jury, it would not be right to attribute all the results to the injury caused by the splinter of bone driven through the membranes into the brain, and removed by the operation of trephining. But, in the first case related, the injury was clearly restricted to that caused by the punctured fracture; and, as it resulted in atrophy of both optic nerves, it affords proof that injury and irritation of the anterior lobe of the brain may result in loss of vision of either or both eyes.

The practical deduction is that, in cases of punctured fracture, the greatest care and caution ought to be observed; and, on the appearance of head-symptoms, the trephine ought to be applied without delay, so as to remove all offending spiculæ of bone from the membranes and substance of the brain.

Percival Pott declared that "perforation is absolutely necessary in seven cases out of ten of simple undepressed fracture of the skull", a doctrine which subsequent experience has disproved; but it is not impossible that, in punctured fracture, some such proportion of cases may demand the operation; and in all such it must be of vital importance that its performance should be as early as possible, and before serious changes have been set up in the substance of the brain.

A CASE OF POISONING BY THE INHALATION OF COAL-GAS.*

By STEWART LOCKIE, M.D.,
Physician to the Cumberland Infirmary.

I FEEL justified in drawing attention to the details of the following case, as accounts of the symptoms and *post mortem* appearances in cases of poisoning by the inhalation of coal-gas are of comparative rarity; and yet it might happen to any one of us practising in towns to be summoned to a similar case.

I was called between eight and nine o'clock in the morning of 26th April to see W. J. B., aged about 18, "assistant boots" at one of the hotels in this city, who was stated to have been found in bed in an unconscious condition, and incapable of being roused. He slept in a cupboard bed in the smoking-room of the hotel. There was no fireplace in the room. He had retired to rest about half-past twelve. At twenty minutes past eight, the "boots" knocked at his door, but, receiving no reply, entered the apartment. There was a strong smell of gas in the room, so strong that the "boots" could not at first remain; the sliding gaselier was drawn down as far as possible, and one of the two jets was burning with the cock turned full. The "boots" tried to arouse him; but, failing to do so, came for me.

I arrived at 8.50 A.M. I found him lying on the right side in the semiprone position. There was a little staining of the pillow with a brownish coloured fluid near the position of the mouth. He was completely comatose, breathing irregularly, now rapidly, now more slowly, moaning much. The face was livid; the pupils were equal, neither abnormally contracted nor dilated, and sensible to light.

I had him immediately removed to a larger room, laid him on a mattress on the floor, and established a current of fresh air through the apartment. Then it was further observed that the pulse was feeble and excessively rapid (150), and that the temperature in the axilla was 102.8 deg. The eyeballs were observed to roll about in a peculiar fashion. The eyes were turned slowly to the extreme left, as if the patient were looking to his left, they then slowly returned to the median line, then back to the left, and so on. The motion was almost rhythmical, and nearly constant. It took place whether the eyelids were opened or closed. The breath smelt of coal-gas.

Dr. Maclaren was kind enough to render me his assistance and advice in the treatment of the case, as also did subsequently Dr. Coldstream and Mr. George Murphy. The subsequent notes were made by one or other of us—by whomever it was that happened to be present.

10.55 A.M. Temperature 102.2 deg. Respirations 52. Pulse 160. The conjunctivæ and corneæ were quite insensible to touch.

11.40 A.M. There was slight reflex action of the lids on touching the conjunctivæ.

It had been determined to try the effects of the administration of oxygen gas; and at 12 noon, an apparatus having been obtained, this was commenced in a modified form by setting free oxygen and conducting it by means of a tube near the mouth of the patient. This was continued with a few short intervals until 1.45 P.M., when it was discontinued. No perceptible improvement occurred during the administration.

1.45 P.M. A catheter was passed, and about a pint of clear pale

amber urine was withdrawn. A considerable portion of this had to be pressed out of the bladder with the hand, showing some degree of paralysis of the organ. Shortly afterwards, an involuntary faecal evacuation occurred. One ounce of brandy and six ounces of beef-tea were administered as an enema.

During the afternoon, our efforts were directed to obtaining a larger supply of oxygen, with a view to its administration in a pure state. An apparatus for the production of the gas was obtained, and, through the kind courtesy of Mr. Hele, a bag capable of containing twenty-six gallons with tube and mouthpiece for its administration. After considerable delay, we succeeded in obtaining the bag full of gas; and, at 6.30 P.M., commenced its administration. The whole twenty-six gallons were inhaled with two short intervals. Except that respiration was increased in frequency and the distress aggravated, no effect was observed.

By 10 P.M., we had obtained another bagful of oxygen. It was agreed to try a different method of administration, viz., to give three or four inhalations every five minutes. This was continued for an hour and a half, during which the whole twenty-six gallons were again inhaled. As before, it only seemed temporarily to increase the distressing symptoms.

At 11 P.M., the temperature had risen to 105 deg. Four ounces of urine had been withdrawn; an enema of beef-tea and gin was administered. At 11.30 P.M., the practice of cold affusion to the head was commenced. This seemed, at first, to have a good effect, the respiration becoming deeper and easier, and the temperature lower. At 12 midnight, the thermometer in the axilla registered 102.6 deg. (a fall of 2.4 deg.) Respirations 48. Pulse 150. The cold affusions were continued at short intervals until 1 A.M. (April 27th), always with apparent though temporary relief to the symptoms. After this, they were practised at longer intervals.

At 5 A.M., it was noted: "There is passive rigidity constantly present in both upper and lower limbs, and about every half minute the muscles become more rigid for a few seconds, and the patient moans. Pupils dilated, and nearly insensible to light; conjunctivæ much injected; about four ounces of urine removed. Pulse 148. Respirations 52. Temperature 103.6 deg." At 5.20 A.M., cold affusion to head; two chamber ewers full. At 5.30 A.M., temperature 102.4 deg.; pupils sensible to light; cold affusion again for eight minutes. At 5.45 A.M., temperature 102.5 deg.; no fall, but rather the reverse after this affusion. It was again practised for eight minutes. At 5.55 A.M., the temperature was 102.8 deg.

At 8.5 A.M., cold affusion was commenced again for ten minutes; before affusion, pulse 144, respirations 48, temperature 103.2 deg.; after affusion, pulse 140, respirations 48, temperature 103.4 deg. 9.5 A.M. Cold affusion had been continued, at intervals, for thirty minutes; before affusion, respirations 57, pulse 140; afterwards, respirations 42, pulse 144, temperature 103 deg.; the conjunctivæ were less injected; the pupils were sensible to light; there was spasmodic rigidity of arms now nearly constant. 10.15 A.M. Cold affusion was applied for ten minutes. The temperature had been gradually rising, and was now 104 deg. 10.45 A.M. Cold affusion was applied for fifteen minutes. Temperature 103.8 deg. Three ounces of urine were withdrawn. 11.40 A.M. Temperature 104.6 deg., pulse 140, respirations 51. 12 noon. Cold affusion was applied. The temperature afterwards was 102.8 deg. Between noon and 3.40 P.M., affusion was practised four times, but it seemed to have lost the effect of reducing the temperature, and was, therefore, abandoned at this time. The nutritive enemata had been given about every four hours. During the afternoon, it was observed that the rolling of the eyeballs had ceased. 7 P.M. Pulse 160. Respirations 65. Temperature 105.4 deg. 8.45 P.M. About six ounces of urine were withdrawn. A trace of albumen was found in this specimen. At 11.30 P.M., we commenced to feed the patient by means of the stomach-pump. One of the enemata had not been retained, and we indulged the hope that, as the struggle was so protracted, if the patient were adequately supported, he might possibly rally. Upwards of a pint of a mixture of coffee and milk, with two ounces of gin, was administered. Soon afterwards, the pulse was observed rather stronger.

April 28th, 3.30 A.M. He was in profuse perspiration. Respirations 66. Pulse decidedly stronger, but 180 at least. Temperature 105.8 degs. He was again fed by the stomach-pump with a similar mixture. Six ounces of urine were withdrawn. 8 A.M. Pulse 180 at least, more feeble. Respirations 64. Temperature 105 degs. There was no spasmodic rigidity. 8.15 A.M. Upwards of a pint of a mixture of beef-tea, milk, and gin was administered. 12 noon. Pulse very feeble, could not be counted. Respirations 62. Temperature 105.5 degs. Eight ounces of urine were withdrawn. He was fed again by the means of the pump. At this point of the case, it was agreed to try

* Read at the Spring Meeting of the Border Counties Branch, held at Carlisle.

the effects of cold packing, and, as soon as preparations could be made, sheets wrung out of iced water were wrapped round the body, and renewed as soon as they became warm. At 1.15 P.M., after one wet pack, the temperature in the rectum was 106.2 degs.; at 1.20 P.M., 105.4 degs.; at 1.30 P.M., 105 degs. The circulation had, however, become very much more feeble, and the respiration somewhat gasping; he was, therefore, removed from the pack, and placed between blankets. 2.30 P.M. Temperature 102 degs. in axilla. Respirations 57. 2.40 P.M. Respirations 48. The right conjunctiva was decidedly more sensitive to touch than at any time previously. The patient contracted the forehead, and turned away the head when it was touched; the left conjunctiva was scarcely at all sensitive. 5.10 P.M. Temperature 103.9 degs. Respirations 56. Pulse 180 at least. The pupils acted very vigorously; both conjunctivæ were sensitive, especially the right. He was fed again with beef-tea, milk and gin. 10.15 P.M. Temperature 105.5 degs. Respirations 58. Pulse 180. The pupils acted very sluggishly; the conjunctivæ were quite insensible to touch. Six ounces of urine were withdrawn. 10.45 P.M. He was fed by means of the stomach-pump.

April 29th, 3.50 A.M. Respirations 52. Temperature 106.7 degs. in the axilla. Pulse imperceptible. The pupils were dilated and insensible. He died at 4.30 A.M., having lived sixty-eight hours after he was found.

Necropsy, thirty-five hours after death. On removing the calvarium and dura mater, the vessels of the surface of the brain were observed much more full of blood than usual. On slicing the organ, the surfaces of the sections were of a darker colour than normal, the puncta cruenta more numerous, and studded over all the surfaces were small clots of extravasated blood, the size of large pins' heads. These clots were observed throughout the sections of the cerebrum, but not in the cerebellum or medulla oblongata. The spinal cord was normal. The spinal dura mater was dark and congested. The laryngeal surface of the epiglottis was mottled with pink spots. Five drachms of bloody serous fluid were found in the pericardium. There was a white patch of old lymph on its anterior surface. The right auricle was very full of dark blood, fluid and coagulated. There was a good deal of dark soft clot in the right ventricle, and a little in the left ventricle. The valves were competent. There was a patch of extreme congestion in the inner surface of the left ventricle between the aortic and mitral valves, involving both. The surfaces of the lungs were of a dark claret colour, mottled with spots of a bright pink hue. The lungs were very full of dark blood; the sections had a similarly mottled appearance to that of the surface. There was no pleural extravasation. The bronchial tubes were free; their inner surface was of a dark purple hue. The digestive organs were normal. Both kidneys were very much congested; their capsules were not adherent; their outer surfaces were smooth, mottled; a few bright pink spots were seen on section of the left kidney.

REMARKS.—Those of the profession who have inquired into the subject of poisoning by the inhalation of coal-gas are principally indebted to M. Tourdes (formerly of Strasbourg, now of Nancy) for an account of the symptoms during life, and *post mortem* appearances in cases of poisoning by this agent. I have not myself had access to the original work of M. Tourdes, and owe the slight knowledge I possess of it to a paper in the *Edinburgh Medical Journal* for July 1874, by Dr. William Taylor, in which he gives a very complete account of the symptoms and treatment of a case under his care, which terminated fatally, but of which there was no *post mortem* examination. In some respects, the present case resembled Dr. Taylor's. In both there was a certain resemblance to apoplexy. In both were observed the rotation of the eyeballs, than which, Dr. Taylor remarks, "no individual symptom was more remarkable". But, in Dr. Taylor's case, there is no record of high temperatures; on the contrary, the surface is reported to have been cold. The same is said of one of M. Tourdes's cases; in another, however, which recovered, the patient is reported to have been feverish for one night. As the result of his observations, M. Tourdes "considers the following to be the peculiar *post mortem* characteristics which we may expect to meet with in cases of asphyxia by coal-gas. 1. Coagulation of the blood; 2. Its deepened tinge; 3. Extreme brilliancy of coloration of pulmonary tissue; 4. The abundance and nature of the froth in the air-passages; 5. Intensity of cerebral congestion; 6. Engorgement of vertebral nervous system, and extravasation of coagulated blood in spinal column; 7. Vivacity of injection of the mucous surfaces at base of tongue; 8. Occasional rose-coloured patches on thighs." No mention is made of the kidneys.

In the present case, the most remarkable *post mortem* appearances were, the congestion of the brain, the minute clots of extravasated blood which were found in large number throughout the brain substance, the colour of the lungs (dark claret, mottled with bright pink

spots), the distended condition of the right heart, and the congestion of the kidneys.

As regards the treatment, the cold affusion was the only agent that seemed to have the slightest beneficial influence, and that was temporary only. The administration of oxygen certainly had no good effect whatever; on the contrary, it seemed temporarily to increase the distress. In any future case, I should feel disposed to feed the patient from the commencement by means of the stomach-pump; to employ the cold affusion and ice to the head; and, in case of a high temperature supervening, to have recourse to the cold pack.

This case supports the view already proved by the cases recorded by M. Tourdes, that a proportion of coal-gas to atmospheric air less than that at which the mixture becomes explosive, may be sufficient to cause death, if respired for a sufficiently long time. As recorded by this gentleman, a family of six persons were poisoned by an atmosphere in which a stove had been a long time the seat of active combustion, and in which a candle had burned to its end.

According to M. Tourdes, it requires a minimum of one part of gas to eleven of air to constitute an explosive mixture; whilst, in his experiments on animals, he found that an atmosphere containing one-fifteenth of gas caused the death of rabbits in nine, twelve, or fourteen minutes, and of pigeons in five minutes; that it proved fatal, though in much longer time, when it formed one-thirtieth of the atmosphere, and that forming one fiftieth, it still ultimately caused death. (Quoted by Dr. Taylor.)

ON A NEW RHINOPLASTIC OPERATION.*

By JAMES HARDIE, M.D., Manchester.

ESTHER MITCHELL, aged 16, came first under notice on February 5th, 1874. She had lost her nose in early childhood, from disease, of which, however, she could give no account. She was well nourished, of good colour, and evidently in the enjoyment of robust health. With the exception of a portion of the columna, and of both alæ, the entire nose, including the cartilages, nasal bones, septum, and portions of the turbinated bones had disappeared. In place of the nose, there was thus a large cavern, through which the upper part of the throat was plainly visible. The edges were surrounded by thin, white, scarred skin, which was adherent to the subjacent bones. This condition was especially marked at the root of the nose. Here there was a considerable depression instead of a ridge, and from it a white scar ran up on the forehead, from which it appeared probable that this part of the frontal bone had also been implicated by the disease. The portion of each ala which had been left was about half an inch in length and a quarter of an inch in width. These parts were turned upwards, and had united with the cheek, forming the boundary of the cavity at the lower extremity of each side. About a third of an inch of the columna remained, and this projected forward, with its end free. The hard palate was perforated by a long narrow aperture.

During the summer of last year, I made an attempt to form an artificial nose from the upper arm, by the Taliacotian operation, preferring this operation to that from the forehead, partly from an unwillingness to cause further deformity, and partly because I feared that, from the thin, cicatricial condition of the parts which would form the pedicle, the vascular supply might, in this case, be insufficient for the nutrition of the flap. This same cause, however, rendered the operation from the arm completely abortive, not the smallest union taking place. I, therefore, replaced the flap on the arm, and allowed the face to heal. This failure was scarcely to be regretted, for, on reflection, it seemed quite improbable, however successful the operation might have been, that the result could have been better than a mere covering to the cavity. Owing to the complete loss of the nasal bones, it would have been a difficult matter to have given any projection forwards to the transplanted flap, or in any way to have fashioned it into the similitude of a nose.

The problem which, therefore, now presented itself was, how to provide a substitute for the nasal bones and cartilages, so as to give the required prominence. This is, perhaps, the most serious difficulty which has to be overcome in rhinoplastic operations. Attempts have been made to meet it by reflecting a piece of the periosteum from the frontal bone; but it is scarcely to be expected that very successful results would follow such a method; and, when the frontal bone has also been involved in disease, it is obviously not to be thought of. It occurred to me that it might be possible, with a sharp chisel, to detach forwards and inwards the nasal process of each superior maxillary bone,

* Read before the Surgical Section at the Annual Meeting of the British Medical Association in Edinburgh, August 1875.