REPORTS

ON

SANITARY ENGINEERING IN HOUSES, HOSPITALS, AND PUBLIC INSTITUTIONS.

BY WILLIAM EASSIE, C.E.

XI.—HOT AND COLD WATER, AND GAS SUPPLIES.

The Gas-Supply.—In England, as a rule, we are culpably careless about our gas-supply. A gas company, for instance, receives notice that the service of such and such a house is ready to be connected with their main; and when they have obtained a signed agreement setting forth who is responsible for payment, the meter is connected forthwith, and there is an end of it. The gas-fitter may have done many things badly, and not done some things at all; but the gas company seldom, very rarely ever, exercises any jurisdiction.* The gas-fitter next sends in his account, which is paid; and when the smell of escaped gas from some faulty portion of the pipes has become unbearable, he is sent for to remedy it, and charges for the rectification. The workman may be thoroughly incompetent, as gas-fitting is not, as it should be, a separate trade. Indeed, the artisan who performed the work may be a black-smith, white-smith, glazier, brazier, plumber, bell-hanger, and gas-fitter, all rolled into one.

A gas-fitter, *who is a gas-fitter*, and who understands his business, will never take leave of a house until he has tested the pipes for leakage. Where this trouble is taken, the ordinary practice amongst us is as follows. When the pipes have been laid throughout the house, and the company's main connected to the meter, a temporary burner is fixed on each floor of the house, and the gas is turned on. The gas is now ignited at these trial jets, and allowed to burn for some little time. The main is then turned off, and at the same time the exact reading of the index is taken. When the gas left in the pipes has burnt out, the taps of the experimental lights are turned off; and if, after the lapse of an hour or so, the dial of the meter continue to indicate a consumption of gas, it is plain that it somewhere escapes, and the leak is searched for by the sense of smell, etc., and remedied.

Whether from sanitary reasons or wholesome dread of fire, I do not know, but in most of the large cities of the United States, every length of gas-pipe which has been laid in a house has to undergo even a severer ordeal than the above before the gas is laid on. The inspector examines the joints and elbows, scrutinises the plugs where brackets and chandeliers are intended to be fixed, and if there be the slightest departure from the rules, he insists upon all being set right. Before, however, the gas-fitter—a separate trade there—asks the gas company to make the connection with their main, he sets about proving the pipes. He stops up, with one exception, all the outlets which have been left for brackets and pendants, with plugs or with screwed caps. On the one not so stopped he attaches a force-pump, into the interior of which have been put a few drops of sulphuric ether. This pump is now connected with a gauge, and it is then set to work, generally until a high pressure has been registered. A high pressure in a gas-pipe at first appears unnecessary, but gas-fitters know very well that iron pipes have many latent weaknesses, so to speak—seams just ready to open, pinholes filled with grease, etc., which might not drop out for years—and a good pressure exerted would rip up the one and cause the others to fall out. When the gauge indicates a certain figure, therefore, the pumping ceases, and if the mercury fall, it is evident that there are one or more palpable leaks, which are at once sought for. The escaping ether will guide the fitter to these, and the defaulting pipes are replaced by others. The pumping is now continued, and the same routine recommences. If the mercury still descend, and the leak cannot be detected by the sense of smell, the joints are separately lathered over with soap, whereupon the weak places will be indicated by bubbles. These parts are then marked, heated by means of a portable spirit-lamp made for the purpose, and covered over with an approved and durable cement. When the inspector arrives, the pump is

once more set in action, and as, the pipes are now tight, he has simply to cast an eye upon the gauge—the column of which no longer shows signs of sinking, examine as before mentioned how the pipes have been laid, and sign the requisite order. Some universal system of house-pipe testing should prevail here. It is common enough with us for gas-companies to test the gas-pipes which constitute the main before they are laid down, but the house-pipes are seldom properly overhauled by any one.

An escape of gas in a house is really a more serious matter than is generally admitted. People dread the effects of an explosion from gas, but they seldom recognise the evil effects which proceed from inhaling it. I have before alluded to a fatal case which had been published, and M. Ziegler has recently described another. An escape of gas occurred through a carious piece of pipe in the main, and the gas was conducted along an old foundation-wall to some distance, the end of which wall was immediately under the bedroom of a gentleman, who was in consequence seized during the night with the oppression and other symptoms of gas-poisoning. It was noticed that but little odour of the gas was discernible.

Besides the danger resulting from the escape of unburnt gas, we have to guard against the inhalation of the products of gas-combustion—carbonic and sulphurous acids, carbonic oxide, ammonia, and the like. The evil effects occasioned by these gases have been repeatedly set forth by medical sanitary authorities. Wherever, therefore, a gas-burner is fixed, a tube to convey these products into the foul-air shaft or to the outer air should be provided. When sun-burners, as they are termed, are used—burning large volumes of gas near the ceiling—a special means of withdrawal is always adopted; but it is the exception rather than the rule to find gas-burners connected with a hood and pipe or any kind of contrivance to rid the room of the irrespirable gases, or to lessen the heat and the humidity of the air which gas-burning entails. The most suitable kind of ventilation for gaseliers is shown at fig. 104, and the plan can easily be copied out in any house—a zinc tube being led from behind the centre flower of a room into the foul-air shaft, chimney, or outer air. Some ventilating grates—Captain Galton's, for instance—do not require an outlet for the air vitiated by breathing to be inserted into the chimney or foul-air shaft; but it must be borne in mind that no matter what system of heating be adopted, the products of the gas should be led away. If the products be not removed, the foundations of health will be silently sapped. Everything also in the room will, after a time, more or less suffer; the ceilings will be discoloured, the wall-papers will lose their finer tints, the upholstery will fade, the ormolu work will tarnish, the gilt upon the books will sully, and even the oil-paintings will lose their freshness.

If a room were adequately ventilated and the products of gas-combustion satisfactorily diluted, there might be no necessity for any special removal of such products; but how many houses are so constructed as to afford a renewal of fresh air to the requisite extent of over 5,000 cubic feet per burner per hour? Few houses, indeed, are able to supply the hourly 3,000 cubic feet needed for the use of the inmates. It is, therefore,

not only imperative to provide an escape for the resultants from gas burning in a poorly ventilated room, but it is wise to bring in from the outer atmosphere a special supply of air for the gas-burners in a well ventilated one. This, however, necessitates the use of a form of gas-light which guards the fresh air for its own separate use; and, fortunately, such a thing is in the market.

This ventilating globe-light as it has been named, is drawn at fig. 106, and the working of the system is as follows. When the burner is lighted at the aperture on the inner side of the globe by the spirit-torch, made for the purpose, and which avoids all chance of charred fragments of paper or wick falling into the globe, an upward current is created in the inner tube, and as this tube be-

Fig. 106.

comes heated, the air in the outer tube is also rarefied. The effect of this is to cause a movement of the vitiated air of the room to ascend and pass through the openings at the top of the stalk into the chimney or

* I am informed that in Liverpool the Corporation refuse to connect the main with a house unless the tradesman who laid the house-pipes carries a certificate of competency. If this were a rule in all towns, much sickness, according to many eminent physicians, would be prevented: I might add, and many cases of surgery, too; for it has been my lot to witness some very bad accidents result to gas-men from careless manipulation, and at least one which proved fatal.

foul-air shaft by way of the specially provided abstraction-tubes, which are laid between or across the joists of the room above. As will be noticed in the sketch, a current of cold air from without is led into the room to replace the withdrawn hot air, and to support combustion.* The burner itself may be so constructed as to heat the gas before it is consumed, and the brilliancy of the flame in this way increased. One globe-light will be found sufficient to light an ordinary sized room; but when rooms require more light, a cluster of these globes is arranged in the form of a chandelier, the products from each globe being led off through the central tube. Besides the pendant form, these lights can also be used as brackets upon a wall. The degree of illuminating power can be modified by means of a regulation-cock fixed to the supply-pipe in the wall of the room. Too much commendation can hardly be bestowed upon this system of lighting. Until it appeared, it was impossible to consume gas in a nursery without evil effects following. It was also impracticable to illuminate a conservatory without causing danger to the more delicate kinds of plants.

Memoranda upon the Gas-Supply.—There are a few precautions to be taken in laying down gas-pipes which every householder should know, in order that he may detect any negligence of the gas-fitter. For example, the service should have at least one inch in ten feet of a fall towards the main, and the meter should also be fixed above the level of the service where it enters the house; the pipes which supply the house should, moreover, rise from the meter. If the latter has to supply any rooms on a lower level than itself, a receiver should be put in the line of pipe so as to intercept the water. A similar receiver should be placed in every flat-lying pipe where it is exposed to condensation from the colder air outside. Composition pipes, which are mainly chosen because they are less bulky than iron pipes, and bend more readily, should never be bedded in plaster, as lime eats them into holes.† Where very small pipes *must* be hidden in the walls, they should be composed of copper. The iron pipes inside the house should be payed over with red lead or oxide of iron paint; and if laid in the ground outside the house between the meter and the main, they should be well coated with tar. All rising pipes should, as much as possible, be fixed so as to be easy of access, and covered over with a movable casing. When pipes *must* run under the floors, the skirting of those rooms should be fixed upon a hard wood fillet of its own thickness, and the floor-boards laid up to that; by so doing, much trouble will be saved afterwards. A plan of the whereabouts of the gas-pipes is also very essential in a large establishment.

When lights are seen to flicker, it is a token of the presence of water in the pipes, and this may be either in the house-service, the meter, or the main. In the two first cases the gas-fitter will easily remedy matters, and in the last the company should be requested to empty their syphon. After some years, too, the burners will be noticed to yield a very poor light, and in such a case it may be taken for granted that the pipes are full of what is called corrosion, and require cleansing; or what is commonly termed naphthaline will have formed in the pipes—generally at some rectangular joint unprovided with a receiver—necessitating even a hammer and chisel to dislodge it.

The Hot-Water Supply.—Four winters ago, one prominent topic of conversation in domestic circles was the danger which frequently accompanied the use of the hot-water boilers which are placed behind the kitchen fires, etc., for the purpose of heating water for the baths and sinks. In December 1869, several fearful accidents occurred, notably one near Manchester, where a lady and her daughter were seated before the kitchen fire when the boiler burst, killing the former and scalding the latter.‡ Even when no life is lost, the damage done to property is considerable. In the case to which I allude, the ceiling was brought down, the walls battered, and the doors and windows destroyed.

The system of heating which permitted this disaster obtains over nearly the whole of this country. The boiler is placed at the back of the kitchen fire, and the hot-water circulating cistern near the top of the house—the latter being supplied by the general cold-water supply cistern situated at a still higher point. The boiler is generally as large a one as can possibly be accommodated at the back of the fire; and as the hot-water reservoir is at the top of the house, and as some of the draw-off taps are at or near the boiler, all the hot water may be made use of when no cold water can possibly enter the general cistern above by reason of frost. The boiler, pipes, etc., are therefore emptied, and the empty

boiler becomes red-hot. In this condition of things a thaw takes place, the water rushes into the boiler, and the consequence is an explosion.

I have no hesitation in saying that this old system of heating water should be entirely discontinued, nor can all the precautionary measures which have been engrafted upon it since 1869 make it much more acceptable. Another objection to the common system is, that when drawing water from any of the taps situated at any distance from the flow or return pipes, a quantity of cold water, depending upon the length of the branch-pipe, has to be drawn off before the hot water arrives.

In the system of Mr. F. Dyer, which I have had fitted up with very satisfactory results, the cold-water cistern is at the top of the house; but the hot-water cistern, which is of iron, and takes the form of a cylinder, is placed anywhere beside the kitchen fire. The cold water is brought down from the general supply-cistern in the upper part of the house, and enters at the bottom of the cylinder. The boiler, which is a tubular one, made of malleable iron, is fixed at the back of the fire, and is so small as to contain little more than a quart of water. The fire has free access all round this boiler, therefore the water begins to circulate the moment the fire is fairly lighted. As the water in the small boiler is heated, part of it passes into the cylinder about half way up, and part courses at once through the supply-pipes, and where likely to be most useful: there is thus no loss of time, as hot water can be drawn before the water in the cylinder is fully heated. The return-pipe, which commences from the highest point of service, is made somewhat smaller in diameter than the flow-pipe—just sufficient, in fact, to keep the water circulating, and it is connected with the cold-water pipe near the cylinder. There is a tap fixed in this return-pipe, the use of which is to enable the servants to obtain, if needs be, warm water in the morning before the fire is lighted, and to do so is to stop the circulation during the night by turning off this tap; the hot water which was in the cylinder will then be at their service. The turning of the tap in question does not prevent the drawing of warm water at any time during the night in any room in the house; only of course in this case the cold water which was in the pipes would require to be first withdrawn. The Dyer system is drawn at fig. 107. There are several imitations, but I prefer the original.

It is impossible to suffer from any explosion if this system be adopted. As the cylinder is down stairs, whatever hot water is required must come

Fig. 107.—Cold-water Cistern, A; Boiler, H; Cylinder, M; Flows, C, B, N; Return, D, J; Expansion-pipe, I; Sluice-cock, K.

from the top of this hot-water reservoir. If, through frost or obstruction, no water can flow from the cold-water cistern at the top of the house, and force the hot water up, there is a limit to the withdrawal of hot water to the various taps in the house; the cylinder will, however, continue nearly full of water, and remain with this only pledge of safety in it until it has wholly evaporated, which would not be likely to happen under six weeks' time. No frost in our country would last that time without an interval of thaw. There is, moreover, a safety-valve fixed at the top of the cylinder, the weight in the interior of which is apportioned to the head of water which it has to resist. An expansion-pipe is also led from the highest service to the top of the cold-water cistern. The cylinder itself can be cleansed out by means of a sluice-cock fixed below it; and if a little water be drawn therefrom about once in three months, the apparatus will be kept perfectly clean. If there be a linen-closet in the house, a coil of pipes can be taken from the cylinder to some place contiguous to such closet, by which means the linen will always be kept perfectly aired and ready for use. If the kitchen were in the basement, and the cylinder large enough, a coil might also be got into the hall or passage above to heat the entering air.

As will be noticed in fig. 107, there is a draw-off tap at one side of the kitchen fireplace, so as to supply hot water from the cylinder, and this will be found very useful for many requirements of the cook: but she should not be dependent upon this supply for hot water for the purer culinary purposes, because water which has to traverse such a distance and serve so many purposes over the house, cannot be considered absolutely pure. There should, therefore, be—in connection with an enamelled slate cistern down stairs, carefully removed from the chance effects of frost—a boiler attached to the kitchen-range, and the hot water from this boiler, besides serving the cook, might in most cases be made to supply the nursery and the dairy, where pure water is so important. The same cistern should also supply the drinking-water of the house, and if it were filtered it would be all the better. The water companies, for the most part, specify that at least one of the cisterns should

* Where ample ventilation for all purposes has been secured for a room, these globe-lights, with one cone only, can be fixed, and the flame fed in the ordinary way, by the air passing through the room.

† Mice will sometimes attack these composition-pipes if laid within their reach. This is well vouched for, but no satisfactory reason has been given why. Most cases of gas escaping will also be found to have resulted from nails or screws penetrating these pipes.

‡ A cat and dog, which were crouching beside the fireplace, were also killed.

be at a low level; and there need be, therefore, no additional expense beyond the enamelling of the cistern.

The Cold Water Supply.—After giving considerable attention to the matter, Dr. Parkes came to the conclusion that twenty-five gallons per head *per diem* is the minimum quantity of water which ought to be allowed for the use of a dwelling. About this quantity should also daily pass through the house-drains into the sewer, in order to insure a complete removal of all the solid wastes. The apportionment of the water per head is as under.

For cooking purposes	0 $\frac{3}{4}$ gallons.
„ drinking	0 $\frac{1}{4}$ „
„ ordinary ablutions	5 „
„ cleaning up	3 „
„ laundry use	3 „
„ bath use	4 „
„ water-closets	6 „
Margin and waste	3 „
Total	25 „

Dividing the number of gallons daily supplied by the seven largest water companies in London by the total population in each of their districts, it appears that about twenty-eight gallons are allowed to each inhabitant. When we consider the wants of the brute creation, this supply is evidently insufficient. Glasgow, which is the best water-supplied city in Great Britain, allows fifty gallons per head of population; and probably this is the correct figure to count upon.

Cisterns.—Given even the proper quantity of water, many houses are provided with only one cistern, and from this is, of course, supplied the drinking-water as well as the water for the closets. I could point out hundreds of houses in London in this predicament within the radius of a mile. This is very reprehensible, and sickness has been repeatedly traced to such a state of things. An independent cistern should be provided for drinking and purely culinary purposes, as already pointed out. A separate one may also be fixed for the supply of the water used for the scullery, and, in connection with the hot-water services, to the baths, lavatories, and sinks. A third one may, with advantage, be erected for water-closet purposes solely.

The drinking-water cistern is best constructed of slate slabs, enamelled inside. A wrought-iron cistern, coated inside with a tar composition, has been recommended, and it would, perhaps, rank next. Lead cisterns should never be erected in a house. The injurious effect of lead upon the human system has been pointed out times without number, but with too little effect; lead, moreover, slowly disappears under the action of some kinds of water. Zinc is also an objectionable lining for cisterns for similar reasons; and even well galvanised iron cisterns, although suitable for the storage of water to be used for common purposes, is unfit to hold water which is destined for the table. The service-pipe, also, which conveys the water from the drinking-water cistern, should never be composed of lead or galvanised iron. The only safe kind of pipe is the leaden-cased block-tin pipe. It may appear ridiculous to add, that the drinking-water cistern should be regularly cleaned out, at least once a quarter; but I have seen such culpable neglect on this head, that I feel self-pardoned for mentioning it. Water should also be laid on and a sink provided to every floor of the house; otherwise the housemaid, who begins to cleanse a house at the top storey, will almost invariably use the same water down to the staircase in the hall.

Memoranda on Cisterns.—In some of the large cities, and in London especially, owing to the regulations which define the water arrangements, not very many liberties can be taken with the supplies, or even with the wastes, but in country houses it is very different; and it would be wise there, as elsewhere, to guard against the following errors. For instance, any overflow* from any cistern should not deliver connectedly with the drain or into a soil-pipe, or even into a rain-water down-pipe which leads direct into the drain: on the contrary, it should deliver upon the leads, or over such a trap as those drawn at figs. 21 to 24. Too much attention cannot be paid to the drinking-water cistern in this respect; and mischief will be certain to ensue from any departure from this sound rule.

By way of example, I will now allude to a house which I was lately called upon to inspect. The house was situated in the most fashionable part of London, and contained two main cisterns. The cistern which supplied the kitchen-boiler, etc., had an overflow-pipe leading down into an *unventilated* house-drain, and the dead water in the main pipe which supplied the cistern was used for flushing the servants' closet in an area-vault, between the street and the cistern. This cistern was,

therefore, open to two sources of contamination. As for the upstairs-cistern, which perhaps often supplied the bedroom drinking carafes, it was even in a worse plight, for the waste from a housemaid's sink branched into the overflow of the cistern, and the pipe then passed into the trap of a closet. A singing-bird has been known to be poisoned by sipping water upon the surface of which tobacco-smoke had condensed; and what kind of health could be predicated for a person, especially an infant or an invalid, condemned to quaff the scum floating upon the water of cisterns so irrationally treated as these? Filtering will do much to remove impurities in water, and the silicated carbon-filter will deliver water, quite free from any of the constituents of milk which has been poured into it previous to filtering—and this is a crucial chemical test for a filter; but it would be well not to trust even to filtering in a case such as I have described. It is doubtless wise to fix filters in every drinking-cistern, even where good water is laid on; at all events, it renders "assurance doubly sure", and against the practice there is only the extra expense.

Well-Water.—Householders have been repeatedly cautioned against making use of well-waters which have not been previously analysed by competent persons. It is safe to presume that a well-water is unfit for drinking purposes, and that the water supplied by a water company is pure. Wells have before now been sunk in places almost honeycombed with old cesspools, with a result not difficult to imagine. In sending a sample of water to an analyst, it should be put into a stoppered quart-glass bottle, which has been cleaned out with sulphuric acid and then washed out with water. The bottle, when filled, should be corked and sealed, and within two days forwarded to the operator. In taking the sample, the vessel should be immersed in the water, and the mouth filled at some little distance below the surface.

Rain-Water.—Where the plan can conveniently be carried out, and where the drains can afford the withholding of the flushing water, it will be found very convenient to store, in an underground tank, that which falls upon the roof of the house. This tank can be built in brick-work in cement, or concrete work, puddled behind with clay outside, and rendered over with Portland cement inside. It should also be provided with a man-hole, to afford means of occasionally cleansing it out. The overflow from the tank should never run connectedly into the drain, but deliver in some space open to the air, which can be managed in a variety of ways. In calculating the size of a rain-water tank, so as to apportion it to the collecting surface, the space covered by the roof in square feet, multiplied first by 144, afterwards by 25—the average in inches of rainfall during the year—and then divided by 277, will give the products in gallons; or, what is about the same thing, twice the space covered by the roof will give the cubical feet of water likely to be collected during the year.

Some persons are inordinately fond of rain-water for culinary purposes, infusing tea with it, and so on; but in such circumstances some caution ought to be exercised, that this rain-water has not been collected from zinc roofs and lead flats. Those down-spouts only should be led into the water-tank to be used for cooking purposes which drain tile or slate-covered roofs. Even on these roofs a certain portion of the rainfall will have passed over lead flashings, ridges, hips, and valleys. This in a large slated or tiled roof, however, will probably not charge the water with more than one-twentieth of a grain of lead per gallon, beyond which a water becomes dangerous to use.

Even before it reaches the roof, rain-water is more or less impure—so much so, that many plants will grow in it independently of soil. It would be wise, therefore, to filter it before using it, either in the house or the laundry. The impurities of rain-water, according to Dr. Angus Smith, can be completely removed by filtration through the soil. It would be possible to construct an earth-filter on the delivery side of the rain-water tank in order to remove the nauseous taste of oil and soot from the intercepted soft water; but I think that it would scarcely be worth while to do so. A box-filter, fitted to the top of the suction-pipe connected with the pump over the tank, would serve all ordinary purposes. If the rain-water were stored in a slate-cistern or water-butt above ground, a low-pressure filter could be fitted to the end of the draw-off pipe. Where rain-water is of a necessity drunk, the caves-troughs and down-spouts should be enamelled or silicated, and reach the tank through glazed earthenware-pipes. Generally speaking, rain-water should be excluded from the kitchen. It contains, amongst other harmful ingredients collected in the "upper deep", especially in towns where manufacturing trades are carried on, too much sulphuric acid, which "may be held to indicate the sewage of the atmosphere". Where rain-water can be got, over and above that desirable for laundry purposes, it will be found most useful for the occasional flushing of drains; some portion can also be led to a tank in the garden for distribution to the plants. The rain which descends upon greenhouses and conservatories may also with advantage be stored in a cistern fixed in the stoke-hole,

* The overflow-pipe is sometimes fitted up with a trap in the cistern. Pipes should be especially well guarded from frost, or the expansion of freezing water.

where it can be sensibly warmed, and whence it can be withdrawn to fill the watering-cans.

The Vane: Conclusion.—I have now traced the erection of a dwelling from the drains in the foundations gradually up to the cisterns in the attics, and have briefly adverted to the principal rules which ought to be observed both in building the house and in equipping it with the necessary services. To justly observe the architectural *unities*, I ought to conclude my last article with a few remarks upon the *roof* of the house, and will, therefore, do so by pointing out the best kind of vane.

A daily knowledge of the direction of the wind may seem of no consequence, but I am persuaded that more depends upon it than appears at first mention. Let me furnish an example. The main staircases of most houses now terminate in what is called a lantern-light, the glass sides of which are made to swing open, and beneath this is generally placed an ornamentally treated flat ceiling-light, which hides the lantern above. The ventilation of the whole house may depend upon this arrangement, the object of the swinging lights being simply to allow the escape of the foul air; and it can be easily imagined that, if the wrong light have been swung open, the wind may be possibly blowing the vitiated air back into the house. Had some one noticed in what direction the wind was blowing—and there is surely in every large house some one sufficiently interested in its ventilation—a glance at the perforated margins of the ceiling-light and a few pulls at the cords would have shut the one window and opened its *vis-à-vis*. But this is only one of the many advantages of a vane. There are many delicate persons who are debarred from a walk or drive during certain winds, and who might have been saved some risk, and certainly some trouble, if the house had been provided with a vane.

It is the exception rather than the rule to see town houses with this article, and the converse holds true of country houses; but it is simply because it is not customary for town residences to mount a vane—not because they will not work properly in a town, or because there is no actual necessity for them. Apart from valetudinarian reasons, I can understand that a vane may prove the centre of much interest and pleasure: at all events, one may as well be cognisant at early morning of the prevailing wind, as peruse it next day in the daily readings of the *Times*. A youthful meteorologist, too, with his anemometer, as well as his barometer, hygrometer, and thermometer, might not prove the least useful member of the family.

If I had meant to describe a common weathercock, I would have left the above sentences unwritten; but I intended to point out one which would register the direction of the wind in the house itself, and show upon the index in the hall or passage every varying sweep of the indicator. A vane upon the house-top—the utilising of which necessitates a journey outside—would prove troublesome in the last degree. A contrivance which embodies a perfect registration is drawn at fig. 108.

Fig. 108.

It consists of an iron standard, which can be fixed upon any convenient part of the roof; and, connected with its copper vane, is a rod running down to the passage of the ground-floor. As may be noticed, the rod can be carried in any direction, and down any number of storeys,

by means of bevil wheels made of gun-metal, and poised upon compensating rollers; the rods being kept free from twisting by suitable universal joints, down to the dial at *a*. It is effective and cheap, automatic and ornamental.

THE ADDENDUM TO THE BRITISH "PHARMACOPŒIA".

I.

WE published, some time since, a list of the more important articles contained in the Addendum, which is now on sale. The following short notes are provided for us by a good practical authority, and may be taken as being written chiefly from the dispensing point of view. We shall next week publish a further commentary from the medical and therapeutic point of view.

Ether aceticus is introduced, we believe, with a view to some alteration in the next edition of the work.

Ammoniac nitras—for the purpose of producing *nitrous oxide*.

Amyl nitris is of doubtful utility.

Aqua chloroformi. We are at a loss to see why the *Pharmacopœia* should be cumbered with a formula for that which may be made extemporaneously without any trouble. The objection to the *Spiritus chloroformi* already on the *Pharmacopœia* is, that it is too dilute; the prescriber, wishing to give a dose of chloroform, is obliged to give also an almost intoxicating dose of alcohol. Possibly, the water may be introduced to meet this objection.

Arca is another useless encumbrance to the *Pharmacopœia*.

Aurantii fructus is given for the purpose of making a tincture from the fresh fruit, said to possess a finer flavour than that made from the dried peel.

Calcis hypophosphis and *Sodæ hypophosphis*. The hypophosphites, originally introduced by Dr. Churchill, having come into general use, it has been thought fit to give them an official sanction.

Charta sinapis is intended as a substitute for the popular remedy known as "mustard leaves".

Chloral hydras, from its great importance, naturally finds a place in the dispenser's text-book.

Extractum glycyrrhizæ liquidum possesses no advantage over the fluid extract usually kept, and made by diluting the ordinary extract.

Gutta percha is used in forming the liquid with which the *Charta sinapis* is prepared.

Hydrargyri oxidum flavum is an important addition, and one possessing advantages in ophthalmic practice over the ordinary red oxide.

Injectio morphinæ hypodermica. To those who know the importance of small quantities of liquid for hypodermic use, it will be difficult to see the object of making this solution just half the strength of that which has been in general use for years, thus necessitating the use of double the quantity of liquid.

Laricis cortex. The physiological properties of larch-bark were brought before the public in 1856 by Dr. Moore of Dublin (see *Pharmaceutical Journal*, vol. 18, p. 35), since which time it has been frequently prescribed with advantage.

Liquor magnesiæ citratis affords an effervescent aperient saline in imitation of the magnesian lemonade.

Oleum phosphoratum is the only manageable form for giving phosphorus, excepting that of the pills, a formula for which is also given in the present work. The advantage over the formula which has long been in use is, however, doubtful.

Pilula scammonii composita is intended to meet the requirements of those who wish to prescribe a purgative pill *without aloes*.

Pulvis elaterii compositus. The reason for this formula is not obvious. It is probably inserted in the interest of incorrect dispensers, in the weighing of very small quantities.

Pulvis glycyrrhizæ compositus. This powder of the German *Pharmacopœia* has recently come into rather general use, and the above formula appears to have been adopted in consequence; but why two of the most important ingredients should be omitted is not so obvious, and only serves to remind one of the threadbare joke of giving a play and omitting the principal character.

Suppositoria. The formulæ given for the suppositories are intended to obviate the inconvenience sometimes experienced from the melted fat in the old process; but it remains to be seen whether the application of an irritant like soap is an unqualified advantage.