still there is ample need for enlightened improvement. The ball-room affords at the present time the only opportunity of active exercise to many; and, in spite of the disadvantages of late hours and hot rooms, I am convinced that the muscular exercise of dancing supplies to many a real want. We hear much at the present day about the improved education of women; but it must be remembered that the more we assimilate their sex to our own in this respect, the more requisite will it be for them also to graduate in manly sports. Without cricket, or foot-ball, or rowing, it would be most unwise to tax the female brain with higher and harder work.

In the treatment of the insane, the value of modern enlightened improvement is nowhere better seen than in the great prominence now given to active employment; and anyone who pays a visit to Hanwell or our other great asylums must be gratified to see the inmates working eagerly at farm duties or other industrial pursuits. And among idiots the same principle has been most beneficially adopted. Dr. Langdon Down, whose ability and zeal have long made him our leading authority on all concerning this hapless class, has favoured me with an interesting letter on the subject. He writes:—"Great difficulty was always found in effecting the combination of idiots in games of play. There was always a want of spontaneity about them, and great efforts were required to induce a spirit of emulation. I took great pains to carry out systematic training in the playground, and with some remarkable results. Those who made exceptional progress in this made coæaneous progress in mental character. There is among idiots a great want of muscular co-ordination, and at the same time a want of endurance of muscular fatigue. They were for the greater part people of low *physique*—succumbed readily to illness that others would tide over. Some were agile, but they were the exception, and at a game of 'French and English' with intelligent boys of far less weight they would be nowhere. They played at this game, at racing, skittles, jumping over horizontal bars, leaping, &c. Some were employed on the farm, but they always avoided physical exertion. I made a strong point of carrying out physical training *pari passu* with the mental."

Now, as regards the proper dose, so to speak, of exercise, every man, under ordinary circumstances, must be his own physician. Physiologists have calculated for us the amount of work which can, or at least should, be done by a healthy man; and Dr. Parkes* states that such ought, if possible, to take a daily amount of exercise which shall be not less than 150 tons lifted one foot, this being equivalent to a walk of about nine miles. But, as he remarks, "as there is much exercise taken in the ordinary business of life, this amount may be in ordinary cases reduced." Of course in diseased conditions we will usually be expected to interfere, and lay down precise rules; but average people might as well weigh their ordinary meals as calculate by the inch or ounce how much their muscles ought to do. I believe a weakened heart may often be braced up by a moderate amount of exercise, for this may act medicinally like digitalis, either paralysing or reinforcing cardiac energy according to its dose and mode of administration. I have seen several instances of boys who had been debarred from active exertion on account of palpitation, speedily lose all their symptoms on being permitted to rejoin their companions' sports; and a striking case recently recorded in the practice of Dr. Stokes showed how a man suffering from intense dyspnoea, the result of extensive heart disease, only obtained relief by the violent exertion of running after a car.

But the unfavourable side of the question also demands some notice; and in devoting a few minutes to its consideration, we must recollect that muscular degeneration is frequently brought about by over- as well as by under-work. Dr. Chambers,† in his clinical lectures, narrates some curious instances of this: one in which the arms of a blacksmith's apprentice became atrophied from wielding too heavy a hammer; another in which a lady nearly lost the use of her right hand by excessive sewing; a third where a literary lady over-exerted herself in mowing her lawn, and suffered from a painful loss of power in the right deltoid and biceps. It is not likely that any such dangers as these will result from our present system of athletic games; but there is too much reason to fear that their great increase checks

mental progress, not only by occupying time and energy, but by dulling the sharpness and clearness of the brain, and lessening the aptitude for concentration and real work. Within the last few years outdoor sports have taken so deep a root, and have come to be considered by many as the most important features of our public school system, that there is now real risk of their being carried to excess. It is perhaps natural that boy hero-worship should run in the direction of his strong and active, rather than his intellectual companion; but when this goes so far as to lead to a double strain—when the natural division of the studious lad from the noted cricketer or foot-ball player is confused by an attempt to excel specially in both, then we find evil effects. There is, it is well known, a certain amount of compulsion exercised in our schools with reference to games, the heads of houses being empowered to order so many a week, and no one is exempt, save by an order from home, or the local medical officer. It may thus happen that a weakly lad, who is studious, and anxious about his work, feels that playing takes too much out of him; he finds his working power fail, perhaps he does not get enough sleep, and in the end he breaks down. A well-marked instance of this series of events came under my observation recently.

I was asked to see a boy of sixteen, who had suddenly been taken ill. I found him in bed, with a flushed face, pulse 120, temperature 103° Fahr., much headache, and confusion of ideas. He was naturally of a studious disposition; and having got into the sixth form at an early age, and being also head of his house, he was obliged to read hard and take a prominent part in football. He had been heard to express his belief that the double strain was too much for him; but though often entreated to relax in either direction, he would never do so. The evening before my visit he had a shivering fit, and passed a restless night, wandering and seeing imaginary objects; in short, his condition at this time somewhat resembled a mild form of delirium tremens. For five days he continued in a somewhat doubtful state: the fever ran high; the intellectual faculties were much obscured, and it seemed probable that more serious cerebral mischief might supervene; and even after all risk of this had gone by, giddiness and inability to concentrate his thoughts, and the very unusual excess of phosphates excreted by the urine, showed the serious weakening of the brain. Although his general health is now fairly re-established, he is still unable to make any approach to a resumption of head work. This is, of course, an extreme case, but one of a class which we must occasionally expect to meet with when both mind and body are strained almost to the limit of endurance.

(To be concluded.)

ON THE USE OF NITROUS OXIDE GAS AS AN ANÆSTHETIC IN SURGERY, WITH COXETER'S LIQUID GAS.

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(Continued from p. 480.)

THERE being, then, according to my showing in the former part of this paper, so many reasons in favour of using this gas, the inquiry naturally follows—How is it that, notwithstanding many successful cases of surgical operations under the influence of nitrous oxide in America, and here in England under the care of Messrs. Clover, Braine, Coleman, Rendle, myself, and others, the use of the gas is certainly not generally in favour for surgical cases?

Several reasons may be assigned for this, but I shall now deal with one only; and that is, the bulkiness of the gas and the difficulty of conveying it from place to place. When first introduced into this country, those who desired to use it had no alternative but to fit up an elaborate apparatus and gas-reservoir at home, carrying it out in large bags; subsequently Mr. Barth supplied us with compressed gas in heavy iron bottles, holding only fifteen gallons each: with these it was almost impossible to press its use on the

* Practical Hygiene, p. 344.

† Vide Lectures, chiefly Clinical, p. 351.

surgeon. In July, 1868, Dr. Evans, of Paris, brought over a single bottle of liquid gas, and I had the pleasure of operating with it at the Dental Hospital of London, Mr. Clover administering the gas; but there the matter ended. Although I have applied to the maker in Paris of this single bottle, I have never been able to get more than an assurance that it would be ready when certain great difficulties were overcome.

The circumstances attending an operation by Mr. T. Carr Jackson, lasting twenty minutes, in which I employed three of Barth's bottles, showed me the need for larger vessels, but I failed to convince anyone of the policy of manufacturing them.

At last, one night at the Medical Society of London, I saw the large bottles of compressed oxygen and hydrogen which were employed by Dr. Thudichum in his illustrations of spectral analysis. In them I saw—at least, for a time—the solution of the difficulty, and happily succeeded in convincing Messrs. Coxeter and Son that if these bottles could be filled in a similar manner with compressed nitrous oxide a great want would be partially met.

They at once set to work energetically in response to my appeal, as mentioned in my letter to THE LANCET of Jan. 2nd, 1869, to supply us with the vessels containing respectively forty five and ninety gallons of gas, which are now so well known. Still, although a great improvement, this was not yet sufficiently portable to win the support of the surgeon. For the dentist, who was always at home, it mattered little, but to the surgeon and the visiting anæsthetist it was everything. I never dropped the hope that liquid gas might be produced at a moderate cost, and never ceased to persecute Messrs. Coxeter on the subject: but they entered most zealously into my views, and on the 1st of November, 1869, I was requested by them to visit their office with Mr. Clover, to test the liquid gas. Finding it as efficient in its effects as what they had already supplied, they set to work with goodwill, and after months of labour, and at great cost, they have at last succeeded in producing a supply of the liquid gas, from the first hundred gallon vessel of which I administered the gas with uniform success to several patients at the Dental Hospital of London on Monday, Feb. 21st, 1870.

The vessels in which the liquid gas is contained are of the same form and make as the large iron vessels hitherto used by Messrs. Coxeter, only differing in size. They are well depicted in the following engravings (Fig. 1), where

FIG. 1.

they are represented on a scale of two inches to the foot. They are made of wrought iron, and their weight and dimensions are as follows:—

Vessel A, to contain *one hundred gallons* of gas in the liquid state, is 12 inches long, $3\frac{1}{4}$ inches in diameter, and weighs 9 lb. 1 oz.

Vessel B, to contain *fifty gallons*, is $8\frac{1}{2}$ inches long, 3 inches in diameter, and weighs 5 lb. 11 oz.

Vessel C, to contain *twenty-five gallons*, is 6 inches long, 2 inches in diameter, and weighs 3 lb. 5 oz.

The screw stopcock for controlling the exit of the gas at *b*, is 2 in. long in each vessel.

Hence it will be seen that a good supply of gas, with apparatus complete, can be packed in a small portable case.

To each vessel, when in use, is attached what is com-

FIG. 2.

monly known as a Cattlin's bag (as shown in Fig. 2), which, being about a foot in diameter, receives the first force of the liberated gas delivered through a small tube; and then from it the gas is inspired, with Mr. Clover's face-piece and

FIG. 3.

two-wayed stopcock (shown in Fig. 3), through a tube 1 in. in diameter.

The extraordinary degree in which the bulk of the gas is diminished by being liquefied will be better understood when I state that one of Mr. Coxeter's present 90-gallon bottles could by this process be made to contain 1000 gallons of gas.

There is one important advantage obtained by the use of this liquid gas, and that is the ability to ascertain to a nicety, after an operation, how much gas is still left in the bottle. The want of this was one of the many obstacles which prevented the gas from being much adopted by surgeons; but in this case each bottle is stamped with its weight when empty, and the difference at any time between the *actual* weight and that stamped on the vessel will give the quantity remaining in the vessel.

This may be readily calculated when we remember that, according to Dr. M'Adams's revised edition of Dr. Wilson's little work on "Inorganic Chemistry," published by Chambers, 100 cubic inches of the gas weighs 47.29 grains; and therefore 30 oz. by weight is equal to 100 gallons by measure, three-tenths of an ounce being equal to one gallon.

As to the quality and anæsthetic powers of this liquid gas, it is so far better than that kept in gasometers, that much less of the liquid gas is needed to produce anæsthesia, and I believe I may say the anæsthesia is more profound. I have long noticed this superiority of the compressed gas over the ordinary gas in gasometers, and I believe liquid gas is even more efficient than the compressed gas.

It has been suggested that there is some danger in the use of such a powerfully compressed gas. On this subject I cannot do better than quote the excellent remarks of Dr. Evans, of Paris, in his communication on liquid gas to the *British Journal of Dental Science*, in July, 1868:—

"Before dentists and surgeons will use the liquefied gas, they must first be assured of its safety. The idea of holding in the hand or carrying in the pocket a bottle within which there is an active bursting force of 750 lb. to the square inch, is certainly scarcely comfortable to a naturally timid man. But a consideration of the facts which bear upon this point will, I think, remove all apprehension, and cause everyone to feel that there can be little, if any, danger when the gas is confined in properly constructed bottles.

"A common glass eau-de-seltz bottle is charged under a pressure of about 100 lb. to the square inch. These bottles are not generally considered as dangerous. They are more likely to burst, however, than bronze bottles of similar form and thickness under ten times that pressure. A fowling-piece, when discharged, is subjected to a bursting force of from 10,000 lb. to 15,000 lb. per square inch, or twenty times the bursting force of the liquid gas; these two very familiar facts are sufficient to show that there is relatively little danger to be apprehended from the gas."

I should occupy too much time were I to give any account of the physical properties of this truly wonderful liquid gas; moreover, it would be superfluous for me to do so. It is not a thing of to-day; it has been well known to chemists for years past, and full accounts of it may be found in the text-books on chemistry, but it has never yet been produced in any quantity, nor for any other purpose than for experiment or exhibition, until this moment, when we are indebted to the enterprise of Messrs. Coxeter and Son for a supply which will, I trust, only be limited by the demand.

Having now introduced my readers to this new liquid gas, without which any further attempt to plead the cause of nitrous oxide as a surgical anæsthetic would have been useless, I must postpone the remainder of my remarks on the subject to a future number, as I fear I have already encroached to an unreasonable extent on the pages of THE LANCET.

A Mirror

OF THE PRACTICE OF MEDICINE AND SURGERY IN THE HOSPITALS OF LONDON.

Nulla autem est alia pro certo noscendi via, nisi quamplurimas et morborum et dissectionum historias, tum aliorum, tum proprias collectas habere, et inter se comparare.—MORGAGNI *De Sed. et Caus. Morb.*, lib. iv. Proæmium.

OPERATIONS FOR REMOVAL OF EPITHELIAL CANCER OF THE TONGUE.

THE following notes of three recent cases of lingual epithelioma, in all of which the disease was removed in the operating theatre, seem to be of some practical interest, as in each instance a different operation was performed. Although there is still much diversity in the practice of eminent hospital surgeons with regard to the removal of cancerous growths from the tongue, it is evident, from the clinical remarks made on these cases, that two important points in connexion with the operation have been pretty well settled, through the results of extensive experience. In the first place, an immediate and rapid removal of the disease is to be preferred to the application of the ligature, which is a tedious and by no means a safe proceeding. Secondly, the *écraseur*, even when slowly and cautiously used, cannot be relied upon as a preventive against profuse hæmorrhage. With regard to the administration of an anæsthetic during the removal of the cancer opinions still differ. In Sir Wm. Fergusson's case, although the disease was extensive and the operation painful and severe, chloroform was not given. It is a somewhat singular fact that in three cases operated upon in the course of five weeks, all the patients were females. Mr. Paget states that a large

majority of the cases of epithelial cancer occur in males; and that in 105 cases affecting parts common to both sexes, 86 were in men and 19 in women.

KING'S COLLEGE HOSPITAL.

Removal of large Epithelial Growth from the right side of the Tongue.—The patient was a sallow woman, fifty-seven years of age. The growth on the tongue had been noticed for two years. It formed a large nodulated and ulcerating mass, occupying nearly the whole of the right half of the tongue, with the exception of the apex and posterior part. On Saturday, March 18th, the patient was brought into the theatre. She was seated in a chair, not being placed under the influence of chloroform. Sir Wm. Fergusson at once seized the apex of the tongue with broad-bladed and toothed forceps, drew the organ well forwards, and then removed the whole of the disease with one sweep of the knife. Profuse arterial hæmorrhage followed the operation, most of which quickly ceased, one vessel only requiring ligature. Sir William, in some subsequent remarks, stated that the use of the *écraseur*, in his opinion, caused more pain, and was attended by quite as much hæmorrhage as that of the knife. The sharp and rapid stroke of the latter instrument was to be preferred to the slow process of strangulation produced by the *écraseur*. With regard to the hæmorrhage attending the operation, he had frequently noticed that this, though very profuse immediately after the use of the knife, soon ceased spontaneously, and that when the surgeon had commenced to take up the bleeding arteries scarcely any would be found requiring the ligature. In the present case, although the bleeding at first seemed very copious, he waited for a short time before attempting any active means to arrest it. The flow of arterial blood in this case rapidly diminished, but one large vessel required the application of the ligature—a proceeding, according to Sir William, by no means so easy in the region of the tongue as one might at first suppose.

GUY'S HOSPITAL.

Removal of Epithelial Growth from Tongue by the Galvanic Cautey.—On Friday, March 11th, Mr. Hilton operated for the removal of a small epithelial cancer, seated on the right side of the tongue, near the apex. The patient was a woman about thirty-four years of age. The tumour was first isolated by passing three needles under its base through the healthy tissue of the tongue. Beneath these pins was fixed a loop of platinum wire in connexion with an *écraseur*. Junction was next made between the loop of wire and a powerful galvanic battery; and, by screwing the *écraseur*, the growth was removed from the tongue. Before the operation, Mr. Hilton stated that he preferred this to other methods for removing lingual cancer. The ligature was painful and tedious, caused sloughing, and subjected the patient to the risk of pyæmia. The knife acted efficaciously and rapidly; but its use was occasionally followed by dangerous hæmorrhage. The *écraseur* gave great pain, was very slow in its action, and frequently caused as much hæmorrhage as the knife. The galvanic cautey acted quickly in removing the growth, was attended with but little hæmorrhage, and occasioned no very great sloughing. It could be applied very readily to the diseased parts. The galvanic cautey used in this case was the instrument invented by Middeldorpf, of Breslau. In THE LANCET of May 1st, 1869, several instances of its use in surgery are reported from the practice of Mr. Bryant, who introduced this instrument into Guy's Hospital.

UNIVERSITY COLLEGE HOSPITAL.

Removal of the Tongue by the Submental Operation.—The patient in this case was a woman of advanced age, who had been admitted into the hospital under the care of Mr. Erichsen. The back part of the tongue was occupied by an ulcerated epithelial growth, the right side of the organ being chiefly involved. On Wednesday, Feb. 16th, the following operation was performed. The patient having been put thoroughly under the influence of chloroform, Regnoli's T-shaped incision was made under the chin, the first cut being made from the lower edge of the jaw, along the mesial line, to the hyoid bone, and the incisions on either side along the inferior margin of the lower maxillary bone. Two flaps, formed of skin and subjacent muscular tissue, having been dissected out, and turned outwards and down-