaned out once a month, and the solid

matter at the bottom is run into beds formed by street sweepings, with which it is covered and mixed, and sold for about 2/- a ton. About 1,440 tons of solid matter are thus intercepted during the year. The site on which these works stand covers 4,450 square yards.

The sewage tanks, including 4½ acres of land and 1,100 feet of inlet sewer, cost £4,320.

The annual expenses of the sewage works amounts to £140.
Amount received for manure in 1868, £120.

In Coventry there are about 6 large dye works, and although most of the solid matter is intercepted as explained above, the sewage runs away as a black inky fluid, and perfectly discolors the stream.

Just before the sewage is discharged into the river, it is occasionally intercepted and allowed to flow over about 14 acres of land, about 4 acres of which are sown with rye grass, and 10 with common English grasses.

In 1868, from the 4 acre field, the crop fetched	£35	0	
The aftermath, or joist	£15	0	
		£50	0
From the 10 acres, there were 3 crops of hay	£180	10	
The feeding off	£15	0	
		£195	10
Total		£245	10

268 acres have been purchased on high ground sloping down to the river, for £27,000 and are about to be laid out for sewage irrigation. For these the sewage will have to be pumped up to the highest level.

The Waterworks at Coventry were erected by the Corporation under a Special Act in 1846. They cost £33,000, the money was borrowed by mortgage at 4 per cent; annual working expenses, £2,700 to £2,900; profit, from £700 to £900

The supply is obtained from the following sources:—

1st.—From a spring at Radford, the water of which is conveyed for about a mile to the filter beds.

2nd.—From a land-spring from the gardens at the north-west of the Town, about ¼-mile distant. Both the above are surface-springs and are dry during summer.

3rd.—From a small brook called the Barley brook, which flows from Radford; the water from this is let in by a sluice into a filter bed composed of sand 22in., fine and coarse gravel and stones, 24in., below are cross drains which carry the water to a centre drain, through which the filtered water passes into a collecting tank.

4th.—From Artesian wells sunk into the new red sandstone; these are 4 in number, 1st is 300 ft. deep; 2nd is 250 ft. deep; 3rd is 75 ft. deep; 4th is 75 ft. deep; these discharge direct into the collecting tank, which is circular in shape, 100 ft. diameter by 15 ft. deep, at 14 ft. 4 in., the water over-flows into the river Sherbourne.

The suction pipe, cast iron, 2ft. diameter, dips into the collecting tank to within 11 inches of the bottom; there is a wall about 3ft. high, built about 18in., from the suction pipe, to protect it from weeds, and especially from the silk weed which is very troublesome, and grows with great rapidity in the tank which is open; the American weed also grows in the tank but is not objected to.

The water is pumped up by two beam, double action, double cylinder engines, one is of 60 horse power, the other of 40 horse power; the 60 horse power one drives about 63 gallons a stroke, and about 1,000 strokes per hour, the water passes first through an air vessel and then through a 14in. iron main into the Town. There is also an air vessel over the suction pipe. The pumps are kept in action for about 12 hours.

The water passes by the mains through the Towns and supplies it in its passage, the surplus is pumped up to a service reservoir built on Barr's Hill, Radford, distant about a mile from the works, and situated 100 feet higher, and over a stand pipe 40 feet high, making a pumping lift of 140 feet. The average daily supply is about 700,000 gallons. The number of fire plugs is 109; hydrants, 294; standposts, 39; houses supplied, 7,364; water closets, 3813; meters, chiefly Kennedy's, 66; public wells and pumps, 21.

The water works stand on 4 acres of land, and there are 6 boilers altogether, though only two are used for each pump, these are fitted with Hulton's smoke burners. There are also public baths belonging to the Corporation, built at a cost of £5,325. They are kept open at an annual loss.

RUGBY.

The following statement is compiled from information kindly afforded me by I. M. Wratislaw, Esq., Town Clerk, and J. E. Palmer, Esq., Town Surveyor.

The population of Rugby, according to the census of 1861, amounted to 7,818, but is now (1869) estimated to have reached about 9,000. The area of the parish is 1,600 acres, and there are estimated to be about 1,500 houses. The main sewers carry off both the rainfall and sewage; they consist of glazed earthenware pipes varying in size from 2ft. at the outfall to 9in, and extend over about 5 or 6 miles.

Water from the hydrants is used for flushing these, and they are ventilated through charcoal trays into the street at the manholes. Nearly all the houses are fitted with water-closets, which are connected with the sewers by pipes, varying in size from 4in. to 6in. The water-closets are syphon trapped. The sink connections 3in. in diameter are well trapped.

Ashes and dry refuse are collected in the back yards of houses in covered ash-pits, about 4 ft. by 3 ft., and 3 ft. or 4 ft. deep. The owners make arrangements to have these pits cleansed; but there is no systematic inspection by the local Authorities whether they are done so or not.

The sewage flows by gravitation through a high and a low level sewer to the Farm, which is situated about a mile from the Town. There are 58 acres on the Farm, 40 acres of which are irrigated by the high level sewer, and the remainder by the low level.

At the high level inlet the sewage is received into a diverting well, from which it flows into one of 2 depositing tanks which are open, and in which are fixed double strainers made of perforated wooden planks. The solid matter is arrested and is deposited, while the liquid sewage flows out through a 15in. earthenware pipe into the main carrier.

Each deposit tank is used in turn, and is periodically (about once a month) cleaned out, and the solid matter removed and covered over with refuse from the carriers, and used as manure.

The main carrier is simply an earth trench, with a fall of 1 ft. in 200 ft.; smaller ones with falls varying from 1 ft. in 600 ft. to 1 ft. in 1,000 ft. communicate with it.

The main carrier is 2 ft. 6 in. broad at the top, tapering down to 1 ft. at the bottom; it is 18in. deep. This is considered to be unnecessarily large: and one of 2 ft. broad at top, 9in. at bottom, and 1 ft. deep, would be preferred.

At intervals, depending on the nature of the ground, are wooden sluices let into brick wall sides.

The principal crop is Italian rye grass, though some mangold is planted. A crop of rye grass takes on an average a month or 6 weeks to grow. After cutting, the ground is saturated with sewage for 3 or 4 days; this of course varies with the amount of rainfall.

The sewage from the low level is obliged from the nature of the ground to be allowed to flow over growing crops, but they are none the better for it.

The effluent water passes off the land into the Avon, two miles below the source of drinking water supply to the Town; but during the summer the land absorbs all the water.

The land in which rye grass has been sown must be ploughed up and sown in with fresh seed every 3rd year; but it is advised that a crop of roots should be sown instead of rye grass every 4th year.

The sewage irrigation works cost £4,700. The first year's receipts were £350; though only a portion of the land was brought under cultivation. The money was raised on mortgage of rates at 4½ per cent interest, principal and interest to be repaid by yearly instalments in 30 years.

Rugby Waterworks.—There are two sources of supply; the principal one being from rainwater which is collected in a rural district, over an area of about 700 to 800 acres. The water so collected flows from numerous points, through earthenware pipes, gravitating by a central main to a covered reservoir, situated at about a mile's distance from the Town: this reservoir holds about 150,000 gallons. The water is pumped from this reservoir by a 15-horse power horizontal engine, to a tank holding about 50,000 gallons, on the top of a water tower 75 feet high. It thence flows through an iron 9in. main to the Town by gravity: it is laid on to nearly all the houses.

The pipes for drinking water purposes are connected direct with the main; but as the supply is intermittent, there are cisterns made of either iron or lead: water-waste preventers are not used. The above supply runs short during the hot weather, and is reduced to less than 35,000 gallons per day.

The subsidiary supply is obtained from the river Avon, about a mile from the Town. This flows into a well, from which it is pumped into a settling reservoir, holding about 2,500,000 gallons.

The mechanical impurities are deposited, and the supernatant water flows into filter beds, of which there are 2, each being about 40 feet long by 35 feet wide.

The filtering medium is composed of—fine sand, 6in.; magnetic carbide of iron and sand, 6in.; medium sand, 9in.; coarsest sand, 4in.; Gravel—size of peas, 4in.;—size of beans, 4in.;—size of walnuts, 6in.;—size of eggs, 4in.

The water after passing through the above, escapes by brick drains to a central drain, from which it is conducted through an iron sliding tube, into an open filtered water reservoir, holding about 70,000 gallons; and from thence it is pumped by the same engine to the water tower twice a day; from the water tower it flows through the same mains at the upper works into the Town.

The height pumped is 108 feet: the pumps are in action about 12 hours per day, and about 180 to 190,000 gallons are pumped during that time.

BEDFORD.

The following statement has been compiled from information kindly given me by the local Authorities. Extracts have also been made from the Municipal Corporations' Directory.

The Town lies on both sides of the river Ouse. The Bedford level was reclaimed by drainage from being a salt marsh, and a great trade is carried on in corn and other grain.

Malt, coal, iron, and timber are considerable items of commerce carried on by means of the river which is navigable to the German Ocean. Lace making affords employment to great numbers of women and children, and there is in the Town one of the largest agricultural implement manufactories in the Kingdom.

Population, 1869, (estimated) 16,000; area of Borough, 1,962 acres; area sewered, 1,000 acres; number of houses, 3,400.

There are very few cesspools in Bedford, the number that do exist is supposed not to exceed 150.

Works of main drainage have been executed at a cost of £18,000. They are on the separate system, the storm water flowing to the river. There are 2 lines of main sewers, a high and low level; both discharge by gravitation to pumping station, a mile from the Town.

The main sewers are constructed of brick, and are egg-shaped. At the outfall the size is 4 ft. by 2 ft. 8 in. The smallest size of brick sewer is 2 ft. by 1 ft. 8 in. The subsidiary earthenware pipes range from 1 ft. 6 in. to 1 ft. 3 in. There are 2,464 water-closets connected with the sewer by 9 in. or 6 in. pipes, fitted with syphon traps.

The drains from the sinks, which are syphon-trapped, are on the outside of the walls of houses.

The sewers are flushed at their extreme ends from hydrants, through 3 in. pipes.

There are 90 special ventilating shafts, of 3 in. or 4 in. diameter, running up from the crown of the sewers to the top of chimney stacks.

There are manholes at the junction of each street, which are fitted with charcoal ventilators; and the rain-water pipes are also connected with the sewers, when they do not open near the windows of houses.

The soil is gravel and sand on the south side of the river; limestone and clay on the north.

The main sewer from the high level is laid under an embankment reclaimed from the river, and about a mile long. The sewage from the low level on the south side of the river, receiving the sewage of about 1,000 houses, passes by an iron pipe 15 in. in diameter under the river, and joins the main outlet. The main sewer flows into a brick tank, 12 ft. by 6 ft., by 6 ft. deep. At about 2 ft. from the outlet, and extending across the tank, is an iron grating 6 ft. high, the bars of which are about ¼-inch apart. By this grating, the paper and solid matter are retained. The sewage then flows into a tank about 30 ft. by 12 ft., and 12 ft. deep, half way down which is a culvert which leads to a centrifugal pump, by which the sewage is lifted into a cast iron cylinder 1¼-in. thick, 6 ft. diameter, and 15 ft. high, from which it flows by gravitation over the land, being conducted to it, for a distance of about ½ a mile, through an iron pipe 1 ft. 6 in. in diameter.

Around the pumping station is a garden, in which there were at the time of my visit, growing beet-root, broccoli, asparagus, onions, lucerne, white turnips, etc. The sewage flows in this garden through earthen trenches, and is applied at intervals, perhaps of a week, to these crops for a day or two.

The sewage flows on to the Farm from the cylinder, through a pipe into a supply well, and thence through earthenware pipes carried along the highest ridge, from which earthenware carriers are laid at intervals of 60 or 70 yards. The sewage flows irregularly over the ground, as the land was not in the first instance properly levelled.

The Farm contains 50 acres; 37 of which are laid out in rye grass, 10 in mangold wurzel and cole rabbi, and 3 in wheat.

A crop of rye grass takes about 6 weeks to grow. After cutting, the sewage is allowed to flow over the field for 3 or 4 days, according to the state of the weather. No sewage is then allowed on for another week, when it is again applied. It should be applied 3 or 4 times during the growth of the crop. Rye grass sells for from £4

to £8 per acre. The field of mangold I saw growing in September, was planted in April. It was irrigated about a month after sowing, and once every fortnight since. It is intended to be pulled in October, and then the ground will be soaked with sewage during the winter, and early in the spring seeded down with rye grass. About 350,000 gallons were being pumped over the land in September, when the pumps were in action about 5 hours during each day; 600,000 gallons can be pumped in the 24 hours. When the pumps are not in action, a sluice is shut at the outlet, and the sewage is ponded back in the main sewer for about a mile.

The effluent water finds its way through various ditches into the river, about 1¼-miles below the Town.

Redford Waterworks.—Established 1868.—Supply from an artesian well sunk in the limestone rock. The well is 14 ft. deep, and the boring 18 ft. into the rock. This yields 205,440 gallons a day, which are pumped by a beam engine into a reservoir, capable of holding 800,000 gallons. The reservoir is situated about a quarter of a mile from the well, which is in a hollow, and about 1¼-miles from the town. The water is lifted about 160 ft. into a reservoir, and then is conducted by iron mains, 1 ft. diameter into the town. The supply is on the constant system. All water-closets are fitted with water-waste preventers, holding 3½ gallons, after the pattern made by Messrs. Guest & Chrimes. The water-closets are fitted with Messrs. Doulton's, of Lambeth, pans.

The water works, including the main sewerage embankment, cost £23,000.

LEICESTER.

The following statement has been compiled from information kindly given me by E. L. Stephens, Esq., the Borough Engineer, and from extracts from the Municipal Corporations' Directory.

Leicester is the centre of the worsted hosiery manufacture, which is the staple trade of the Town, along with lace, sewing cotton, wool combing, worsted spinning, &c.

Population estimated at 90,000; area of Borough, 3,000 acres; area of district sewered 1,200 acres; No. of houses, 20,000

The sewers which carry off both storm water and sewage, formerly discharged into the river Soar, at the nearest points. An intercepting sewer has since been built, with which the sewer from the west side of the Soar, communicates in its passage to the sewage works, which are situated on land adjoining the Abbey, on the north side of the Soar. The main sewers are built of brick, are circular in form, and vary in size from 2ft. 6in., to 5ft.

Flushing is effected by pipes from the hydrants, and from moveable tanks large enough to hold about 1,080 gallons, which are suddenly discharged into the sewer. It is calculated that about a million gallons of water are used during the quarter in flushing the sewers.

The method of ventilation adopted is to connect the sewers with the engine shafts of different manufactories. There are now (1869) 25 such connections. The rain-water pipes also communicate direct with the sewer, and ventilation is effected through them.

There are only about 6,000 water closets in the Town; but on cottage property, there is on an average only one water closet for every 4 cottages. The size of the water closet connections, varies from 6in. to 9in., they are all syphon trapped. The sinks are situated outside the houses, and communicate by a short drain, which is furnished with a trap, with the main sewer.

Middens or ash privies are numerous throughout the Town; they are estimated to amount to between 3,000 and 4,000. These are also connected with the sewers, so that the watery matter finds its way into them. The solid matter consisting of nightsoil and ashes remains, and is removed on an average once in 6 months.

The Construction of the sewers is estimated to have cost £40,000.

The Sewage Works.—The sewage flows through a barrel culvert 4 ft. 6 in. in diameter, into 2 wells, each 7 ft. by 11 ft., and 12 ft. deep, from which it is pumped up 20 ft.

into reservoirs, which are 200 ft. long, 45 ft. broad, and 14 ft. deep. The reservoirs on section are triangular in shape, and so constructed that the gutter is in the centre.

The engines used for pumping are 2 Cornish engines, which consume about 20 tons of coal during a week, in lifting about 35 million gallons of sewage; they are each in action for about 12 hours per day.

In its passage from the supply well, the sewage receives, and is intimately mixed with, a solution of lime of the strength of 1 ton of lime to a million gallons of water. The sewage and lime then pass slowly over the reservoir, where the lime precipitates the solid matter.

The effluent water from the reservoir passes over a weir into the river Soar, which soon after joins the grand junction canal.

The reservoirs are in duplicate, and the sewage flows into one whilst the other is being emptied. This occurs about once a month, when the sludge at the bottom is lifted, and run down into earth embanked beds, where it is allowed to remain for 2 or 3 years to consolidate. It is then sold for one shilling a cartload as manure.

The sewage works cost £25,000.

The yearly expenses of working them amounts to £1,300.
From which must be deducted sale of manure ... £300.

Leaving £1,000 as the expense of working them.

The Water Supply of Leicester is under a private company. Two brooks, the Thoraton and Carr are impounded, and the water is collected in a reservoir, which holds 365 million gallons. The water passes through 4 filter beds, and is brought down 10 miles by an iron 24in. main to the service reservoir, which is 100 feet lower than the main reservoir. The service reservoir is situated a mile from the Town, and is about 90 feet above it. The water is distributed through about 23 miles of pipes, and is on the constant supply system. There are about 14,000 connections. No cisterns are allowed in houses except for water-closets when they are compulsory; each service cistern holds about 2 gallons. Messrs. Stock Bros., and Taylor's taps are recommended to be used, but Messrs. Guest & Chrimes' taps are permitted. About 21 gallons per head per day are supplied. These water works cost about £90,000.

The death rate for the year 1868 is stated to have been 27.855 per 1,000.

BIRMINGHAM.

The following statement has been compiled from information kindly given me by W. Till, Esq., Borough Surveyor; J. W. Gray, Esq., the Engineer to the Birmingham Water Works Company; and also from some extracts from the Municipal Corporations' Directory.

Birmingham is the great centre of hardware manufacture for England and the World. Every description of hardware, from the most ponderous steam engines to the smallest piece of jewellery being made here.

Population by census of 1861, 296,076; 1869, estimated 360,000; inhabited houses by census 1861, 59,060—by estimate, 1869, 70,000; estimated number of electors, 43,000, burgesses 47,000; gross estimated rental, about £1,260,000; rateable value, £1,052,796 19s. 9d.; area of borough, 8,420 acres; area sewered, 7,320.

The Main Drainage Works.—The length of sewers at present constructed amounts to 97 miles, leaving 36 miles still to be made by the Council. The cost including compensation of land, amounts to £200,000.

They consist of egg-shaped brick sewers and circular pipes, varying in size from 5ft. 9in. by 3ft. 6in. down to 12in. pipes. The main sewers are ventilated by shafts from their sources to the surface of the roads and are flushed by gates fixed in them and from shafts at dead ends.

The house connections are 9in. and 6in. pipes, with 4in. soil pipes. The proportion of water closets is very small, and every house almost has its privy and ash-pit.

The scavengering was formerly let to a contractor, who failed to perform the work satisfactorily and it is now done by the Corporation.

Outlet Works.—The sewage flows down by 2 egg-shaped mains 5ft. 9in. by 4in. Their contents are received into a large culvert, which at either end has 7 arches, and which forms the side of 2 depositing tanks, which are 330ft. long, 90ft. broad, and 6½ft. deep. The tanks are in duplicate, to allow of one being used whilst the other is being cleaned.

Each depositing tank is divided into 3 sections: the sewage is allowed to flow into 1 tank for 14 days it is then diverted into the other whilst the full one is being cleaned; all the supernatant water is allowed to run off and the mud and sludge deposited at the bottom is lifted about 14 feet by a 13 H.P. engine, and run down into a depositing ground which covers about 7 acres, to a depth of about 4 feet. It remains on this ground for about a year, until it has become sufficiently consolidated for removal, but is covered over with gypsum to prevent smell at an annual cost of £100. About 42,000 cubic yards are removed from the tanks during the year.

13,615 tons of sewage manure were disposed of during the year 1867, and were sold for 9d. per ton. The charge for the manure at the works is 1/- per cart, 2/6 per waggon, and 20/- per boat load.

The Birmingham and Fazely Canal adjoins the works.

£25,000 were expended in construction of the works, purchase of land, etc., etc., and about £2,000 is the annual cost of maintainance.

The effluent water runs into the river Thame.

Experimental Farm at Outlet.—Mr. Tila's Report 1868.—About 50 acres of land belonging to the Council were double dug, levelled, and the necessary road carriers constructed so as to allow of the same being seeded down with Italian rye grass prior to July last, whilst 6 acres, on which the liquid sewage cannot be conveyed without pumping, have been planted with mangold and other experimental crops, such as clover, celery, cow-cabbages, swedes, turnips, etc., but owing to the lateness of the time of planting, and the excessive heat, the crops were not large.

The remainder of the meadow land was irrigated with the sewage several times during the season, and let out to cow keepers.

The amount received for sale of rye grass, was £314 9s. 3d.; for hay for cattle, £517 1s. 11d.; and for barley, oats, mangold, etc., £142 10s. 11d., making a total of £973 14s. 1d.

The Water Supply of Birmingham is in the hands of a private Company. Source of supply,—river Tame and its tributaries, also some artesian wells. The water flows and is pumped into 2 reservoirs at Aston. The 2 reservoirs are capable of holding 50 million gallons of water, and from them it is pumped by 6 steam beam engines (2 Cornish, 2 Baldwin, and 2 fly-wheel) through 2 22in. mains to a service reservoir, 265ft. above level of pumping well, capable of holding about 6 or 7 million gallons, and which is 3½ miles from pumps. From this reservoir a portion is pumped to another reservoir, distant about ½ mile and 80ft. higher, which supplies the highest levels. The supply is constant, the pipes being always charged. Water closets are supplied from cisterns, (Dale's patent,) holding about 2 gallons. House connections are filled with Guest & Chrimes' ½-inch screw valve taps. About 8,000,000 are supplied daily.

Chessire's Intercepting Tanks.—At Birmingham I likewise saw in operation Mr. Chessire's intercepting tank.

The box is 2ft. 4in. long, 18in. wide, 18in. deep. The pipe from the privy or closet having a syphon trap above it, passes into the top of the box at the opposite corner to the outlet pipe, which placed at the bottom of the box is divided from the main part by a perforated grating, extending across the corner and the whole height of the box. The lid is

sealed with putty, and the outlet pipe is also trapped with a syphon trap. All the water, urine, etc. runs away to the sewer, the solid matter, paper, etc. being retained to be periodically removed. This appears to be a better form of cesspool, and may be worth trying in places that have no regular system of drainage.

LIVERPOOL.

I am indebted for the following statement to the kindness of James Newlands, Esq., the Borough Engineer.

The area of the borough is 5,210 acres; of which there are occupied by buildings 4,148 acres, 2 roods, 23 perches, 725 yards; and unoccupied 1,061 acres, 3 roods, 16 perches, 23 yards. The length of streets is 221 miles,—of passages 90 miles. The length of street sewers is 189 miles 340 yards,—passage sewers 90 miles. The number of houses in the borough at the last census was—

Inhabited	65,781	
Uninhabited	5,197	
Total	70,978	
The number of houses since built, to December 1868, is—	12,772	
Making the total	...	83,750
But Railways and Town improvements have in that time demolished a number, which may be estimated at		1,359
Making the probable total number of houses	...	82,391
The population at the last census was	...	443,938
Corrected for increase to this date (Sep., 1869), is now estimated by the Registrar General		509,052

The rateable value of the Borough is £2,412,672.

The water supply is obtained from 4 wells in and about Liverpool, which yielded in 1868 ... ... 2,085,088,693 gallons, and from Rivington Pike, which has a watershed of 10,000 acres and store reservoirs, which form spacious lakes, upwards of 6 miles in length, with an average storage of 3,180 millions of gallons, and from which were delivered in 1868 ... ... 3,436,922,208 „ making the total quantity supplied to the Borough and the district traversed by the pipes in that year ... ... 5,522,010,901 „

The population of the district of water supply is estimated at 600,000.

The annual consumption per head for domestic purpose was in 1868—24.38 gallons. The mean annual rainfall from 1848 to 1868 was 46.053 inches. The maximum was 61.70 inches in 1852. The minimum was 34.80 inches in 1865.

The water closet system is general, and will soon become universal. In the last 5 years 15,000 privies were converted into water-closets, and the work is steadily proceeding.

The quantity of Sewage estimated to be discharged from all the Sewers of the Borough is 2,100,000 cubic feet or 18,125,000 gallons in the 24 hours, say in round numbers 60,000 tons.

The annual rainfall in Liverpool may be taken at 35 inches, which would give 1,809,504 cubic feet in 24 hours. An amount nearly equal to the sewage proper.

Ventilation of Sewers and Drains.—In addition to the ordinary ventilation through untrappped drop-spouts, which has been the constant practice for the last 21 years, there has of late been an immense extension of ventilation by means of the Archimedean Screw Ventilator. Of these ventilators 1,030 have been erected and are now at work throughout the Borough.

High chimneys, furnaces, &c., in the line of sewers, are also connected with the sewers.

The utilization of the Sewage of one outlet is being experimented with by a Company.

The Test Works consist of a pumping station at Sandhills, with an engine capable of lifting 500,000 gallons 125 feet high in 24 hours; of about 9 miles of cast iron piping, 9 inches in diameter, extending from the station northwards to the Bleasdell Estate. The 9-inch pipe is provided with proper connections for delivering the sewage along its course. It terminates in a distributary pipe, carried through a piece of land containing 43 acres 1 rood 33¼ perches, which has been taken on a lease by the Company.

SCAVENGERING.—Report of the Superintendent of the Scavenging Department for 1867.—

The general scavenging, and the cleansing of middens and ashpits and everything connected therewith, was effected during 1867 at an actual gross expenditure of £65,010. The average strength of the staff employed on the scavenging day and night service has been—

	Day.	Night.	Total.
Inspectors	14	8	22
Trough Closets and Urinal Men	39	...	39
Scavengers	438	...	438
Night Men		106	106
Ashpit Men	40	...	40
Carters	77	80	157
Stable and Wharf Men	30	20	50
Total Men	638	214	853
Horses	80	80	160

As regards the results of the work done by the scavenging staff, in the cleansing and emptying of middens and ashpits, the sweeping of the streets, attention to urinals and trough water-closets, and the removal of all nightsoil, ashes, and scavenging products, they are represented by the following statement:—

Number of tons removed.

	Daily.	Weekly.	Total for the Year
Night service, contents of middens and ashpits	446	2669	138,777
Day service, street sweepings, etc.	328	1963	102,065
	774	4632	240,842

I was also favoured with copies of the admirable reports of Dr. Trench, the Medical Officer of Health, from which I have extracted the following statements, which will show how vigourously Sanitation is carried in Liverpool.

The death rate of the Borough of Liverpool in 1868 was equal to 29.1 per 1,000 of the estimated population.

The average death rate of the Borough during the previous 10 years, (1858 to 1867,) was 32.2 per 1,000, or 3.1 per 1,000 more than in 1868. This is equivalent to a decrease of 1,552 in the number of deaths relatively to the population, or in other words, it may be regarded as a saving of 1,552 human lives, when compared with the mortality of the previous decennial period.

The Registrar General's weekly reports enable us to compare the mortality of Liverpool with thirteen of the large Towns of Great Britain, but though such comparisons are desirable as incentives to sanitary improvements, they will lead to very fallacious conclusions if at the same time due weight be not given to the moral, physical, and economical conditions of the inhabitants. The amount of pauperism, of Irish immigration, and of unskilled labour in Liverpool, is far greater than in any other Town in the Kingdom, and no zeal in sanitary legislation can succeed in placing an indigent population in the favourable conditions of health, attainable by Towns whose labourers have constant work and are in receipt of remunerative wages; the density of population is also a physical condition which ought to be duly considered in every comparison of the results of sanitary work, and as this can be shewn directly, it has been included in two of the columns of the following table.

	Est. Population in the middle of the Year 1868.	Births in 52 weeks, ending Dec. 26, 1868.	Deaths in 52 weeks, ending Dec. 26, 1868.	Annual rate to 1000 of Population. Births.	Deaths.	Area in Acres.	Population on Acre.
London	3,126,633	113,239	73,279	36.2	23.4	77,997	40.0
Bristol	167,487	6,057	3,800	36.1	22.7	4,674	35.8
Birmingham	352,296	12,689	8,394	36.0	23.8	7,831	45.0
Manchester ...	366,835	13,793	11,742	37.6	32.0	4,069	90.1
Salford	117,162	4,629	3,592	39.5	30.7	5,009	23.4
Sheffield	232,362	9,103	6,188	39.1	26.6	22,830	10.2
Bradford	134,000	4,931	3,537	36.7	26.4	6,590	20.3
Leeds	246,851	10,190	6,725	41.2	27.3	19,221	12.8
Newcastle on Tyne	127,701	4,860	3,232	38.0	25.3	5,336	23.9
Hull	122,628	4,243	2,984	34.6	24.3	3,621	33.8
Edinburgh	177,039	6,601	4,736	37.3	26.7	4,191	42.2
Glasgow	449,868	18,439	13,680	40.9	30.4	5,691	77.7
Liverpool	500,676	19,341	14,553	38.6	29.1	5,210	96.1

There are 2 disinfecting establishments in Liverpool where clothes and bedding are gratuitously disinfected; the number of articles sent to them during 1867 amounted to 16,639.

Slaughter house return of cattle killed in the Borough:—

Beasts.	Sheep.	Lambs.	Calves.	Pigs.	Goats.
49,331.	281,015.	20,889.	13,681.	32,474.	41.

Unwholesome meat condemned during 1868:—

Beef. lbs.	Veal. lbs.	Mutton. lbs.	Lamb. lbs.	Pork. lbs.	Poultry. head.	Rabbits. head.	Fish. lbs.	Shell-fish. bags.	Oysters. number.
80,927.	21,551.	14,466.	706.	5,385.	1,360.	1,639.	375,026.	384.	22,100.

Inspector of Nuisances' reports during 1868 :—

Complaints of nuisances made by inhabitants	1,953
Total number of nuisances reported by district Officers	40,601
Total nuisance notices	27,799
Number of informations	818
Number fined	165
Number withdrawn and acquitted	623
Magistrates' order	29

Fever in houses :—

1,283 Street houses examined, contained 2,172 cases of Fever.
667 Court „ „ „ 1,216 „
76 Cellars „ „ 80 „

Total number of cellars inspected, 66,284.

Proceedings :—

Number of cellar notices	3,068
„ „ informations	361
„ „ fines	251
„ „ „ acquitted and withdrawn	103

House to house visitation during 1868 :—

Total number of houses examined	131,101
Notices to white-wash houses	27,603

Fines inflicted for 1868 :—

Nuisances	£87	18	2
Diseased meat and slaughter houses	£17	2	0
Cellars	£26	3	6
White-washing	£31	2	6
Total	£162	6	2

PRESTON.

The following Statement is compiled from information kindly given me by R. Ascroft, Esq., Town Clerk, and by E. Garlick, Esq., Borough Engineer, and from extracts from the Municipal Corporations' Directory.

The Town is situated on the banks of the river Ribble. It is connected by Railways with all parts of England, and with the coast towns and manufacturing districts of Lancashire, and Yorkshire by the navigable river Ribble and the Lancaster Canal.

The chief trade is the manufacture of cotton fabrics; there are also iron foundries and machine works, and a small amount of shipping trade. Population is estimated at 97,000 persons, who reside in 17,241 houses. Its rateable value is £210,000: the area of the Borough is 2,819 acres.

Main drainage works have been executed at a cost of about £50,000. The main sewers extend for 25 miles, and there are 30 miles of sewers connected with them, paid for by owners. The large main sewers are brick and circular in shape, and the smaller ones brick, but eggshaped. These brick sewers extend for 8¼ miles, the remainder are made by stoneware pipes.

The sewers are ventilated through charcoal boxes and gratings into the street, and also through the down spouts, and are flushed by water laid on direct from the mains. All the houses are furnished with water-closets, and these are fitted with syphon traps. The house connections are 6in. and upwards: there are no cesspools known to exist: the sewers at present discharge into the river Ribble.

The present water supply is obtained from the Cowley brook, and streams in the south side of Longridge Fell (about 18 miles from Preston), which streams flow into the river Ribble above Preston. This water is conducted to the Spade Mill reservoir, which is capable of holding 110,000,000 gallons. Another source of supply is the Loud brook, which flows into the river Hodder, and thence into the Ribble. The water from this brook is conveyed to Alston reservoir by a conduit 4ft. diameter.

Alston reservoir is capable of containing 78,755,161 gallons; so that the total supply is 188,755,161 gallons.

The gathering grounds of these two sources of supply contain about 2,777 acres.

This supply has become inadequate for the requirements of the Town, as the demand for water in the Town and suburbs has gone on rapidly increasing; the demand for manufacturing purposes having more than doubled during the past 10 years. From these causes the Town has been short of water in the summer months; and for the scarcity of water and fear of running short for the domestic supply, the sewers in the Town have not been flushed, and the streets have been only partially watered, thereby causing great annoyance and damage from dust; and the dirty crowded courts and unhealthy portions of the oldest parts of the Town could not be cleared so effectually for want of water.

The quality of the Loud water is also very much complained of, so that the Corporation are about to expend £65,000 in procuring water from the valleys of the Langden and Handen brooks which are on the millstone grit, and where water of the purest quality is to be obtained.

The present supply is intended to be constant, and all houses are connected direct with the mains.

BLACKBURN.

The following Statement is compiled from information kindly given by F. Smith, Esq., Borough Surveyor, and by Mr. Whitehead, the Secretary of the Waterworks, and also from extracts from the Municipal Corporations' Directory.

Blackburn derives its name from the black colour of a rivulet which runs through the Town. It has ample railway communication with all parts of the country; and by means of the Leeds and Liverpool canal, with the ports of the eastern and western coasts.

The population is estimated to be about 80,000 persons, who live in 15,300 houses: the gross estimated rental is £225,000: the rateable value £182,000: and the area of Borough 3,681 statute acres.

The rates for highways and sewerage are 3s. 1d. in the pound; the poor rates are 3s. in the pound.

Main drainage works have been executed at a cost of £90,000.

There are 32 miles of sewers in main streets, and 19 miles of subsidiary mains. Of these, about 10 miles are composed of brick, eggshaped, and varying in size from 6ft. by 4ft. 8in., to 2ft. 6in. by 1ft. 8in. The rest are glazed earthenware socket pointed pipes, varying in size from 21in. to 9in. diameter.

Ventilation is effected through trays containing charcoal and placed at the end of each sewer.

The down spouts are connected direct with the sewers, with which also a few large chimneys are connected, and at the higher levels of the Town small shafts terminating in an Archimedean Screw at the top have been affixed to buildings. Special flushing arrangements are not considered necessary, as all the sewers have a good fall.

About 14,000 houses are drained with 9in., 6in., and 4in. glazed earthenware socket jointed pipes, which are all properly trapped, and connected with slopstone pipes, down spouts, and cesspools.

There are only 740 water-closets in Blackburn, and about 13,500 privies, and 6,700 cesspools, which latter are drained and kept dry; as a general rule there are 2 privies to each middenstead.

The present system adopted at the outfall is to let the sewage run through tanks, where the solid matter is retained, and the liquid runs into the river.

THE WATERWORKS at Blackburn are in the hands of a private company. The water is drawn from streams, and from the rainfall collected over a large gathering ground. This is conducted into open reservoirs, which in the aggregate are capable of holding 454 million gallons. The lowest reservoir is about a mile from the Town, and about 220ft. above it. The water is brought in through an iron main 18in. diameter.

About 16,800 houses, in which from 75,000 to 80,000 people live are supplied with water, which is laid on day and night direct from the service pipe.

The water-closets are fitted with cisterns and ball taps; but MESSRS. GUEST & CHRIMES' bib taps are used for house service.

The daily supply averages 1,400,000 gallons—a quantity equal to about 18 gallons per head. For domestic supply the charge is 6 per cent on assessment to poor rate.

MANCHESTER.

The following Statement has been copied almost verbatim from a report by SIR JOSEPH HERON, Town Clerk, with which I have been favoured by J. G. LYNDE, Esq., Borough Surveyor. I have also incorporated an extract from DR. LITTLE'S very valuable report, and from the Municipal Corporations' Directory.

There are about 250 cotton manufactories in the Town and Parish, some on scales of enormous magnitude for spinning, weaving, and printing, besides which there are bleach works, silk mills, and manufactories of every description of animal and vegetable fibre.

The City of Manchester comprises within the Municipal boundary the townships of Manchester, Cheetham, Hulme, Chorlton upon Medlock, Ardwick, and Beswick, containing a total area of 4,203 acres.

The population at census of 1861 was 338,722; it is now (1869) estimated at 370,000; the estimated number of inhabited houses is 73,000; the rateable value of the City amounts to £1,471,331 16s.

Sewage works have been constructed at a cost of about £340,000.

There are about 280 miles of main sewers in the City, and the area sewered is 3,235 acres. The main outfall sewers, varying in size from 6ft. by 3ft. to 3ft. by 2ft., are principally constructed of brick-work. The smallest sewers are glazed earthenware oval pipes, varying from 25in. by 18in. to 12in. by 9in. The inclinations generally are very good, varying from 1 in 30 to 1 in 300.

Nearly all the main sewers have such rapid falls that they do not require flushing; in special cases water is used from the nearest main. The only method of ventilation of the sewers adopted is through the down spouts of the houses and the street grids which are untrapped. There are about 67,000 dwelling houses within the City, and it is estimated that there are only about 10,000 water-closets within the City, but there are about 3,800 privies with ashpits connected therewith: the Corporation does not permit any water to be thrown into these middens, which are systematically cleaned out by the Corporation at a cost per year of £17,668 10s. 4d., including carriage of manure to farmers, when about 130,987 tons are removed.

The sewers discharge into the rivers Irwell, Irk, and the Medlock, which are in fact only open cesspools, as they receive the refuse from the works on their banks, consisting chiefly of dye works, bleach works, paper mills, chemical works, bone works, tanneries, India rubber works, and slaughter houses.

THE WATER SUPPLY is under the Corporation and is obtained from reservoirs made by damming up the river Etherow and its tributaries 18 miles distant from Manchester; the area of gathering ground is 18,900 statute acres, and the area of reservoirs is 601 acres, which hold about 4,582,000 gallons.

From these reservoirs the water is brought by mains to service reservoirs at Godley, Denton, and Prestwick, and from them the higher levels are supplied.

There is also a well sunk in the red sandstone rock at Gorton, about 5 miles from the City. This well is 12ft. in diameter and 210ft. deep, and the water is lifted by a Cornish engine into a reservoir capable of holding 223,000,000 gallons, and covering 57 acres. The maximum yield of this well was at the rate 750,000 gallons per day, which supply the lower levels. The area of district supplied equals 81 square miles, and on it are 108,419 houses, which are supplied for domestic purposes, and 9,416 works for trading purposes. The supply is constant, and a daily average of 13¼ million gallons is supplied for domestic and trade purposes; 846,000 gallons are supplied per week during 4½ months of the year for watering the streets and for flushing purposes. Water for drinking is supplied to the houses direct from the mains, but for water-closets into cisterns.

The water-works have already cost about £1,780,000.

Copy of analysis by DR. ANGUS SMITH, of water supplied to Manchester:—

	In Grains.
Sulphate of lime	1.743
Sulphate of magnesia	.661
Chloride of magnesia	.555
Chloride of Sodium	.499
Iron, per oxide of	.145
Organic matter	.840
Total residue	4.515
Nitrates	none
Hardness	2°.

The death rate per 1,000 from 1857 to 1867 was

1857	31.7	per 1,000 of population.	
1858	32.5	,,	,,
1859	29.1	,,	,,
1860	28.0	,,	,,
1861	30.0	,,	,,
1862	30.3	,,	,,
1863	32.6	,,	,,
1864	30.6	,,	,,
1865	35.5	,,	,,
1866	34.6	,,	,,

The high death rate in Manchester is largely due to the excessive mortality in the infant population; nearly one half of all the deaths occurring in children under the age of 5 years.

The mortality at all ages is however abnormally great; consumption and the diseases of the lungs generally, especially bronchitis, are relatively to the population more fatal than in any other locality in England. This is probably due to a considerable extent to the constant irritation produced in the air passages by the dense smoke with which the atmosphere is constantly loaded. Zymotic diseases, including autumnal diarrhœa also largely swell the death rate.

BRADFORD.

The following Statement has been compiled from information given me by the Local Authorities; extracts have also been made from the Municipal Corporations' Directory.

Bradford is a manufacturing Town in Yorkshire, and has railway communication with the principal Towns in the Kingdom, and by means of a canal, has water communication with the Mersey and western coast, and the Humber and eastern coast of England.

The principal trade consists in the manufacture of woollen goods; and in the neighbourhood are extensive iron and coal mines, and several large iron foundries, dye works, soap, grease, and gas works.

Population by estimate, 1869, 138,000; inhabited houses by estimate, 1869, 29,280; rateable value, £504,192; gross estimated rental, £603,314; area of Borough, 6,508 acres.

£89,637 have been expended in works of main drainage; 21¼ miles of main sewers have been already completed, and the work is still going on.

The brick sewers are eggshaped, from 15in. by 12in.: the smaller sewers are glazed earthenware pipes from 8in. to 6in. Ventilation is effected through the rain-water pipes; there are also vertical pipes from the sewers, carried up to chimney stacks.

There are about 2,000 water-closets, and a large number of middens: the house connections are stoneware pipes, varying in size from 4in. to 9in.

The sewage at present is discharged into a Beck, which is a tributary of the river Aire, which it joins about 2 miles below at Shipley: this Beck has obtained an unenviable notoriety in Yorkshire from its excessive pollution, from, not only the sewage, but from the refuse cast into it from the various manufactories in the neighbourhood.

The annual rate of mortality has been reduced from 28 to 25 per 1,000.

The Water Supply is derived from various streams. The area of the gathering ground from which the water is brought is 21,000 acres, yielding from 10 to 12 million gallons per day for Town use, and about the same quantity as compensation water. It is stored in 11 reservoirs, occupying an aggregate area of 315 acres: other reservoirs and works are in progress. The supply is constant; and the house connections are direct from the mains. The annual rainfall is about 36in.

LEEDS.

The following Statement is compiled from various reports by Local Authorities, and from Dr. Robinson's report on the Sanitary Condition of Leeds, in 1867, and from a report on the best mode of obtaining an additional water supply by E. Filliter, Esq., kindly given to me by the Author; extracts have been also made from the Municipal Corporations' Directory.

The Town of Leeds is an important city in Yorkshire; it has railway communication with all parts of the Kingdom, and has water communication with Bradford, Liverpool, and other places, by means of the river Aire, the Aire navigation, and the Leeds and Liverpool canal.

The woollen manufactures of Leeds are very extensive; in addition to which, the working of iron is being rapidly developed; and there exists also numerous dye works, tanneries, chemical works, beside factories for a great variety of purposes.

The area of the Borough, comprising 12 townships, covers about 34 square miles. The population within the limits of the Borough is (1869) estimated to amount to about 250,000 persons: the rateable value is £678,514.

Main drainage works have been executed at a cost of about £180,000. There are about 100 miles of main sewers: the smaller ones consist of glazed

earthenware pipes 12in. diameter, and the larger ones are eggshaped brick sewers, varying in size from 2ft. 6in. by 1ft. 9in. to 7ft. 9in. by 8ft. at the outfall.

There are about 47,000 houses, but only 7,000 water-closets: there are about 12,000 middensteads or ash privies, about 1,000 of which are situated under dwellings. The Corporation undertakes the cleansing of these middens, at an annual gross outlay of over £7,000.

The sewers discharge their contents into the river Aire, which is still further polluted by the refuse and waste products of the various manufactories situated on its banks.

On the assumption that the population was 232,428, the death rate in 1867 was 26.9 per 1,000, during 1865 it was 30.9, and 32.3 during 1866. Out of 253 deaths from Fever, 93 instances were attended with marked sanitary defects, consisting either of defective drainage, or offensive cesspits.

Amongst the various sanitary operations carried on, the following summary exhibits some of the work accomplished during 1867:—

Cottage houses visited with a view to improve their sanitary condition	3,509
Houses disinfected where contagious diseases had occurred	516
Over-crowded houses partially emptied	147
Cellar dwellings closed	33
Offensive middensteads, under or immediately adjoining houses, converted into water-closets	128
Pigsties removed	125
Orders made by Magistrates	45
Miscellaneous other nuisances removed	4,604
Notices and letters issued	7,657

A self-acting tumbler flushing apparatus has been successfully applied to water-closets in the poorer districts, especially in cases where the privies are used by more than one family.

The scavenging of the city is performed by men employed by the Corporation, the contract system having failed; and owing to the unsatisfactory way in which the night scavenging was performed by the Contractors, the Corporation has also undertaken the cleansing of the ashpits. From April 13th to Dec. 21st, 1867, 14,991 ashpits were emptied, containing 45,307 tons of manure, at a cost of £7,487: the sale of manure, however, amounted to £4,183, which materially reduces the gross cost.

Mr. Filliter's Report.—

The present supply of water is derived chiefly from the river Wharfe, at Arthington, and partly from the small gathering ground about the Eccup reservoir with certain springs near thereto. Altogether there is a total available quantity in a dry year of somewhat under 7 millions of gallons per day, and in an ordinary year of somewhat over 7 millions of gallons per day.

The source of present supply is open to suspicion of contamination by the sewerage of Otley, Burley, Ilkley, and Addingham, and the refuse of the paper, worsted, and other mills, and works on the Wharfe and its branches, above the point at which the water is pumped.

The conclusions arrived at in the report are thus summarized:—That the new source should be one capable of affording a supply of about 20 millions of gallons per day.—

That the hardness of the water should not exceed if possible 4 or 5 degrees.—

That the river Washburn is capable of affording this quantity and quality of water chiefly by gravitation, but assisted in dry weather by pumping from the foot of the Washburn; the water for this purpose being conveyed by pipes, laid thence to the present works at Arthington.—

That the cost would be about £317,000; other suggestions are made, but the one above has been adopted, and is in course of construction.

The use of cisterns in water-closets is compulsory; and Messrs. Guest & Chrimes' fittings are recommended.

PENRITH.

A small Town situated in Cumberland. Its population amounts to 7,948 persons, who live in 1,721 houses; the gross estimated rental of the district amounts to £37,246.

Main drainage works have been executed, at a cost of about £5,000. The sewers consist of stoneware pipes, varying in size from 6in. to 15in. They are ventilated chiefly through the rain-water pipes; and are flushed partly from the water mains, and partly from the Beck, which runs through the Town.

The Water Supply is derived from the river Eamont, the overflow of the Ullswater Lake, from whence it is pumped into a reservoir, and brought into the Town.

The sewage is applied to meadow land. This meadow is situated between the rivers Eamont and Lowther just above their confluence; and the sewage is conveyed through an iron main under the river Eamont, and flows through open stoneware carriers on a raised embankment, and is distributed through open trenches to such parts of the meadows as may be desired.

At its outfall into the main carrier it is received into a small tank, where, by a simple arrangement, it is made to mix with carbolic acid.

The use of carbolic acid is strongly advised by the lessee of the meadow, Mr. Mac Dougall, the inventor of Mac Dougall's carbolic acid disinfectant. He states that by its use, flies are driven away; and that this is a matter of some importance, as the meadow to which the sewage is applied is immediately in front of, and distant about a quarter of a mile from a gentleman's house. The grass of the meadow is grazed by cattle, who thrive very well on it.

The effluent water passes off into the 2 rivers. No complaints have arisen from the owners of property on either side.

CARLISLE.

The following Statement has been drawn up from information supplied, and copied from a report written by Edward Morley, Esq., City Surveyor, and extracts have also been made from the Municipal Corporations' Directory.

The City of Carlisle is placed on a slight eminence at the confluence of the Rivers Eden, Caldew, and Peteril.

The principal trade consists in the manufacture of woollens, coarse linen cloth, calico printing, and cotton piece goods; there are also iron foundries, breweries, and tan yards.

Population, 1861, 29,417, estimated 1869, 31,000; inhabited houses, 5,140; estimated number of electors, 4,000; burgesses, 3,500; rateable value, £88,000; area of borough, 1,525 acres; municipal income, £27,000. Main drainage works were executed in 1853—1855 at a cost of £23,000.

About 20 miles of main sewers have been constructed, consisting of brick sewers, iron and earthenware pipes, varying in size from 3ft. 9in. by 2ft. 6in., down to 9in. diameter. They are ventilated by connections made with tall chimneys, and through charcoal ventilators into the streets, and through the down spouts, and are flushed by water from the streams, and by chambers especially constructed for the purpose. Every house in the Town is connected with the sewers, by circular 9in. or 6in. diameter pipes: no cesspools are allowed: the sewage is partly utilized in irrigating the land, and is partly delivered into the river Eden.

The scavengering is performed by the Board's own workmen, though the horses used are supplied by a Contractor: the annual cost of scavengering is £855.

Sewage Irrigation Works.—The site of these works is situated about ¼ of a mile from the market-place, in a north-easterly direction from the City, and is surrounded on three sides by the rivers Eden and Caldew, and on the fourth side by the North British and Caledonian Railways.

These works were designed and constructed by Mr. H. W. Mc Kie, in the year 1860, at that time City Surveyor, on behalf of Mr. A. Mc Dougall, of Manchester, who leased the whole of the sewage of Carlisle for a term of 15 years, for the nominal rent of £5 a year.

The total population is about 31,000; but the whole of the sewage is not at present used for irrigation, owing to 1 district containing 9,500 inhabitants delivering its sewage into the main outlet sewer below the site of the engine works.

A 4-horse power engine, working one of Gwynne's centrifugal pumps, lifts the sewage from a well in connection with the main outlet sewer, to the height of about 12ft. and delivers it into an open trench, constructed along the side of the river embankment, with an inclination of 1in. in 1,100: the sewage is then distributed where required by means of moveable iron troughs, 12in. by 8in. Previous to pumping, the sewage is deodorized by lime water and carbolic acid, in the proportion of 1 gallon of the fluid to 40,000 gallons of sewage, at a cost of about £25 per annum.

The sewage is distributed over the whole of the lands, in extent about 110 acres, about 4 times a year. The subsoil of the land is sandy and very porous, allowing water freely to percolate, and is laid down in ordinary pasture, and is entirely grazed.

Mr. Mc Dougall has sublet the whole to an extensive sheep farmer and butcher in the Town. The cost per acre is about £10 per annum, including all working expenses: the value of the land previous to irrigating was about £4 per acre, and is now let at £8 per acre.

The natural grasses have not been made any coarser through the irrigation works, but have increased in firmness and quality; and the sheep and cattle eat it readily.

It has been stated that the patients in the Lunatic Asylum have been made ill from this irrigation, but it is altogether a mistake.

The meadows immediately adjoining the Asylum were being irrigated in a very crude manner by the sewage from the Asylum; and the medical officer stated that the patients were afflicted when the wind blew over the Asylum meadows in a certain direction.

The distance between the Town irrigation meadows and the Asylum is 3 miles as the crow flies; and the whole of the Town lies between, at a distance of only ½ a mile from the works; and if there had been any truth in the assertion, it is natural to suppose that the inhabitants of the City would have suffered.

In Mr. Mc Dougall's lease, a clause is inserted "That should any nuisance arise, the Corporation shall be at liberty to break the lease without any compensation;" but up to this time there has not been a single complaint, although the site of the works is surrounded by the castle and several villas.

Water Supply is obtained from the river Eden, from whence it passes through an open filter, which has been constructed on—what I am informed is termed—the Scotch plan: this plan is not approved of, and they are now altering it to the usual English one.

The engine house is situated on a slight eminence, at about 1,400 yards from the river Eden. The water is pumped from here to a reservoir, a distance of

about 2,200 yards: this is capable of holding about 2½ millions of gallons. It is about a mile from the centre of the Town, and its top water level is 41ft. above the highest part of the Town, and 84ft. above the lowest part of the Town: the service is constant, and no cisterns are permitted, the house service being laid on direct from the mains.

The above structural works were performed with money borrowed in loans; principal and interest to be repaid in 30 years.

HEXHAM.

The following information has been for the most part kindly supplied me by WILLIAM ROSS, ESQ., Chairman of the Public Health Committee.

Hexham is a small Town in Northumberland, situated on an eminence rising in the valley of the Tyne.

The population according to the census of 1861 was 5,270, and it is estimated that there has been no great increase since; inhabited houses amount to 525; gross estimated rental, about £21,000; rateable value, £18,496 15s.; main drainage works have been executed at a cost of nearly £5,000.

They extend over a length of 4 miles, and consist of glazed earthenware pipes, varying in size from 18in. to 9in. Flushing is effected from hoses attached to the street hydrants, and ventilating shafts open into the streets protected with charcoal trays. Every house is connected with the sewers; but there are only 230 water-closets in the Town. No cesspools exist, but there are a few middens which are however kept dry; at the outfall there is a brick elliptical formed sewer of about 200 yards long; through this the whole of the sewage flows into depositing tanks, which are in duplicate, where the solid matter is partially deposited and from which the sewage flows into the river Tyne.

These depositing tanks are periodically cleaned out and the contents mixed with Town street refuse and sold to farmers at about 1/- per ton.

The water supply of Hexham is gathered from a reservoir on the side of the hill above the Town, where an embankment has been thrown across a valley into which spring water flows. The reservoir which is open, is capable of holding 20 million gallons of water.

The water is conveyed through an iron main 12in. in diameter into the Town, and distributed through mains varying from 12in. in size to 3in. in diameter.

The supply is constant and nearly every house is supplied direct from the mains,—no cisterns are allowed.

The scavengering of the Town is done by the Board.

The permanent works were performed out of monies borrowed, repayable for the most part in 30 years, at 6½ per cent per annum, meeting both principal and interest. The remainder was borrowed at 5 per cent on debenture.

Since these works of water and sewerage were finished in 1865 the death rate has been reduced from 27 per 1,000 to 22 per 1,000.

SUNDERLAND.

The following statements has been compiled from information given me by WM. SNOWBALL, ESQ., Town Clerk of Sunderland. Extracts have also been made from the Municipal Corporations' Directory.

Sunderland is an important Town in the county of Durham, and is situated on sloping ground abutting the sea, or the south bank of the river Wear.

Sunderland and Newcastle are the two largest coal shipping ports of the United Kingdom, and besides the immense ship building docks of the former,

(second only to Liverpool for the number of ships of small burthen annually launched,) it enjoys an immense export trade in glass, rope, chains, anchors, and other ironwork, earthenware, etc., etc.

The population is estimated at 85,000, who live in about 10,000 houses: the gross estimated rental is £300,000, and the rateable value, £250,000, and the area of the Borough is 2,768 acres.

Main drainage works have been executed at a cost of £163,000.

The sewers are made of brick and earthenware pipes: the brick ones are eggshaped and vary in size from 4ft. by 2ft. 8in to 2ft. 10in. by 1ft. 10in., and the pipes from 18in. to 9in. The sewers extend over about 80 miles and their contents are discharged into the river and into the sea; they are ventilated through connections with the factory chimneys, and are flushed with water taken from the mains.

THE WATER SUPPLY is into the hands of a private Company who have extensive works at Humblet on-Hill, Pulwell, Cleadon, and Ryehope. At these places the water is raised from artesian wells, sunk and bored into the limestone rock, and it is stated that the storage capacity of the several reservoirs equals 8¾ millions of gallons; the daily supply which is on the constant system equals 3½ to 4 millions of gallons. Houses are supplied direct from the mains; about 3,000 water-closets are supplied, and each one must be fitted with double valve cisterns. MESSRS. GUEST & CHEIMES', and LAMBERT'S fittings are used.

Not only Sunderland but South Sheilds and Jarrow are supplied by this Company.

ALNWICK.

This statement is made from information kindly given me by R. ELLIOT, ESQ., the Town Surveyor.

Population of District about 7,000.
of Town about 6,000.

The whole Town is sewered with glazed earthenware pipes, varying in size from 18in., 15in., 12in., 9in. to 6in. pipes. The main sewers is laid on a gradient of 1in. in 400in. and discharges into the river Alne about 1¼ miles below the Town. The street mains generally have a good fall; there are two flushing chambers, and the sewers are flushed once a fortnight from hydrants. Ventilation is chiefly effected by rain water down pipes which are carried above the windows. There are about 1,000 water-closets connected with the sewers; these are all fitted with a syphon trap: there are also about 1,500 trapped sinks. The house connections are 6in. pipes.

The sewers carry off about half the rainfall, the other half is taken in at storm gullies and carried in conduits to the river.

THE WATER SUPPLY is obtained from various springs, the farthest of which is 2½ miles from the storage reservoir, to which the water is conveyed through glazed earthenware pipes. Before it reaches the reservoir however the water passes through a filter made of the usual form and composed of broken stones, gravel, and sand which are 4½ft. deep in the aggregate. The storage reservoir is about ¼ of a mile above the Town, is covered, and capable of holding about 220,000 gallons when full. It stands on a considerably higher level than any part of the Town, and would give a mean head of 150ft.

The supply is generally constant, but in seasons of long draught it is necessary to cut it off for a few hours during the day.

It is distributed through iron mains of the following sizes:—9in., 6in., 4in., 3in., and 2in.; there are however very few 2in. pipes as they are considered to be

too small. The house supply both for water-closets and other purposes come direct from the mains. Messrs. Guest & Chrimes' taps and fittings are used.

The iron mains were coated inside and outside with Dr. Smith's solution; and after 15 years there is not the slightest corrosion; the branches are galvanized iron.

BERWICK ON TWEED.

The following Statement is compiled from information supplied to me by James Weddell, Esq., Clerk to the Local Board, and from extracts from the Municipal Corporations' Directory.

A seaport Town, carrying on a considerable coasting trade with London, Edinburgh, Newcastle, Hull, etc., by means of steamers and sailing vessels. The chief exports are fish, corn, whisky, and coal: the chief imports—iron, timber, flax, hemp, and tallow. There are extensive iron works for constructing steam engines and mill castings, and slips for the repairs of vessels.

Population of the Borough, 13,303. The Borough includes the adjoining townships of Tweedmouth and Spital; but these townships have not been drained or supplied with water by the Local Board of Health. The population of the Town of Berwick, which has been drained and supplied with water 8,571. Gross estimated rental of that part of the Borough assessable to special district rate drained and supplied with water, £18,500; rateable value, £16,500.

The main drainage carries off both the storm water and the sewage, and has its outfall into the river Tweed.

The main drains are brick, circular, sewers varying from 2ft. 6in. at outfall, to 18in. at the upper levels, and extend over a length of 6,353 yards: the subsidiary drains are glazed earthenware pipes, varying in size from 15in. down to 9in.

Ventilation is effected by shafts (metal pipes) which are carried to the tops of houses, where there are blank gable ends; and also through the down spouts and manholes.

The sewers are flushed by metal pipes connected with the water mains, let into special flushing chambers, and at the dead ends of sewers. There are no cesspools in the Town; and there are 693 water-closets, which are all syphon trapped, size of soil pipe, 6in., pipe from sinks and kitchen, 4in.

The scavengering of the Town is performed under the direction of the Local Board of Health, who have their own plant, and employ the requisite number of labourers.

The drainage works were executed at a cost of £6,182 15s. 11d.

The average annual mortality rate per 1,000, during the 10 years prior to the completion of works of sewerage and water supply—25.3 per 1,000,
During the subsequent 8 years—23 ,,

Water Supply is obtained from a reservoir, formed by an embankment thrown across a valley, about 3 miles from the Town: this reservoir covers about 5 acres, and is calculated to hold 8,500,000 gallons. From this reservoir the water gravitates to a service reservoir, which is about 300ft. above the lowest part of the Town, and holds 250,552 gallons of water; from thence it is conveyed by a 12in. pipe into the Town.

Unfortunately, several years after construction, the service reservoir has been found to leak, and the towns-people are put in dry weather to the very greatest inconvenience: the supply which was calculated to yield about 30 gallons a head to each individual, has dwindled down in dry weather to only 36,000 gallons during the day, or a little more than 4 gallons per head. During August, 1869, the average supply was 51,000 gallons per day.

Of course under these circumstances the supply is necessarily intermittent.

The Waterworks cost £8,218 1s. 5d.

EDINBURGH.

The following Statement is compiled from extracts copied from the extremely valuable reports of Charles Mac Pherson, Esq., Borough Engineer, and of Dr. Littlejohn, F.R.C.S.E., Medical Officer of Health for the City.

The greater part of the City of Edinburgh is built on the slopes of 3 ridges, lying nearly east and west, and parallel to each other: the High Street and Canongate being on the centre ridge, George Street on the northern, and Heriot's Hospital on the southern.

The drainage of the City is naturally to the Firth of Forth by three main outlets, namely,—

1.—The Craigentinny Burn draining the area which includes the slopes on each side of the centre ridge and opposite slopes.

2.—The water of Leith draining the area which includes the slope northward of the north ridge; and

3.—The Jordan or Powburn, which receives the drainage of the slope southward of the south ridge.

Between the years 1778 and 1825, about 19½ miles of sewers were constructed, at a cost of about £69,000.

The size of the sewers then laid down is generally 5ft. 6in. by 3ft. The branch drains for collecting the refuse from kitchen sinks, water-closets, etc., were generally imperfectly constructed with rubble stones, side walls and pavement sills, and covers. In the course of the branch drain a built cesspool was invariably formed, the evil arising from which, has been forcibly pointed out by Dr. Littlejohn, and the substitution of syphon traps recommended.

From 1825 to 1853 little seems to have been done in regard to sewerage; but since 1853 about 20 miles of sewers have been constructed, of which, above 5 miles are built sewers, above 3 miles are pipe sewers above 12in. diameter, and the remainder are pipe sewers 12in. diameter or less. The cost of these works has been nearly £50,000.

Edinburgh is pre-eminent for its arrangements for the removal of solid refuse, 50,000 tons of which are annually collected and sold for manure. The inhabitants are compelled by the Police Act to bring all household refuse to the streets, and 65 carts or wagons are employed in the removal of it from the Old Town and poorer districts in the morning and evening, and from the New Town in the morning.

Eight overseers and 135 scavengers are employed under the Inspector of Cleaning in these operations. The scavenger after filling the cart, sweeps up any refuse that may have been left in the streets, and conveys it to covered dust boxes, provided in various parts of the City, which are cleaned daily.

These dust boxes are 8ft. long, by 4ft. broad, and 6ft. high to the eaves, with a sloped roof, and entrance is obtained by a door about 3ft. wide.

The cost of the whole cleaning arrangements, including implements, collection of rates, etc., etc., amounted in 1866 to £17,268; but as the manure sold for £8,072, the actual cost to the City was £9,556. The cartage of the refuse is let to a Contractor, the collection of it being the work of the scavengers.

The greater part of the dry refuse consists of that from dwelling houses, namely, ashes, vegetable matter,—such as potato peelings, cabbage leaves, etc., animal matter resulting from the cleaning of fish, fowls, etc.; and there are also the horse droppings, and other impurities collected from the streets by the scavengers.

The mud from the macadamized roads is not mixed with the manure.

Besides the ashes obtained from the poorer neighbourhoods there is some excrementitious matter. After the ashes and refuse from the streets have been taken to the wagons, the excrement from the public conveniences, of which there are 26, amounting to about 7 tons daily, is then added.

This refuse is sent out of the City by three lines of railway and by the Union Canal; or in the event of there being no demand for it at the time by any of these routes, it is taken to 2 depots, situated beyond the outskirts of the City.

Application of Sewage to Irrigation.—The waters of the Craigentinny Burn, the Lochrin Burn, the Jordan Burn, and the Broughton Burn, are used in irrigating about 336 acres of land adjoining them; and the following is a description of the details of the management of the meadows irrigated by the Craigentinny Burn:—

The area within the City, draining towards it, is about 1 square mile and a half in extent. From this district there flows about 20 cubic feet of spring water per minute; the surplus rainfall being the non-absorbed portion of 24in. per annum, and the sewage from a population of 95,589 persons according to the census of 1861, with a water supply—say of 25 gallons per head. Of this population, about 60,000 have the use of water-closets, and the excrementitious matter from about 15,000 or 20,000 of the remainder, finds its way to the sewers connected with the Burn.

The sewage emerges from the sewer at Clockmill Bridge, and from this point till it reaches the sea near Portobello, a distance of fully a mile and a half it is used for the irrigation of lands adjoining the stream.

Various kinds of soil are irrigated: the subsoil of the part of the meadows nearest the City is peat with loam over it, near the course of the Burn; while to the northward it is naturally sand; but the sand has been taken away, and the ground made up with rubbish of buildings, dressed off with soil. Further down the course of the stream, the soil is reddish clay or loamy clay, or sandy clay; while at the part of the Figgate Whins adjoining the sea shore, it is pure sand, with a coating of rich loam, varying from 1in. to 4 or 5in. deep, entirely derived from repeated applications of the sewage, no soil having ever been spread over the sand.

The deeper soil is nearest the channels for conveying the sewage to the land. The meadows in the Farm of Loch End, at Restalrig and at Craigentinny, have a slope transversely to the course of the stream, varying from the steepest part 1 in 55, which is of small extent, to about 1 in 50, which is the slope of the greater part of the meadows. The Figgate Whins were artificially levelled to allow of irrigation.

The ground has been dressed, so as to have a regular slope transversely, from the course of the stream up to artificial channels, called feeders, about 18in. wide by 6 or 8in. deep, formed round the ground to be irrigated: these feeders have been formed with only fall enough to cause the sewage to flow slowly along them.

At intervals of from 30 to 45 yards, channels about 12in. deep and 6in. wide, are formed from the bywash to the feeder, thus disposing of the ground into panes or square plots of about ¼ of an acre each: the irrigation of these plots is a separate operation.

The sewage can be turned into the feeders as required; and the irrigation of any particular plot is effected, by stopping up the feeder where it passes the lower end of the plot, until it becomes full of sewage, then, by small notches on the top of the bank forming the feeder about 3ft. apart the sewage is drawn off from the feeder, and overflows the ground in minute streams, the number of which may be increased or diminished at pleasure. At some places in the flat ground, the transverse channels convey the sewage down each side of the plot, and from them it is drawn off by a number of smaller channels.

The point aimed at is to have the ground so disposed that the sewage shall flow equally, if possible, over the whole surface.

The irrigation is begun in the month of February, when about a quarter of an inch in depth of sewage is allowed to flow over the ground for 24 hours. Ten days afterwards, the same quantity for 12 hours; and a third soaking is given in another 10 days, care being taken not to soil the partially grown grass by the latter operation. This is the whole process, repeated once for each crop, of which there are generally 4 per annum.

It is important to remark that the land, except the sand at Figgate Whins, has been drained thoroughly, to a depth of 4ft. below the surface. It was found that with shallower drains, the sewage was drawn off by the drain, leaving the lower part of the ground without irrigation. At the Figgate Whins, the sewage soaks into the sand and oozes out upon the sea shore.

The kind of grasses grown are Italian rye grass and meadow grass. The rye grass requires to be re-sown every third year; but the meadow grass has not required re-sowing, not even on the Figgate Whins, which was sown about 40 years ago, when the ground was first irrigated.

The irrigated ground is let off in small plots or squares for the season, to the highest bidder: the grass is cut by the tenants as required. An average crop is considered to be from 30 to 40 tons per acre, in 4 cuttings.

The whole grass is eaten by 3,100 cows; but after the fourth crop is cut, sheep are turned on for about a fortnight. The sheep do not seem to thrive, however, although the food is plentiful: the grass has been found most suitable for feeding cows; the attempt to use it for feeding other animals having been found not to answer, and the cost of converting it into hay being proved to be such as to render the process unprofitable.

The price paid for the plots varies considerably; the best being known to bring £40 per acre, while others are as low as £15 to £20.

The rental of the Figgate Whins previous to irrigation, was about 20s. per acre; while, when irrigated, parts have been let for some years at £40 per acre.

In no case is the whole of the sewage of any of the streams absorbed; and no irrigation is carried on from September till February, except at the Figgate Whins. During this time, the whole sewage passes to the Firth of Forth without being used.

The Water Supply of Edinburgh is in the hands of a private company; and the water is derived from the Crawley and other springs. In 1863, the daily supply amounted to 31 gallons for each inhabitant; but it is expected that this amount will be increased to 39 gallons per head. The service is constant.

There are 49 public wells and 20 drinking fountains distributed throughout the City. An enormous waste of water is complained of, as taking place through the faulty construction of the ordinary watercocks; and the construction of the water cisterns, and their connection with the drains is also complained of.

The City has been divided into 19 sanitary districts,—7 of which constitute the New Town; 9 the Old Town; and 3 form the Southern Suburbs.

The district of Landward, although not within the Municipal boundary of the City, has been included in the reports of the Registrar General under that of Edinburgh.

In the table below are given the population of the 3 divisions, as at the census of 1861; their respective mortality during 1863; their acreage; and the density of the population.

	Population, 1861.			Mortality, 1863.			Death rate per 1,000.			Area in Imperial Acres.	Proper. of Pop. to each Acre.
	Above 5 Years.	Under 5 Years.	Total.	Above 5 years	Under 5 years	Total.	Above 5 years	Under 5 years	Total.		
New Town ...	55,084	5,519	60,603	741	368	1,109	13.27	66.67	18.3	1765.5	34.3
Old Town ...	85,187	12,901	98,088	1,618	1,397	3,015	18.99	108.29	30.73	1078.5	90.9
Southern Suburbs	8,513	917	9,430	146	46	192	17.15	50.16	20.36	1104.	8.5
Total for Parliamentary Area	148,784	19,337	168,121	2,505	1,811	4,316	16.83	93.65	25.67	3948.	42.5
Landward ...	2,130	193	2,323	85	11	96	39.9	57.	41.32	3327.	.7
Total	150,914	19,530	170,444	2,590	1,822	4,412	17.16	93.29	25.83	7075	24.1

Edinburgh has never been considered an unhealthy City. It is, however, peculiarly exposed to the ravages of epidemic diseases of all kinds, on account of its dense and badly housed population; and whether the epidemic be cholera or fever, the poorer inhabitants living in the crowded districts of the Old Town, suffer in a marked degree.

The following table shews the average death rate for the 5 years, ending in 1863, to have been only 24 per 1,000. It will be observed that the population has been calculated for each year, and that certain deductions have been made for the number of deaths, viz:—those of persons who died in the Royal Infirmary, and were belonged to Leith, or to various counties of Scotland.

By this means a correct estimate can be formed of the death rate of the City, which would otherwise be burdened with a large amount of mortality, for which it is solely indebted to the celebrity of its Hospital and Medical School.

YEAR.	Pop. within the Parliamentary Boundary.	Total deaths Registered within the Par. Boun.	Deduct deaths belonging to		Remaining Mortality.	Births.	Death rate per 1,000.	Birth rate per 1,000.	Excess of birth rate over death rate.
			Leith.	County.					
1859	166,380	3,619	23	86	3,520	5,446	21.09	32.73	11.64
1860	167,248	4,149	22	97	4,030	5,380	24.09	32.16	8.07
1861	168,121	4,077	23	108	3,946	5,694	23.47	33.87	10.4
1862	168,989	4,661	19	137	4,505	5,722	26.65	33.86	7.21
1863	169,857	4,496	31	149	4,316	6,122	25.4	36.05	10.65
						Average	24.15	33.74	9.59

GLASGOW.

The following Statement is compiled from extracts from various reports, kindly given me by Dr. Gairdner, the Medical Officer of Health of Glasgow; and from the report on the Vital Statistics of Glasgow, by Wm. West Watson, Esq., the City Chamberlain; and from the report of Messrs. Bateman & Bazalgette, on the Sewerage of Glasgow, and the Purification of the river Clyde.

Mr Watson's Report.—

The City of Glasgow, including Gorbals, lies on both sides of the river Clyde, and the population within the Municipal boundaries is estimated to have been, in the middle of 1868, 447,000 persons; basing the calculation upon the average family ratio, which was found to exist in 1861.

Inhabited dwelling houses, 93,393, taken at 4.72—440,814
Inmates of public Institutions, barracks, and seamen in harbour, say— 8,186

Total population within Municipal boundary 447,000
Population in the suburbs 69,565

Total estimated population of the City of Glasgow, inclusive of suburbs 516,565

The births and deaths ascertained to have been registered in 1868, are represented by the following ratio:—

Births ... ... 41.63 per 1,000
Deaths ... ... 30.928 „

The following abstract shews the entire rental of Glasgow during 1868-69:—

Houses, shops, warehouses, factories, gas, water, and other works £1,904,092
Railways and canals £40,536

£1,944,628
Royalty beyond Borough—houses, shops, etc. ... £30,738
Railways and canals ... £11,580

£1,986,946

The area of the Borough is 5,063 acres: the average number of persons to an acre, was in 1861, .78

From Messrs. Bateman & Bazalgette's Report.—

Compared with most English Towns, the City of Glasgow covers a small area, in proportion to its population. The land on which the City stands rises rapidly on the north bank of the river Clyde: the higher parts of the Town attaining an elevation of about 200ft. above the sea. On the south side, some low level ground occupies a narrow belt adjoining the river, from the southern margin of which, the ground rises to an elevation about 100ft. above sea level.

Several Burns,—the Camlachie Burn, the Molendinar Burn, St. Enoch's Burn, and the Pinkston Burn, together with the more important stream of the river Kelvin, cut up the sloping ground on the north side of the river, into a succession of ridges and valleys, which rather facilitate than hinder the convenient sewage of the City.

On the south side, the ground is more uniform in level no Burn or stream of any importance occurring within the area occupied by buildings.

The City itself on both sides of the river possesses great facilities of good drainage, which have been carefully and judiciously taken advantage of, and the City may be considered, therefore, as being thoroughly well drained. For the greater part, the sewers have short and rapid runs, and flow direct into the river. The extensive introduction of water-closets, together with the refuse of many distilleries and chemical works, swell the volume of the sewage beyond that of most Towns, and increase its offensiveness.

Received into the river, it stagnates and putrifies in the harbour, poisoning the air, injuring the health of the residents, acting destructively on the sheathing of vessels in the harbour, annoying all travellers by steamboat, and no doubt injuring the trade of the port.

Messrs. Bateman & Bazalgette in their report, (from which space will not permit me to make further extracts,) propose to intercept all the sewage of the Town and to carry it by a culvert exceeding 27 miles in length to the sea coast of Ayrshire, to be utilized in irrigating the sandy land of the coast. They estimate that not less than 8,000 or 9,000 acres would be required for this purpose, and the probable gross outlay, if this scheme were carried to completion would amount to £1,253,256.

There are at present upwards of 70 miles of main drainage in Glasgow; the sewers are composed of brick and are egg shaped; they vary in size from 2ft. to 5ft., and are ventilated by the rain water spouts, and through gratings and manholes. No especial arrangement have been made for flushing them.

The house connections are laid in pipes varying in size from 9in. to 12in. in diameter.

The water-closet system is not universal in Glasgow. In the report of the engineers above quoted, it is mentioned that out of the 90,000 families of which the population of Glasgow is estimated to consist, 40,000 are without water-closets.

The City has been divided by Dr. Gairdner into 54 sanitary districts, which are under the medical inspection of six Medical Officers of Health, Dr. Gairdner supervising the whole.

The Medical Officers of Health order tenements to be fumigated and white-washed, articles of clothing to be disinfected, bedding of fever patients to be destroyed, and replaced, closes, streets, lanes, and gutters to be flushed with water, besides inspecting tenements let in lodgings, and seeing that the terms of the law regarding over-crowding are carried out.

Sanitation is also vigorously carried out by the Improvement Committee, who are doing a vast amount of good, in pulling down and re-constructing houses in the most densely populated quarters of the Town: the over-crowding in some portions of which exceeds that of the worst parts of London.

The cleansing of the City is performed under the Board of Police of Glasgow.

The average number of men employed during the year was as follows:—

In the scavengering department—including street sweepers, cleaners of private streets and courts, broom makers, fumigaters, washers, etc.	392 men.
In the manure department	346 „
Average Total	738 „
Horses employed	118 horses.
Total railway wagons belonging to the City	250 wagons.

The total quantity of manure collected:—

	Tons.	cwt.
By night service, contents of middens and ashpits	97,237	1
„ day „ street sweepings	42,002	12
Remaining on hand	6,351	0
Total	146,590	13

During the same period the following quantities of manure have been despatched:—

	Tons.	cwt.
By rail, 15,193 wagons at $6\frac{14}{20}$ per wagon	101,635	13
By canal	6,878	0
By farmers in their own carts	35,420	11
	143,934	4
Stock of manure on hand	2,656	9
Total	146,590	13

The total expenditure on these operations amounted to		£41,729 3s. 6d.
But from this has to be deducted sale of manure	£21,001 4s. 9d.	
Stock on hand— Value of manure ... implements ... hay ...	£1,843 1s. 0d.	£30,885 17s. 2d.
Amount received for private work	£6,168 5s. 8d.	
Balance from general assessment	£1,873 5s. 9d.	
Leaving as the total cost to the City		£10,843 6s. 4d.

The works for the supply of water to Glasgow are one of the most extraordinary instances of successful engineering on record.

In the words of Mr. Galf, for whose very valuable report on the Loch Katrine works I am indebted to the Secretary of the Institute of Engineers in Scotland:—

"In the face of doubts and distrusts freely expressed, and of unparalleled difficulties arising from the wild and rugged nature of the district through which the aqueduct passed,

the whole works, involving an outlay of upwards of £900,000, and extending over 34 miles of country, were completed in less than 4 years. It is a work which will bear comparison with the most extensive aqueducts in the World, not excluding those of ancient Rome; and it is one of which any City may well be proud."

It would be impossible in a sketch of this kind, to give even a bare outline of this gigantic work. I may, however, briefly notice from the above report that the gathering ground of the Loch Katrine works, made by damming up Loch Katrine, Loch Vennacher, and Loch Drunkie, covers about 45,800 acres.

The aqueduct from the Lochs convey the water to a service reservoir, 25 miles from Loch Katrine. This reservoir has a water surface of 60 acres, and a depth when full of 50ft, and containing 548,000,000 gallons, and is 317ft. above ordnance datum.

The water is drawn from the reservoir by pipes, and about 50 yards from it passes into a circular well cut out of the rock, 40ft. diameter and 63ft. deep, and is strained by passing through copper wire cloth, 40 meshes to the inch, arranged in oak frames, forming an inner well of octagonal shape, 25ft. diameter, and from this latter the water finally passes into 2 lines of pipes leading to the City. These 2 pipes are 42in. in diameter, and are intended to deliver the whole 50,000,000 gallons a day. They first pass through a tunnel, 440 yards long, and then diminished in size to 36in. are continued for a distance of about 7 miles to the City.

Water is also supplied to the City from the Gorbals water works, which draw their supply from the Brock Burn, a small stream having its sources near Brother Loch and Long Loch, in the south east of Renfrewshire. The surface water is collected in 4 reservoirs, and after being filtered, is supplied to the City by gravitation. The lowest reservoir is $4\frac{1}{2}$ miles from the upper sources of the stream, and about 6 miles from Glasgow.

In connection with these reservoirs, there are 2 distributing tanks, and 2 sets of filters. Each set can be worked while the other is under repair. Each set of filters is divided into 3 transverse sections, any one of which can be cleared without stopping the action of the others. The filters are upon the Lancashire principle, the sand being removed when foul, washed, and again replaced. When any filter has ceased to discharge its proper quantity of water, about 1in. of sand is removed, and a new filtering surface exposed. The sand is washed by an upward current of water in cast iron boxes.

The area of the filtering surface is 3,800 square yards; and the average quantity of water passed through is 875 gallons a square yard per 24 hours.

The 2 tanks into which the water passes from the filters are each 220ft. long, 66ft. broad, and 19ft. deep. They contain 3,250,000 gallons, and are 240ft. above ordnance datum when full.

The main pipe to the Town, 24in. in diameter, passes from these tanks, the inlets being furnished with valves, and copper wire cloth strainers. The average daily supply of water furnished by the Commissioners during 1868 was obtained thus—

From Loch Katrine,	22,100,000 gallons.
From Gorbal's gravitation works,	3,730,000 „
Total	26,830,000 „

The domestic rate is 1s. in the pound over the whole municipality, and 1s. 1d. in the northern suburbs, together with 1d. of public rate chargeable to the owners of property within the municipality.

So abundant has the supply been, that the Commissioners have been enabled to furnish some of the neighbouring Towns, such as Renfrew, Pollokshaws, Rutherglen, etc.

In houses at the higher levels, cisterns are compulsory, but not elsewhere, except for water-closets, although many water closets are supplied direct from the mains: single valve cisterns are used for water-closets. The house taps most commonly used are the common ground cocks which cause great waste.

SWANSEA.

The following Statement has been compiled partly from extracts taken from the very valuable report of E. Davies, Esq., Medical Officer of Health, and from information kindly placed at my disposal by E Cousens, Esq., the Borough Surveyor. Extracts have also been made from the Municipal Corporations' Directory.

Swansea is a Borough situated on the west side of the river Tawy, at its mouth at Swansea Bay in the Bristol Channel. The Town has communication with the South Wales and Vale of Neath Railway, and with the South Wales and Swansea Vale Railway. It has also water communication with its own and adjacent counties by means of the river Tawy, the Swansea and Neath canal, and another canal which runs up the valley for a distance of 16 miles.

The staple trade of Swansea is the smelting and refining of copper, which is brought hither for that purpose from all parts of the world. There are also iron, tinplate, zinc, patent fuel, and alkali manufactories. The exports consist of the articles manufactured here, and the imports of metallic ores, timber, tobacco, hemp. tallow, flour, grain, etc.

Population in 1861, 41,606; in 1869 estimated about 60,000; inhabited houses, 8,778; gross estimated rental, £131,375; rateable value, £123,000; area of Borough, 4,363 acres.

From Dr. Davies' Report:—

"Previous to 1857 Swansea was without a system of drainage, at that time there was only one main sewer along the Strand which emptied itself into the river, receiving in its course the contents of the Old Town ditch, partly surface water, and partly sewage from the lower part of the Town.

The Town ditch was in fact an open sewer along a great part of its course, from 3 to 4ft. wide and in some places 5ft. deep; always stagnant, and in summer weather offensive and dangerous to the public health. The cesspool system was general, and the water supply of that part of the Town above the level of the existing reservoir which was obtained from pumps and wells, was insufficient in quantity, and in many instances of a very questionable character.

In 1857 the main drainage of the Town was commenced. There are 5¼ miles of brick sewers and 34 miles of pipe sewers.

The system of sewage adopted in Swansea differs in some respects from that of many other Towns and is believed to have advantages peculiar to itself.

The main outlet sewers constructed of brick are eggshaped in section, varying from 4ft. by 3ft. to 2ft. 3in. by 1ft. 6in., with other mains of circular glazed earthenware pipes, from 18in. to 9in. in diameter. Except in the case of cellars abutting on the sewers, houses are not drained directly into the main sewer but into subordinate sewers at the rear of the houses on both sides of the street. In this way, with the precautions immediately to be mentioned, the risk of the escape of sewer gas into the interior of houses is avoided, and the expense of private drainage is very much lessened.

The sewers are easy of access, and the drainage of back premises is not carried under the houses. Each house is connected separately with the subordinate sewer, which is finally connected with the main sewer at the end of the street.

Ventilating shafts are constructed in connection with every manhole along the course of the main sewers at an average distance of 40 yards from each other, and before the gases escape into the street they must pass through trays filled with finely broken vegetable charcoal. The result is most satisfactory, the neighbourhood of the ventilators is not offensive, and as a proof of the efficiency of the ventilation it may be mentioned, that it is at all times possible to enter the sewers

for the purpose of examination and repairs, and the effluvium is never so concentrated as to be overpoweringly offensive to the workmen.

In order still further to protect the interior of houses from danger arising from sewer gas, a double system of traps is provided; the drainage of closets and sinks within houses is not carried direct into the sewer but the pipes from these places discharge themselves into trapped gullies outside the houses, and above the point of discharge there is a communication with the water-shoot, which acts as a ventilating shaft.

The flushing of the sewers is effected in two ways:—

1st.—Where the highest point of the sewer adjoins the street and is easily accessible, the sewers are flushed by means of a hose attached to the hydrant on the water main.

2nd.—Where the sewers can only be reached through houses they are flushed by self-acting flushing chambers, which act at intervals of from 4 days to a week.

The action of the flushing chambers is shortly this,—a receptacle balanced on an eccentric axis is gradually filled with water, which, when it reaches a certain height in the receptacle representing a quantity of about 150 gallons is suddenly discharged into the sewer, the receptacle immediately returning to its place to be in course of time refilled."

The main drainage cost £47,000.

The Water Supply is obtained from a reservoir capable of holding 300,000,000 gallons, formed by an embankment thrown across the valley of the Lliw river. The reservoir is situated among the hills about 9 miles away from the Town, and the river receives the rainfall of about 1,860 acres, principally common lands, and is entirely free from any possibility of sewage contamination.

The water flows through earthenware conduits, 2ft. in diameter, from the storage reservoir into the Borough and is distributed within the Borough by about 20 miles of iron pipes, varying in size from 2ft. to 2in. in diameter. About 7,000 houses are connected, and the water-closets are fitted with cisterns, but for other purposes the water is drawn direct from the mains.

The supply is on the constant system, excepting during a short time in summer when it is necessary to shut the water off for a few hours during the day.

Dr. Davies says also—"That there is every reason to believe that the sanitary improvement of the district is really beginning to tell on the public health, and the reduced death rate of 1867. viz.,—18.1 per 1,000, against 28 of the previous year, and 24.1 of the 3 years preceeding, is an augury of better things and is an indication that Swansea is about to place herself in a position, which, from her natural position, she ought to occupy among the healthiest Towns in the Kingdom."

PORTSMOUTH.

The following Statement is compiled from information kindly supplied me by S. E. Greatorex, Esq., Borough Engineer, and from the Secretary of the Water Company.

Portsmouth, together with Portsea Town (included in the borough) is situated on the Island of Portsea, which is 15 miles in circumference.

Population estimated at 115,000; inhabited houses, about 20,000; the area sewered covers 2,374 acres; rateable value £253,941 15s. The sewage is removed both by pumping and by gravitation. The area of the Town from which the sewage is pumped covers 740 acres: of this, half is densely populated, the remainder is suburban.

The high level sewer removes by gravitation the sewage over 1,634 acres, half of which is already, and the other half is rapidly becoming, densely built upon.

The sole of the sewers in the low level, or the area pumped, ranges from 3ft. to 4ft. below high water mark, to 6ft. and 8ft. above it. The outfall is into the sea, and is about 18in. below low water mark. The mouth of the outfall is laid 5ft. below ordnance datum.

The outfall is situated in Largston Channel, where the tide runs out about 7 knots an hour.

From the pumping area the rainfall is excluded as much as possible; but the higher level carries off both storm water and sewage.

The main sewers are eggshaped and constructed of brick; at their upper end they are 3ft. by 2ft., running into 4ft. by 2ft. 8in., 4ft. barrel.

The low level empties into an elliptical sewer, 5ft. by 3ft. 8in., from whence it is pumped into the outfall, whence it is conveyed into the sea by 2 iron pipes, each 3ft. in diameter.

The branch drains are partly brick, partly stoneware pipes.

The brick drains are all eggshaped and vary in size from 1ft. 9in. by 1ft. 2in. to 2ft. by 1ft. 4in.—2ft. 6in. by 1ft. 8in.—3ft. by 2ft. These are all laid into stoneware blocks (JENNING's patent.)

The stoneware pipes are vitrified and vary in size from 12in. of 1¼in. thickness, to 15in. of 1½in. thickness.

The sockets are 2½in. deep, and they are laid and embedded in 4in. of concrete all round. There are manholes at distances of about 300ft., and flushing shafts at every bend; and the sewers are ventilated through charcoal trays.

The soil pipes from water-closets are 6in. and 9in. diameter.

The main drainage works are estimated to cost £150,000.

The water works are in the hands of a private Company. The supply is intermittent, and is on for about 8 hours out of the 24. It is derived from spring water in the chalk at Havant, about 8 miles distant from Portsmouth. The water flows into a collecting reservoir, which holds about 2 million gallons, from whence it gravitates into a pumping well, from which it is lifted by 2 80-horse power engines into a service reservoir in Portsdown Hill, situated about 2½ miles from Havant, whence it is brought into Portsmouth, a distance of about 7 miles.

The supply equals about 3 million gallons a day, and is distributed to about 16,000 houses. Cisterns in houses are compulsory.

WORTHING.

The following Statement is compiled from information kindly given by the Local Authorities.

Worthing is a small Town, on the coast of Sussex, chiefly noted as a watering place. The lowest part of the Town is from 3 to 4ft. below high water mark.

The population is estimated Nov. (1869), to be between 7,000 and 8,000 persons. Theren of the district sewered, comprises 2 square miles.

Main drainage works have been executed, and a separate system adopted. The main sewers constructed of brick, are barrel shaped, they are 3 ft. at the outfall, diminishing gradually to 12in. at the highest point.

The branch sewers are glazed earthenware pipes, from 6in. to 9in. diameter. There are about 1,500 houses fitted with water-closets. Ventilation is effected through charcoal trays at the manholes, and also through 6in. ventilating pipes. The down spouts are not connected with the sewers.

Flushing is effected by hose pipes, connected with the water mains, at the bend of every sewer.

The sewage flows down to a well, which is 30 ft. deep, and of an average breadth of 10 ft.

In dry weather about 400,000 gallons, and in wet weather double the quantity is pumped by 2 engines 1 of 16 horse-power, which works an average for 18 hours, 1 of 20 horse-power, which is only occasionally used.

There are 2 pipes, through which the sewage is conducted from the pumping well; one of earthenware, 15in. in diameter, for conveyance of sewage for the low level; the other of iron, through which the sewage is forced on to the high level.

THE SEWAGE FARM at Worthing consists of 90 acres, which slope downward to a brook. The sewage for the low-lying ground, brought down as described above, is received into a cistern on the highest level; from this it flows through a covered main carrier, consisting of a pipe about 1 ft. in diameter. Branch carriers which are simply earth trenches, communicate with the main carrier, and are distant from each other about 3 rods (49½ ft.) At each junction with the main, is an expensive and unnecessary arrangement, consisting of an iron flanged pipe let into masonry.

One field consisting of 40 acres, is sown with rye grass. Up to September, 4 crops had been cut, averaging 12 tons per acre.

Twenty-seven acres were laid out in pasture, on which cattle were grazing.

On the high level there are 20 acres on to which the sewage is pumped; 9 acres being sown with rye grass, and 11 with roots and cabbage.

MR. LANGLEY the able superintendent of this farm, advises that the land should be divided into 3 portions, and that in the early autumn of each year it should be all ploughed, and the land soaked with sewage for a fortnight.

Then, that the 1st division should be sown with roots, the 2nd with cereals, such as wheat, oats, etc.; and the 3rd with rye grass.

By such treatment a succession of crops is ensured to each plot of land, and the soil will yield far heavier crops, than if the same crop is repeatedly grown on the same land.

HASTINGS.

The following Statement is compiled from information kindly given me by J. MEADOWS, ESQ., Town Clerk; and from extracts from a report by WM. ANDREWS, ESQ., Borough Surveyor; and also from extracts taken from the Municipal Corporations' Directory.

The Old Town of Hastings is situated in a valley between 2 hills, whilst the New Town extends along the sea shore, until it becomes incorporated with the township of St. Leonards.

The population of Hastings is estimated to amount to about 30,000, who live in about 4,000 houses; the gross estimated rental is about 20 per cent more than the rateable value, which is £162,836; the area of the Borough is 1,800 acres.

Main drainage works have been executed at a cost of £47,030.

Formerly the sewers discharged into the sea by 3 outlets, but the sewage formed a nuisance on the beach, and an intercepting sewer was consequently begun in 1866 and finished in 1869; the old outlets being still retained as overflows during storms. The sewers carry off both storm water and sewage: they extend for about 12 miles. The main sewers are constructed of brick and are eggshaped, while the subsidiary drains are stoneware pipes, and they vary in size from 9in. to 5ft.

The main intercepting sewer from Warwick Square to the Albert Memorial, a distance of about ¾ of a mile, is 2ft. 9in. by 4ft., with an inclination of 1ft. in 794ft.; from the Memorial to the junction of the Bourne, being a length of 1 mile 200ft., the sewer is 3ft. 6in. by 5ft., and has an inclination of 1ft. in 1,320ft. From the

Bourne to the tank the length is ¼ of a mile, and the sewer 4ft. by 5ft., with an inclination of 1ft. in 1,320ft.

The sewers are ventilated into the streets through charcoal trays; and they are flushed by salt water, which is impounded at high tide, and allowed to flow through the sewers.

The sewage flows into a tank 210ft. long, by 100ft. broad, and of a depth of 14ft.: this tank is capable of containing 1½ million gallons. The bottom of the tank is about 5ft. 6in. above low water at neap tides. Its discharge pipe is a cast iron 4ft. pipe, with a fall of from 8 to 10ft. per mile, which will empty the tank when full in about 1½ hour. The penstock is lifted about an hour before low tide, and the sewage runs away to the eastward.

THE WATER SUPPLY of Hastings is derived from surface reservoirs, from springs, and from an artesian well.

The water after collection is forced by pumps up to tanks, about 400ft. above sea level, and about ¼-mile from the pumps. The supply is intermittent; and cisterns are compulsory on houses.

A controversy arose some few years ago, regarding the contamination of the water with lead, and it was stated that instances of lead poisoning had taken place in consequence of drinking the water that had been stored in leaden cisterns. An analysis of the water so used was made by DR. TAYLOR, who failed to detect any appreciable quantity of lead in the water.

CROYDON.

The following Statement has been compiled from extracts from the very valuable reports of BALDWIN LATHAM, ESQ., Engineer to the Local Board of Health.

"The Town is situated in the county of Surrey, on the east and west sides of a valley through which the river Wandle runs,

The natural drainage outfalls of the Parish are—for the north portion into the Effra river; for the north-east portion into the Ravensbourne; for the north-west and centre portion into the Streatham brook; and the remaining portion into the Wandle. The total area of the district under the jurisdiction of the Local Board is 9,821 acres; and the population is estimated at 70,000.

Croydon was almost the first town to put in active operation the Public Health Act, and to try the new system of tubular pipe sewers, although it was a system condemned by some of the ablest Engineers of the day. In spite, however, of that condemnation, it is a system that has year by year gained extended adoption, and has completely revolutionized the whole system of drainage throughout the Country.

As Croydon was the pioneer in the track in which many Towns have followed, many imperfections did of necessity exist in the early works. Of the great errors committed in the early works, one was the too small size of some of the sewers; and another the want of sufficient strength in the sewer pipes themselves, 15in. pipes having a thickness of but ¼ of an inch. collapsed when laid at moderate depths.

The total absence of any system of ventilation of the sewers was the most grievous error, for no sooner was the original works drawing near to completion, than the Town was visited by an epidemic of Fever, which though not very fatal, was extensively prevalent. There can be no doubt that this outbreak was due to the entire absence of any system of sewer ventilation. A remedy against the recurrence of such a disaster was at the time proposed, and a system then adopted; but within the last 18 months, a more perfect system of ventilation has been devised and carried out. The Board have now under their control 75 miles of public sewers, of various sizes and inclinations and depths.

The sewage is removed at the outfall into 1 of 2 large settling tanks, where it is strained to remove the solid matter, which, after being mixed with street sweepings or earth and allowed to stand for a few days until quite solid and free from odour, is used on the land. The liquid portion of the sewage then flows on to the Farm at Beddington, which is situated about 2 miles from the Town, and covers 280 acres. The soil at Beddington is sandy upon a gravel subsoil. The sewage flows through open earth channels; the main channel varying in breadth from about 12ft to 4ft. The land is laid out in Italian rye grass, and common English grasses. Earth trenches communicate with the main channel, at distances varying from 15 to 20 yards apart.

"The sewage"—MR. LATHAM says—"may be applied during all stages of the growth of the plant, up to the time of cutting the crop; and it only need be withdrawn from the land for a very limited period previous to the time of cutting."

In carrying out this system it is absolutely necessary to prepare the land for the reception of the sewage, by carefully levelling it, so that no holes or uneven places may exist: an uneven place will certainly retard the flow of the sewage, and if the sewage should be allowed to stagnate, owing to any unevenness in the ground, it will effectually destroy instead of invigorating the crop.

The sewage of Croydon varies (1866) in bulk from 50 to 120 gallons per head per day of the population.

About 6 crops of grass have been cut in a single year, and sold for an average price of £5 per acre.

The effluent water flows into the Wandle.

Italian rye grass is the proper crop for sewage, but it dies out every 3 years, and it requires to be renewed *after*—and this is the first principle in sewage irrigation—the land has been ploughed up.

THE WATER SUPPLY of Croydon is derived from 3 wells, sunk and bored into the chalk.

The original works for water supply consisted in enlarging and deepening a well on the site of the works.

The erection of 2 Cornish engines, with cast iron equal beams, 30in. cylinders, and 9ft. stroke, the plunger of each pump being 12in. in diameter. The erection of 2 single fired Cornish boilers, 5ft. diameter, and 21ft. long, which very shortly after the completion of the works, were supplemented by another boiler of the same dimensions, and the construction of a covered reservoir at Park Hill, consisting of a domed chamber, 74ft. diameter, and 35ft. deep, capable of holding 900,000 gallons of water.

A rising main 12in. in diameter was laid from the works to the reservoir: this main also furnished the supply of water to the Town.

The original works were calculated to furnish a supply of 1 million gallons of water per day; and their cost amounted to £26,353 14s. 8d.

The rapid increase in the population of the Town, and the consequent increase in the consumption of the water, rendered it expedient to provide the means of furnishing an additional supply.

A new well was sunk and bored to the depth of 150ft., being just twice the depth of the old well. Upon the completion of this well, it was found to furnish a supply of water totally independent of, and distinct from the supply of the old well.

The site of the new well was arranged to form the pumping wells, in which the pumps of a large engine could be fixed, and as it was found on the completion of the well that there was no connection between the supplies of water,

it became necessary in order that the engine should raise the full volume of water, that a connection should be made between the new and old wells.

This was done by means of an 18in. cast iron syphon, which performs its work admirably; provision is made in the machinery for keeping this syphon exhausted of air.

A new engine which is in the same house as the old one has been erected. It is a Cornish engine, and has a wrought iron beam, consisting of two rolled 1½in. plates, kept apart by cast iron distance pieces which are rivetted to the plates. The beam is 38ft. long over all 35ft. from centre to centre; the piston and pumps have each 10ft. 6in. stroke; the plunger of the pump is 24in. diameter, and the cylinder is 60in. diameter; the cylinder is provided with a steam jacket, and this again is felted and lagged; the piston of the engine is supplied with metallic packing. Instead of the ordinary injection condenser, a surface condenser containing about 400 copper tubes has been fitted to the engine. The advantages of this description of condenser are, that the water passing into the condenser to condense the steam never comes in actual contact with the water required for condensing, consequently the water passing away is as pure as when introduced, and not being at all contaminated with any oily or any other matter, as in the case with the injection condensers of the old engines, it is at once available for the public baths, and now supplies the swimming bath with warm water.

These new boilers, each 27ft. long and 5ft. 6in. diameter, and each containing a single tube 3ft. diameter, have been fixed. The furnaces of these boilers are fitted with smoke consuming apparatus.

An 18in. rising main has been laid from the new engine to the reservoir, and base of the water tower at Park Hill: 23¼ miles of water mains have been laid in connection with the new works.

The erection of residences in the higher parts of the Parish rendered it necessary to establish a high level service, consisting of water tower engine, and engine house, and a distinct set of mains to these high districts.

The water tower contains a reservoir in the base which will hold 94,000 gallons of water, and which is on the same level as the covered reservoir in connection with the supply of the Town; also a summit tank of wrought iron capable of holding 40,000 gallons of water. The shell of this tank is made of ½in. plates of iron, strengthened at the joints with T irons, and the bottom of ⅝ plates. It is supported, partly on the external walls, and partly on 3 central columns, one of which serves to furnish a supply to the high level, a second forms the rising main for the engine house, and the third acts as an overflow.

The engine house is situated at the foot of the Tower, and contains an horizontal engine and 2 double-acting pumps, fixed vertically: the steam is furnished by 2 of Field's vertical boilers.

The new water works, including all the mains, cost of water Tower, low and high level engines, pumps, engine houses, boiler houses, monies paid for compensation, and a stock of pipes in hand has been £42,430 0s. 7d.

At the present time (Sep. 1869), 7,697 houses are supplied, and the supply is distributed by 11,005 taps, 9,416 water-closets, 284 baths, and 27 fountains. The population supplied in 1868 and 1869 may be taken at 45,000 persons, and the quantity supplied at 50 gallons per head per day. The average daily supply has been 2¼ million gallons; but from defective service pipes, there has been and is an enormous leakage, so that it is estimated nearly 1¼ million gallons are daily lost or illegitimately used."

H. ROSE, Printer and Engraver, High Street, Southampton.

Professor Longmore CB, with Dr Fayrer's kind regards

For the Library Table
T. Longmore

Femoral Aneurism. Ligature of the External Iliac Artery.

A West Indian Negro, named F. W., aged 34 years, was admitted into the Medical College Hospital on the 10th of September, 1869, with a femoral aneurism.

He was a tall, well-made, active, muscular, and healthy-looking man. A native of Barbadoes, the earlier part of whose life had been spent at sea; he has been several years in India, and served for seven years in the Lahore Light Horse, subsequently as a rough rider, and last of all, as a barman in one of the taverns in the Lall Bazar.

He gives the following history of his case. About three years ago he sprained his toes in falling from his horse, but he does not attribute his present disease to that accident. Six or seven months ago, he and another man were lifting a weight of about 200lbs., when he felt something give way in his thigh, just about the site of the tumour, but no notice was taken of it and the sensation passed away. About three weeks ago, he observed a slight swelling, and he admits that for, perhaps, three weeks before that, he had felt a sense of uneasiness in the spot. This swelling gradually increased till he could feel it pulsate, and about eight days before admission, he began to feel numbness in the limb. There had been more or less pain from the commencement of the swelling, but it increased to such an extent and the limb became so painful, accompanied with fever, that he was confined to bed; at last he applied for relief at the hospital.

He had been poulticing the swelling and taking medicines, but, as he said, to no purpose. On admission he was weak and feverish, the bowels were confined. The aneurismal tumour is situated in the middle third of the anterior aspect of the

left thigh. It is ovoid, fusiform, and its apex must be within half an inch of the profunda. The diameter of the tumour is about that of a fowls-egg, indeed the size and shape of it is very much what would be produced by placing a body of the size of an egg under the integument. The pulsations were very strong, and there was a loud bruit synchronous with the pulsation. It was very tender to the touch, and from his description is evidently increasing rapidly. Pressure on the femoral above the tumour completely commanded the pulsation.

He was put to bed, and perfect rest enjoined. The limb was bandaged and some aperient medicine ordered. A belladona plaster relieved the pain in the tumour, and a sedative draught gave him rest at night.

He was restless and feverish during the first two or three days after admission; but simple treatment and rest relieved him. The pain and swelling in the leg abated, and in all respects he was much better.

During the first three days, the tumour diminished in size and impulse.

On the 15th, I found him worse—the tumour had increased considerably without any apparent reason, for he had not left his bed. I decided, in consultation with my colleagues, to place a ligature on the external iliac artery, as the disease extended too high up the thigh to give any reasonable hope of success from ligature of the superficial femoral, and as to the common femoral, I prefer the ligature of the external iliac as a safer operation. Accordingly, at 8-30 A. M., of September 15th, the artery was tied, in the following manner, under the influence of chloroform.

At the junction of the inner and middle thirds of a line drawn from the anterior superior spine of the ilium to the symphysis pubis, and about half an inch above poupart's ligament, I commenced an incision which extended for about four inches parallel to Pouparts, ligament, slightly curved and terminating a little above and about two inches from the anterior superior spine of the ilium. The first incision divided the skin and part of the superficial fascia; having completed the division of the fascia, I next divided to the same extent the aponeurosis of the external

oblique. The superficial epigastric vein was divided with the fascia, and required a ligature, but no arterial branch was wounded. The internal oblique and transversalis, and the fascia transversalis having been carefully divided the peritoneum was next carefully separated with the intestines. It bulged forwards but was kept out of the way by Professor Partridge, who also pressed the spermatic cord aside and kept the wound dilated with his finger and a copper spatula. The contents of the pelvis were pushed aside until the artery came into view, lying on the psoas muscle.

The internal epigastric artery came plainly into view; it was very large, being quite as big as an ordinary quill. Dividing the sheath, and being very careful not to include anything but the artery in the ligature, I passed the aneurism needle from the inner side of the vessel, and tied the ligature firmly leaving both ends to hang out of the wound. Pulsation ceased in the tumour, which appeared immediately to shrink in size; in a few minutes later, it increased again to its original size, but without pulsation. Not a drop of blood was lost after the superficial epigastric vein was tied. The operation was almost as bloodless as though it had been done on the dead body, and I confess I was surprised at the ease with which the various steps of it were accomplished. The peritoneum separated more readily than it does in the dead subject, and the artery being distended with blood, looked larger. The iliac vein was not the least in the way: the sheath was most readily divided and the ligature easily passed. The day was dull and cloudy, and the light consequently not very good.

The lips of the wound were next brought together with wire sutures, and it was dressed with the carbolic oil dressing. It was remarked by all that before he was removed from the table, the temperature of the limb had fallen considerably. About ten minutes after being removed into his ward, he had quite recovered from the effects of the chloroform, and was complaining of pain in the left side of the scrotum and left testicle, as well as in the left iliac region shooting down the left thigh. I fear the genital branch of the genito-crural nerve has been included in the ligature.

3-30 P. M. Has had considerable pain in the scrotum, all down the inner side of the left thigh and leg, and up the left

The foot and leg are enveloped in cotton and flannel. The pulsation of the posterior tibial is fainter to-day. About 3ii of thin purulent discharge came from about the ligature to-day. Washed out the cavity with the carbolic acid solution. There is neither pain nor tenderness in the tumour, which is quite quiescent.

September 19th.—He looks well; says that his sleep was disturbed by starting pains in the wound. There is a tolerably free thin purulent discharge from about the ligature. The cavity was again washed out with the carbolic acid solution.

The ligature on the epigastric vein came away. The wound is uniting, excepting about the ligature. His pulse is now 92. Tongue still coated; bowels acted freely. Takes his food fairly. Pain nearly diminished; numbness in foot less; says, that the general feeling of the limb is still one of numbness, but that this is decreasing.

Temperature at 4 P. M. yesterday.		This Morning.	
Axilla ...	100°2	Axilla ..	99°
Left ham ..	97°6	Left ham ..	97°
Right ham ...	97°8	Right ham ..	97°
Left toes ...	94°2	Left toes ..	91°8
Right do. ...	97°2	Right toes ..	94°4

He may have a mutton chop and some wine now.

September 20th.—He looks well; bowels moved twice yesterday; tongue still coated; no fever yesterday or last night.

Temperature at 5 A. M. to-day, was—

Axilla	99°8
Left ham	97°2
Right ham	97°4
Right toes	96°
Left toes	96°

at 4 P. M. yesterday, it was—

Axilla	100°2
Left ham	97°
Right ham	97°8
Left toes	95°
Right toes.	95°2

His pulse this morning is 96. Still some pain in the ankle and shin. Has occasional starting pain in the wound. About three drachms of pus came from the wound to-day. The aneurismal tumour is becoming smaller and more consolidated, no tenderness on pressure.

Takes his food fairly.

May have solid food and two measures of Port Wine daily.

September 21st.—Pulse 92. Tongue still rather coated. Had very little sleep last night, notwithstanding three one-grain of opium-pills. Pain in the leg diminishing. Toes still feel somewhat benumbed.

Temperature, 4 P. M. yesterday.		7 A. M. to-day.
Axilla	99°8	99°2
Left ham ..	97°	96°9
Right ham ..	97°5	96°5
Left toes	96°	94°6
Right toes ..	96°6	94°8

The sutures are separating and the wound is granulating healthily. He takes his food well and is in good spirits.

22nd.—Is doing well. Bowels open. Discharge healthy. Pulse 92. Says both legs feel much the same now, but there is still some numbness in the left foot.

Temperature at 7 A. M.		At 4 P. M. yesterday.
Axilla	98°4	97°7
Left ham	96°8	96°
Right ham	96°8	95°7
Right toes	94°	94°3
Left toes	94°	94°4

There can be no doubt that the anastimotic circulation is established.

The aneurismal tumour is gradually shrinking.

23rd September.—Does not look quite so well to-day. Pulse 96. Complains of pain in the tumour and along the course of the femoral artery and also in the left testicle. The discharge is healthy and decreasing in quantity. I found that notwithstanding the strictest prohibition, he has been getting out of bed to go to the night chair.

Temperature at 4 P. M.		This morning.
Axilla	98°1	98°4
Left ham	97°1	95°4

Right ham	96°1	..	...	... 95°
Left toes	96°	...	...	... 93°
Right toes	95°	...	...	... 92°

He says that the left leg now feels to him warmer than the right. There is still some numbness in the foot and ankle, and along the shin.

He has been cautioned not to get out of bed again.

He had some brandy yesterday in addition to his wine. This did not agree with him and is prohibited.

24*th*.—Tongue clean slept well; pulse 88; wound healthy. Still has pain in the tumour and along the course of the femoral artery, but rather less than it was. He had no opium either yesterday or to-day.

Temperature at 4 P. M.				This morning.
Axilla ..	99°4	..	...	.. 99°
Left ham ..	97°4	...	..	.. 96°4
Right ham ..	97°4	...	...	.. 97°4
Left toes ...	93°5	...	..	... 91°
Right toes ...	93°6	..	..	... 89°

He says he has an odd sensation as though the toe nails of his left foot were loose.

September 25*th*.—Pulse 96, but no fever. Wound looks very healthy and the discharge very slight. There is less numbness in the foot. The tumour and the femoral artery are less painful than they were. Temperature the same as yesterday. He says he feels very well.

September 26*th*.—Feels well; slept well; tongue clean; bowels open. Pulse 86.

Very little pain in the wound. The leg feels better, but is still rather numb about the foot

Temperature at 4 P. M.				This morning.
Axilla	98°	..	..	.. 98°4
Left ham	96°4	...	..	... 96°4
Right ham	94°8	...	..	... 95°3
Left toes	96°	...	...	.. 91°
Right toes	94°	...	...	.. 87°6

Thus the affected limb keeps at a higher temperature now than the sound one.

September 27*th*.—Looks well; tongue clean; bowels regular; pulse 88; wound healthy; discharge diminishing. There is still some numbness in the foot and toes. There is very slight pain in the tumour, which is gradually shrinking in size.

Temperature at 4 P. M. yesterday.				This morning.
Axilla	98°8	...	...	... 97°8
Left ham	97°2	...	...	... 96°4
Right ham	96°8	...	...	... 95°
Left toes	93°8	...	...	.. 91°4
Right toes	93°4	...	...	.. 90°5

The affected limb thus maintains a higher temperature than the other. The cotton packing of the foot and limb may now be discontinued. The flannel bandage may be continued as a support to the limb.

28*th September*.—Doing well, still some numbness in the foot; wound looks healthy; no pulsation can be felt in either tibial.

Temperature at 4 P. M. yesterday.				This morning.
Axilla	98°	...	...	... 98°6
Left ham	96°1	..	..	.. 96°5
Right ham	96°1	...	..	.. 96°2
Left toes	91°7	...	..	... 92°
Right toes	91°2	...	...	... 91°3

29*th*.—Says he has more pain in the foot and toes and shin of the affected limb, and that it is of a burning character, otherwise all seems to be going on as well as usual.

Temperature at 4 P. M.				This morning.
Axilla	99 2	...	...	... 98°6
Left ham	97°2	...	...	... 96°6
Right ham	97°1	...	...	... 96°2
Left toes	95°	...	..	... 93°
Right toes	95°6	...	...	... 92°4

He attributes the pain in the leg and foot to removal of the cotton. Let it be re-applied.

30*th September*.—Tongue clean; pulse 92. Leg feels much the same as yesterday; bowels open; slept well; tumour still slightly painful. The ligature on the iliac artery came away

to day, it was loose in the wound. It separated therefore on the fifteenth day.

Temperature at 4 P. M.				This morning.
Axilla	99°6	...	...	98°2
Left ham	98°5	...	...	96°3
Right ham	97°7	...	...	96°4
Left toes	96°7	...	...	95°
Right toes	95°	...	...	94°4

The temperature is now nearly equalized in both limbs.

1*st October*.—He is doing well, the wound is rapidly healing, and the discharge diminishing. I may remark that the healing of the wound has been somewhat delayed by the skin having ulcerated at the points of suture.

It is now rapidly closing in with healthy granulations.

Temperature at 4 P. M.				This morning.
Axilla	99°2	..	..	98°
Left ham	98°2	..	..	96°5
Right ham	97°2	..	..	96°
Left toes	96°4	..	..	95°
Right toes	95°4	..	..	96°4

The affected limb is still a degree warmer than the other. There is still a little numbness in the toes, instep, and foot. Tumour still slightly painful. Pulse 88.

2*nd October*.—Pulse 88. Did not sleep well; suffered from griping pains in the bowels, and pain in the wound from 6 P. M. to 4 A. M. The leg, he says, "felt as though it were on fire." This was relieved when the bandage and cotton were removed. The wound looks well, but not so florid as yesterday. The discharge of a dirty yellow color.

Bowels acted twice in the night. He had a sedative draught. The pain has now passed off, but there is still some in the leg and foot.

Temperature at 4 P. M.				This morning.
Axilla	99°8	...	..	98°2
Left ham	98°4	...	..	95°6
Right ham	98°6	...	..	96°2
Left toes	94°8	...	..	90°6
Right toes	95°	...	...	92°

The temperature of the affected has fallen again below that of the sound limb. His tongue is foul, and bowels probably out of order. A dose of Ol. Ricini ordered.

3*rd October*.—He feels better; slept well. Pulse 88.

Only slight pains with numbness in the foot. No pain in the tumour which is certainly much smaller.

Temperature at 4 P. M.				This morning
Axilla	98°4	..	..	97°8
Left ham	96°	...	..	95°4
Right ham	96°1	..	..	96°5
Left toes	93°4	..	..	86°8
Right toes	94°	...	..	87°

4*th October*.—Doing well; slept well; no pain. Pulse 88. Foot still rather numb. The wound looks very healthy, it is rapidly closing in.

Temperature at 4 P. M. yesterday.				This morning.
Axilla	99°	...	..	99°
Left ham	96°6	..	...	95°7
Right ham	96°8	..	...	95°7
Left toes	91°8	...	...	90°
Right toes	92°	..	...	88°

The temperature of the limbs is again nearly equalized.

5*th October*.—Doing well; slept well; tongue cleaning. No pain in the leg; still some numbness in the toes.

No pain in the tumour which has not changed during the last two days.

Temperature at 4 P. M. yesterday				This morning.
Axilla	99°5	...	...	98°4
Left ham	98°	...	...	93°
Right ham	98°2	...	...	92°4
Left toes	95°	...	..	91°1
Right toes	95°3	..	..	90°3

6*th October*.—Tongue cleaning, no pain on the limb; still some numbness in the toes. No pain in the tumour or in the wound.

It is three weeks to-day, since the operation was performed.

7*th October*.—He is doing well; slept well; no pain; but some

numbness in the toes, and a feeling of soreness across the instep. The wound is healing rapidly.

Temperature at 4 P. M.		To-day.
Axilla	99°4	98°2
Left ham	96°8	94°4
Right ham	97°	94°5
Left toes	95°	87°8
Right toes	96°5	89°2

8th October.—The night was very stormy and wet, the weather has affected him, and he has much pain in consequence. Tongue clean. Pulse 94·.

Temperature at 4. P. M.		This morning.
Axilla	98°4	98°6
Left ham	97°2	96°5
Right ham	97°6	96°2
Left toes	93°4	93°
Right toes	93°8	93°4

The temperature of the limbs is thus about equal. The wound closing rapidly.

10th October.—Doing well; no pain; still some numbness in the toes.

Temperature this morning.	
Axilla	99°
Left ham	94°4
Right ham	93°
Left toes	91°8
Right toes	92°5

Pulse 96. Eats and sleeps well.

11th October.—Doing very well. Sat up in a chair, and walked a little yesterday; slept well. Pulse 84· Had pain in the testicle after walking.

Temperature this morning.	
Axilla	99°2
Left ham	95°6
Right ham	95°8
Left toes	91°6
Right toes	91°6

The temperature of the limbs is now equalized. Wound all but healed.

12th October.—Walked into the next ward. Pulse 88·

Temperature.	
Axilla	98°
Left ham	96°
Right ham	96°4
Left toes	91°
Right toes	91°4

Still some numbness in the toes.

15th October.—I have not seen him for two days. He has been doing well; general health very good. The temperature of the limbs equal. He walks about freely. The tumour has almost disappeared.

21st October.—Temperature of the limbs equal, he walks with ease. There is a point of the wound still unhealed, but otherwise he is quite well, and is very anxious to leave the hospital.

24th October.—He is very well, walks about the ward freely. His strength is rapidly returning. There is still a vestige of the tumour remaining, but it gives him no pain. He says that in walking there is still a little numbness in the toes, but he feels quite well, and fit for his work.

26th October.—We could not persuade him to remain any longer.

He left yesterday, apparently quite cured: no pulsation could be felt in either of the tibials of the affected limb; some thickening only indicates the site of the former aneurismal tumour. The temperature, size, and strength of the legs are equal. There is no tendency at present to hernia at the seat of the wound.

He was admitted on the 10th September.
The artery was ligatured, 15th „
The ligature came away 30th „
Discharged cured—25th October.

He was brought to the Hospital on the night of the 25th November, intoxicated and cut and bruised about the face from fighting. It was observed that the temperature of the legs was equal, and that he seemed to have perfectly recovered from the aneurism; there was still some thickening observed

when the thigh was everted, with the knee flexed; and there was a small sinus at the upper extremity of the wound. There was no pulsation in the site of the aneurism nor in the tibial arteries of that limb.

He had been drinking for some days, but otherwise was well and strong.

J. FAYRER, M. D.

Calcutta, 3rd December, 1869.

Biographical Memoir of Inspector General Sir John Davy written by his Son-in-Law Professor Rolleston of Oxford.

[*From the* Proceedings of the Royal Society, No. 104, 1868.]

John Davy was born at Penzance on the 24th of May, 1790; and he died in his 78th year, at Ambleside, on the 24th of January last. He was the youngest of five children, of whom Sir Humphry Davy, born twelve years before him, was the eldest. He survived his brother thirty-nine years; and one of the most marked features in his character for the whole of this period, and, indeed, of his life, was the well-deserved gratitude and veneration with which he regarded that famous philosopher. His first introduction to scientific life was made at the age of eighteen, in the Laboratory of the Royal Institution, where his brother was then (1808) in the zenith of his fame, lecturing and prosecuting chemical research. Dr. Davy always considered the period of from two to three years during which he acted as an assistant to Sir Humphry as one of the happiest and best employed of his life. On relinquishing this post he studied medicine in Edinburgh, where he graduated in the year 1814, the same year in which he was made a Fellow of this Society. From the year 1815, up to the end of his life, he held various appointments in various parts of the world in the Army Medical Department. He passed a life of great activity, which was but little less varied than this short sketch will show the incidents of his history to have been. He has left behind him numerous papers on purely scientific subjects—chemical and biological; he has written the history of his brother's life, and has also edited his works; his medical experience has been embodied in a volume treating of Army Diseases; and he has written accounts, partly scientific, partly of general interest, of the various countries—Ceylon, the Ionian Islands, and the West Indies—in which he was at different periods of his life stationed in the course of his professional duties. The fact that the Royal Society is now in course of publishing a Catalogue of Scientific Papers, renders it superfluous to specify Dr. Davy's very numerous memoirs individually; and it will be the aim of this notice merely to give the main features of his life in outline, and to mark only the chief points upon which his multifarious labours threw light.

The first remark which a glance at a list of his contributions to science suggests, relates to the length of the period over which his activity in the way of research extended itself. His first paper was published in 'Nicholson's Journal' for 1811, and contained the result of certain investigations undertaken in vindication of the doctrines taught by his brother as to the simple nature of chlorine, or oxymuriatic acid, as it was then named, and as to the incorrectness of the then current views of the composition of hydrochloric, then known as "muriatic" acid. His last paper, one "On the Temperature of the Common Fowl," was read subsequently to his death before the Royal Society of Edinburgh this very year 1868.

During a considerable part of these fifty-seven years Dr. Davy was on

actual service as a medical officer of the army. His services began in the campaign of 1815, when he was attached to a General Hospital in Brussels; he was shortly afterwards sent out to Ceylon, where he continued during the suppression of a rebellion and up to the year 1820. After this he was for several years on Mediterranean stations, in the Ionian Islands first, and afterwards at Malta; and he was sent by Lord Palmerston in the year 1839 on a mission to Constantinople, which lasted nine months, and aiming, as it did, at effecting a reform in the administration of the Turkish hospital system, ended in failure and disappointment. His last public duty was performed as an Inspector-General of Army Hospitals on the West-Indian Station during the three years 1845–1848. In the intervals of foreign employment Dr. Davy was usually on duty at home. An 'Account of the Interior of Ceylon,' a quarto volume published in 1821, 'Notes on the Ionian Islands and Malta, with some account of Constantinople,' two octavo volumes published in 1842, and a volume entitled "The West Indies before and since Emancipation," and bearing date 1854, contain the results of his observations and investigations into the non-medical history of these stations. In a work 'On the Diseases of the Army, with contributions to Pathology,' published in 1862, Dr. Davy has embodied the results of the medical experience which he gained in the discharge of his professional duties at home and abroad. Not the least valuable portions of this volume are those which relate to the ætiology of the yellow and other malarious fevers of the tropical and subtropical countries he was made familiar with. Ten years previously to the publication of this work Dr. Davy had acted as editor to Dr. Blair's volume on 'The Yellow Fever Epidemic of British Guiana.' It is well here to put on record that, whilst discharging the duties of an Inspector-General at Barbadoes, he found time to deliver and publish a course of 'Lectures on the Study of Chemistry,' with especial reference to the agricultural requirements of the island. Dr. Davy had many years previously acted as editor of Sir Humphry's well-known and much read treatise on 'Agricultural Chemistry.'

Two volumes of 'Researches, Anatomical and Physiological,' were published by Dr. Davy in the year 1839; and they were followed by a third on the same subjects in the year 1863. The papers collected in these three volumes are of a very varied character; those on the Torpedo; on the Structure of the Heart of Amphibia; on the Generative Organs of Cartilaginous Fishes; on the Blood-corpuscles of the *Ornithorhynchus*; on the Temperature of Man in the Tropics; on the ova of the *Salmonidæ*, with reference to the Distribution of Species; and especially those on the Blood and the cause of its Coagulation, are the most particularly noteworthy, and the most particularly connected with the author's name.

The debt of gratitude which Dr. Davy owed to Sir Humphry for the assistance and sympathy which he received from him in early life, he discharged, so far as such obligations can be discharged, by the publication in 1836 of 'Memoirs of the Life of Sir Humphry Davy, Bart.,' in two

volumes; secondly, by his edition of the works of Sir Humphry in twelve volumes, the first of which is a Biography condensed from the two volumes just mentioned, the author "carefully abstaining from all that was controversial and vindicatory, trusting that what was before a duty was then superfluous;" and, thirdly, by the volume of 'Fragmentary Remains, Literary and Scientific,' which contained a sketch of his brother's life and was published in 1858. The sixth volume of this edition of Sir Humphry Davy's works, and the second volume of the first of the Biographies of him published by his brother, contain a full statement of the relative claims of Sir H. Davy and George Stephenson respectively to be considered the inventor of the Safety Lamp. Upon another occasion, and as recently as 1864–1865, as may be seen by a reference to the pages of the Philosophical Magazine, Dr. Davy engaged himself in a vindication of his brother's reputation from certain aspersions which had been cast upon it with reference to his conduct when President of this Society.

Dr. Davy was the author of two works on Angling, which have the form of colloquies, and are discursive and digressive, especially in the direction of the various biological bearings of the sport. His liking for this pursuit was, as is well known from the 'Salmonia,' common to him with the author of that work.

Dr. Davy pursued a regular and methodical course of literary and scientific work up to the latest days of his life. His activity, as seen in his later years at the Meetings of the British Association, which he regularly attended, was the wonder of much younger men. Those who saw him in ordinary life gathered from the sight the moral that regular habits in ordinary life are the best guarantee for the possession of a power for putting forth extraordinary exertions upon extraordinary occasions.

The great reputation which, in spite of all efforts to the contrary, has settled round the name of Sir Humphry Davy, has necessarily put Dr. John Davy's claims for scientific distinction somewhat at a disadvantage. The younger brother's main deficiencies were deficiencies affecting his power of imagination and his faculty of exposition, and for excellence in these mental qualities the elder brother was not less preeminently distinguished than for his more strictly scientific abilities. It is much to the credit of Dr. Davy's moral nature that no shadow of mortification or jealousy ever darkened his meditations on his brother's achievements, into comparison with which he was so constantly forced to bring his own. Nor can we close this notice more fitly than by saying what is the literal truth, that his sympathy with the cause of his brother's reputation, showing itself as it did in a repeated and successful championship of it, elevated his whole nature and spread through and over his long series of labours the warm light of a sunny memory.

PAMPHLETS

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