larged thyroid gland in this body, that it might with a possible advantage have been removed by operation. Although this would have been practicable in this instance, still in others the tumour may be so situated, and may have formed such adhesions, as to preclude any attempt at extirpation. The respiration and swallowing may be both much impaired, and every remedy may have been tried and failed. Under such circumstances, is it necessary to leave the patient to die a miserable and lingering death? or is there any expedient which may reasonably be employed to protract life, and to render existence more comfortable? Such an expedient is within our reach. The dissection of this case proves its practicability. There it has been mentioned that the upper thyroid artery was greatly enlarged; that it was even nearly equal in size to the carotid; and also that it lay very near to the surface. Its coverings were few and thin; the pulsations of the artery were strong and distinct. Placed as that vessel almost always is, no one would have experienced difficulty in reaching it. The pulsation itself would be a guide, which would conduct us easily and safely to the vessel. No nerve of any importance would come in the way; no muscle would require to be displaced; no depth of substance to be divided; no intricate dissection to be performed. A small incision would expose that vessel on which the tumour in great measure depended for its support. It would be easy to carry a ligature round it to intercept the flow of blood to the gland; and, till the other vessels enlarged, the tumour would have more slowly increased in size; not only so, but it will sometimes be actually reduced and life protracted. A surgeon who would decline extirpating a large bronchocele would have little dread in tying the thyroid artery. Not a thyroid artery as in health, small, indistinct in its pulsation, and requiring, consequently, a more intricate dissection to expose it, but an artery too large to be missed. I would not, however, rest the question regarding the propriety of this procedure on conjecture, nor would I appeal to the healthy or morbid connections of the vessel alone to prove that it may be safely tied, when the operation has actually been performed on the living subject, and, in so far as concerns the tumour, with a favourable result, though we must regret that the patient died. . . . The patient died; yet this does not militate against the repetition of the experiment; the same might have happened from merely opening a vein, and, in the confined air of an unhealthy hospital, has actually happened. A tumour which, before its nutrient arteries were tied, was so large that it would have been folly to have attempted its excision, may, by depriving it of the circulation along the two upper thyroid arteries, be so reduced as to allow the operation to be performed, provided its connections do not prohibit us from interfering. It is not, therefore, the immediate effect on the disease which we are to look to in tying the arteries; we are to anticipate the command which it may ultimately give us over the tumour; and consequently, when the swelling, although very large, has not formed adhesion to the large cervical vessels and nerves, we are to urge the expediency of tying its nutrient arteries as a prelude to other proceedings. We shall not, however, in bronchocele, have occasion often to extirpate the thyroid gland, neither shall we require in many cases to tie the thyroid arteries."

Again, a little further on, Mr. Allan Burns remarks: "In extirpating this gland, an incision of an elliptical shape, if the tumour be large, or if the integuments be diseased, is to be made over it with the long diameter directed from above to below. The surface of the swelling is next to be uncovered by dissecting back the integuments on both sides. The finger is to be insinuated between the skin and the muscles, pushing it upwards and backwards till it comes in contact with the thyroid artery, round which a ligature is to be passed with a blunt needle. In a similar manner, the other superior thyroid artery and the two inferior vessels are to be secured when the whole gland is to be removed. By these ligatures, we cut off the circulation into the tumour, and consequently are left at liberty to finish the operation by cutting the vessels nearer to the morbid parts than when the threads have been applied, and by dividing the sterno-hyoid and thyroid muscles above and below the tumour, which is afterwards to be detached from the trachea and gullet by cautious working with the fingers. In this way, we may remove one or both lobes of the thyroid gland; but the operation is difficult, tedious, and not without danger. . . . To those who are accustomed to do everything with the knife, the extirpation of the thyroid gland must appear a formidable operation; but, to one who knows when to use the scalpel, and when to substitute the fingers, the removal of the thyroid gland, although hazardous, does not appear impracticable. 'Wilmer (*Cases in Surgery*, page 243), in his essay on *Bronchocele*, says: 'When we reflect upon the situation of the thyroid gland, and consider its numerous arteries, which increase in diameter in proportion to the enlargement of the part, we shall not be surprised at the difficulties that must attend its extirpation in a diseased state, and the danger there ever must be of incurring a fatal hæmorrhage.' These are

the notions entertained by all who reprobate this operation; but they are founded upon a mistake in anatomy. A diseased thyroid gland really derives all its blood from four arteries; if, therefore, the surgeon push at once to these and secure them, he will, in detaching the morbid parts, have nothing further to dread from bleeding arteries. By venous hæmorrhage, he may still be incommoded; but it will easily be checked. When, however, he employs the knife and trusts to tying the arteries after he has divided them, he will unquestionably experience all the difficulty, and the patient will run all the hazard that Gooch's did. The life of the patient will be saved only by having a succession of persons to keep a constant pressure upon the bleeding vessels day and night for near a week with their fingers upon proper compresses, after the operator has been repeatedly disappointed in the use of the needle and ligature" (page 232).

THE SANITATION OF HOUSES, ESPECIALLY IN THE MATTER OF DRAINAGE.*

By W. EASSIE, C.E.

THE evils induced by improper systems of drainage, etc., will be best observed by instancing the cases of houses which have from time to time been added to, until they have passed from the chrysalis or cottage condition to that of the winged mansion. When such cases occur, it will be found that the residences will have passed through all the applied gradations of sanitary knowledge. One will be able to trace there the first rude awakening up of the inmates, when something has been found wrong with the patrimonial cesspool in the kitchen, when perhaps it has filled up, choked the tributary drains, and even raised the paving-stones out of their places. When this happened in a village or hamlet, all that the united talent of the place could apparently suggest was merely a more or less partial emptying of the offensive receptacle, and the cleaning out of the drains leading from sink and closet. And, when this had occurred several times, or when the sides caved in, and the contents of the cesspool began to interfere with the economy of the sink or the working of the closet, the fiat would be issued for the excavation of a new dumb-well close by, and for the diversion of the drains to its mouth. The old cesspool was then duly covered with a stone, without being emptied. Very rarely, indeed, were these places cleaned out; the reason, doubtless, being that a disturbance of the deposits would render the absence of the family a matter of absolute necessity, owing to the overwhelming stench. Handy disinfectants for the use of soilmen were then unknown. It was, no doubt, also found cheaper to provide a paving-stone, and cover up the effete matter out of sight. And it is just the same in towns and cities. Only last week, I laid bare in the basement of a house in the West End of London three cesspools, which had been dug in most brotherly proximity, and abandoned in rotation as they filled up with ordure and filth. More than four cart-loads of night-soil were removed, and the bulk of it could not have been disturbed, I am sure, for half a century. Nor would this valuable kitchen-garden stuff, we will call it, have seen daylight now, and been carted to some spoil-bank, where will perhaps stand a future row of houses, had not the rats formed runs in the vicinity of the pits, and allowed horrible smells to invade the house by way of a long forgotten brick drain.

The reason why these ancient nuisances are found inside houses in towns and cities is not necessarily because the residences were built in rows or terraces, with but little external accommodation; for the same practice held good in country houses, where space was no object. It was rather owing to the absence of a proper flushing supply, and the improbability that the slops from the kitchen would suffice to carry away the more solid wastes outside the walls of the house. Indeed, they would be certain to be insufficient; for, at the time when these cesspools were excavated, only brick-built drains were used, generally laid with uneven bed, and through the open or perished joints of which, too, most of the fluids percolated.

The plan (Fig. 1) gives the earliest appearance of the basement of a house with which I have lately had to do, and I propose to follow its history up to the present time. At first, it must have been drained in some such manner as indicated by the dotted black lines, and I have drawn the cesspools in the kitchen, K. That cesspools are somewhere there I strongly diagnose. In a similar manner, the stables and coach-house, S, were once drained into the cesspool shown by the black spot between the stalls, because I have already discovered that one. Fortunately, the soil was of an impervious nature, or the whole basement would have been sodden throughout, and the well at W poisoned.

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

Here we have a very fair representation of a house built fifty or sixty years ago; the sinks and, by-and-bye, a closet upstairs drained into the intramural cesspools. Successive ones were dug, because there was no overflow provided; nor would an overflow have been of service, since the floating matters would never have run off, but only clogged up the pipe. The stable cesspool acted as a catch-pit for the urine, and the dung was removed to the pit beside the boundary-wall. An old-fashioned, and consequently filthy and unwholesome, privy was also in use by the family or the servants.

Fig. 1.

We will now pass to the second stage of progress, still regarding the same diagram, and this was reached when the water-closet was introduced, and glazed earthenware pipes. The black lines, which indicate this state of things, will show that the sink and upstairs closet drained down into the garden, picking up the conservatory floor-drain and the drain from the stables, and so on to the first cesspool. When this ran full, the overflow was into another, lower down; and both, which were built with brick, were, of course, sealed down in an air-tight fashion. There could have been no ventilation, except through the trapping-water of the syphons at the foot of the sink-waste, soil-pipe, or rain-water stack. The privy arrangement had been continued probably from a paucity of water.

And here I might interpolate a line or two, to say that it does not follow that the drainage of such a house into a cesspool is necessarily a dangerous proceeding. Provided only that the waste-pipe of the sink be made to deliver on the outside of the house over a suitable trap; provided, too, that the soil-pipe be carried up through the roof, and the highest point of the drain, near the stable at R, ventilated by a shaft up to the eaves, the residence might be deemed a safe one. It would, nevertheless, be wise to ventilate the (outdoor) cesspool by an upright pipe, or the insertion in the cover of a ventilating trap, the charcoal of which could not be saturated by rainfall. Similar or even open ventilators could even be inserted in the march of the drain, and an earth or ash-closet would improve the surroundings in the stable-yard.

The plan (Fig. 2) exhibits the same house under different auspices. The stable buildings at S have been converted into servants' offices and butler's pantry, and the loft over raised to the dignity of sleeping-rooms. A new wing has also been added at A; and, fresh land having been purchased on the stable side, new stables and coach-houses have been erected at B. The laying down of a parish sewer in the main road—the first enhancing agency in the price of land—without doubt led to these improvements; for improvements they certainly were. We will now see how matters were managed from a sanitary point of view.

First of all, then, owing to the introduction of an upstairs closet at D, it became necessary to lay the drain to that point, and also to a servants' closet which was added at E; the latter with a closet situated immediately above it in the hall. The builder began to lead a drain from the sink at F round the garden front of the house to the old privy, which he raised to the dignity of a water-closet, and then continued the drain-pipes to the front of the house, between the old and new stable on to the sewer, draining, of course, the stables in passing, and taking up also some surface-drains. All this was proper enough; but he fell into his first error when he led the surface-drain, M, downstairs, and laid pipes on to meet the sink-drain at N. No sewage from the three closets could possibly have passed the rectangular

junction at N. Nor was this his only blunder; for, thinking to exclude any sewer-gas from entering the house from the sewer, he interposed in the line of drain a common deep syphon at U.

Fig. 2.

Another mistake of his was to continue the use of the garden cesspools, and the leading of the rain-water cistern overflow at R, the waste of the butler's sink at Y, and the floor-drain of the conservatory C in the old drains down to the cesspools. I have since ascertained that he did this to please his client, who objected to the deep digging between M and the sewer in the road. The consequence, however, was, that the gases forced the conservatory floor-trap, and found their way into the drawing-room, invaded the butler's sanctum by way of the sink at Y, and regularly stormed the servants' sleeping-rooms through the cistern overflow at R. He, moreover, forgot to dig up the old stable cesspool at S, and, as a consequence of this, that portion of the domicile smelt very offensively to those whose pituitary membranes were at all sensitive. The non-placement of any ventilating-pipe in the new drains was also a great oversight.

The sins of omission and commission of sanitary law came speedily upon the inmates. First of all, the syphon at U became stopped up, owing to the sluggish flow of the faecal matter from the closet at X,

Fig. 3.

and the paltriness of the flushing water. The closets at D and E also filled up their portion of the drain. On taking up the drain below the syphon U, I found that during the whole of the time not one particle of sewage had ever reached the main sewer. Some of the drains had

also been laid in with a *backward* fall; and, in fact, it became necessary to dismiss the builder and send for the engineer.

After discovering the stoppage and its cause, and after removing some cart-loads of ordure out of the extra large-sized pipes, I began to re-arrange the whole, as shown upon plan (Fig. 3). I dug out the drain-pipes on the dotted line between the points E and N, and transferred the servants' closet from the middle of the house to E E, in the corner of a new coal-cellar, which I built at O. I also carried the drain from the foot of the upstairs water-closets, through the open area P on to the sewer in the road, and moved the scullery-sink from F to the site F F, which was more convenient to the servants. I next dug up the old stable-cesspool at S, and led the wastes of the cistern and butler's pantry to an open disconnecting chamber seen at Z, and on to the main-drain, easing the bends as I went on. I also laid in a new drain round the garden-path from the rain-water stack-pipe in the conservatory C, and so made sure of an occasional good flushing for the new drain. Ventilation for the drain I provided by erecting a shaft at V up the high gable of the new stable building B, and upon the top of it I fixed a foul air withdrawing cowl. Very little remains to be done, except to ventilate the soil-pipes and relay the basement-floor; first searching for the cesspools, and concreting the surface over. An open area round the building would also prove a blessing.

An example of a large-sized mansion, which was partly drained into cesspools and partly otherwise, is given on the plan (Fig. 4). The

Fig. 4.

drainage was at first collected, as shown by the black lines, and ran down to a lake where the drain was trapped, the sewage falling through a valved grating into the water. The outlet being thus hydraulically sealed, and there being no ventilation in the march of the drain, the gas generated in the drains (which, by the way, were all brick-barrel ones) found it way into nearly every room of the house.

The collection from one side of the house commenced with an old rotten brick drain under the housekeeper's room at H, and the state in which it was found sufficiently accounted for certain smells prevalent thereabouts, for dampness, and for the presence of slugs. The rain-water flowing down this drain led to the beer-cellars I I, and then ran in an open channel (see faint dotted line) as far as the passage, when it entered the store-room, and here, at C, was put a catch-trap, which was relied upon to shut out the air of the drains from the house. It then ran on to the main-drain. The smells in this part of the basement were intensified, owing to the beer-droppings in the open channelling. The collection from the other side of the house led on from J through the scullery S, a separate pipe being led on from the sink. The water-closets throughout the establishment were eighteen in number, and of these ten drained direct into the drain, and so on to the lake; five into a cesspool in the quadrant-shaped yard, and only the overflow into the drain, and the other three drained into deep cesspools at A and D, excavated in the chalk. And I might here note, as a curious thing, that, upon opening a cesspool cut in the chalk, it will be found that the soil disappears there with an unaccountable rapidity. But, when once the cesspool is emptied, and the porosity of the sides interfered with, it holds water like a common brick cesspool, and becomes a receptacle where disease-germs multiply.

Whatever gas was generated in the main-drain or tributaries, or in the large cesspool in the quadrant yard, had, therefore, no escape, save into the house. The cure, therefore, lay in the abolition of this cesspool, the diversion of the drain which led into the catch-pit C outside the house altogether, the ventilating to the roof of the heretofore unventilated soil-pipes, the disconnection of the house-sinks from the drains, and the taking up of the retardative brick drains, and substitution of earthenware pipes. The large cesspool A was also filled up after having been emptied, and the closets which formerly discharged there were drained by way of the dotted line into the main sewer.

The plan (Fig. 5) illustrates the ground-floor of a large house of

Fig. 5.

which I was both architect and engineer; and I exhibit it merely to demonstrate how easy it is to arrange so as to have the whole of the wastes delivering immediately outside the house. The water-closets A, B, and C, and others above these, the lavatories D and E, and the sinks G and H, have only the exterior wall between them and the drain. Hence none of these drains which convey the soil and other effete matters pass under the house. When it was found advisable to drain the basement—and here I found it so along the dotted double lines—I disconnected it from the main drain by interposing over the junction a ventilating shaft at X. The sinks and lavatories also deliver in the open air. To assist in flushing, some rain-water pipes, for instance, R and W, might, under certain circumstances, be led into the soil-drains. But, as a rule, it will be found wise to collect the rain-water as I did, by the dotted single line of drain-pipes to the tank T, for use in the laundry and green-houses. The main walls of the house were also built hollow, and protected from rising damp by a damp-proof course.

TWO CASES OF PUNCTURED FRACTURE OF THE FRONTAL BONE TREATED BY TREPHINING;

AND RESULTING ONE IN TOTAL THE OTHER
IN PARTIAL LOSS OF VISION.

By KELBURNE KING, M.D., F.R.C.S.,
Surgeon to the General Infirmary, Hull.

THE following cases seem to me to possess sufficient interest, both in a surgical and a physiological point of view, to warrant me in bringing them before the notice of this section. Though differing greatly in the extent of injury, they have this in common: that in each the most formidable symptoms depended upon extensive fracture and displacement of the internal osseous plate of the skull, of which but little evidence was procured by means of external examination; and in both the ultimate result of the accident was loss of vision: of both eyes in the first, of one eye in the second; although in both the seat of the accident was far removed from the origin or course of the optic nerves.

CASE I.—G. A., aged 17, was kicked by a horse on the left side of

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