REPORT ON HEATING AND VENTILATION.

The Tuberculosis Committee of the Medico-Psychological Association have referred to us in their difficulty of dealing with the complex question of heating and ventilation, inviting us to give them a supplementary report on the subject; and, while we see the difficulty of treating fairly a matter of such magnitude in so necessarily condensed a form, we have done our best to comply with their request.

Heating and ventilation, as applied to most buildings, are more or less inseparable, but it will be convenient to deal with the latter subject first, as being, for the purpose of this report the more important, and to which the question of heating should be made subservient.

Broadly speaking, ventilation may be obtained by natural or artificial means. Natural, by constructing a building in such a way as to obtain all the advantages of atmospheric pressure and, consequently, free passage of air into and out of every habitable room. Artificial, by various mechanical methods described later on.

To obtain natural ventilation is sometimes a difficult task, as only a limited number of rooms have an outside wall on more than one side; but much can be done by using properly constructed windows, such as those of the isolation hospital type, with a fanlight over a transom and sliding sashes below, by which air can be admitted without a direct draught, also by well-arranged inlet and exhaust ventilators. In a well-designed and properly administered asylum a natural system of ventilation can be made effective in, perhaps, 320 out of the 365 days in the year, and by utilising the heating system to assist ventilation, the non-effective days can be further reduced.

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We shall probably be met with the objection that to ensure successful ventilation by natural means a more intelligent and watchful type of attendant is required than is generally met with in asylums; but while we feel that it is perhaps not for us to criticise administration, we are of opinion that it is better to aim at training the staff to a higher degree of efficiency than to resort to automatic appliances for every emergency, in which there is always a danger of lowering the intelligent usefulness of the attendant.

Artificial ventilation is obtained by various methods, generally either by the fan or the so-called air-pump ventilator as an extracting power, or by the application of heat in the extraction shaft, which rarefies the air and induces an upward current. Sometimes both these forces are applied reversely on the plenum system, by using the fan as a propelling power to drive fresh air into the building, or by applying heat for the same purpose in a ventilating radiator fixed with its back to an outer wall, having an inlet flue through which air is drawn from the outside by the heat of the coil and admitted with some velocity into the room, thus displacing polluted air, which escapes up the chimney or through outlet flues provided for the purpose.

Both these systems are more or less elaborated in various ways, which it is neither necessary nor possible for us to enlarge upon in this report.

The disadvantages of artificial ventilation are those arising from mechanical construction and the upkeep of the plant; the dangers resulting from the fouling of the air flues, many of which are necessarily too small to be possible of proper and constant cleaning; and, where combined with heating, as these systems generally are, the difficulty of regulating the temperature in rooms of varied size and position. In this connection, however, we would express the opinion that, while, on a suitable soil and under careful direction, the plenum system may be made a more perfect substitute for natural ventilation, combined with heat, than any method we know of, there is, perhaps, *generally* less danger in an extraction system than in one of propulsion, as in the former the inlets may be direct from the outer air, with a flue limited in length to the thickness of the wall; while in a plenum system the air must be passed through a considerable length of underground trunks

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and branch flues, which may become contaminated in a variety of ways, and from which the air might, possibly, be driven into the wards in a noxious condition.

There is similarly a danger of fouling in the extraction flues, though to a lesser extent, but as the air generally passes *out* of the wards through these extraction flues, the danger arising from contamination of these trunks is minimised.

While on this subject we must not omit to refer to cubic space, to which ventilation is so closely allied.

It is an axiom that an adult requires 3000 cubic feet of fresh air per hour, and it is frequently asserted that to obtain this 1000 cubic feet of space is necessary. We would, however, point out that the hygienic properties of a room are not so dependent on the amount of air it contains, as on the frequency of its change; and, while probably a large room, where the air is only changed two or three times in the hour, may be more agreeable to live in, it is quite possible, as we have proved in experience, to change the air in a properly ventilated room five or six times in the hour without undue draught.

Without any desire to minimise the urgency of the plea against overcrowding, we foresee the difficulties that would arise in enlarging our asylums to give more cubic space per patient, owing to the great increase of cost that would be involved in the erection of these already too costly buildings; and we would, therefore, more emphatically urge the importance of efficiently ventilating all day-rooms and dormitories, even at the risk of occasional complaints of draught.

We are, however, satisfied that the Lunacy Commissioners' standard of space is sufficient to ensure a healthy condition in a well-constructed building, if properly maintained and ventilated.

Turning to the question of heating, there are, as is well known, a variety of methods in use. The open fire-place, which is, perhaps, as a question of hygiene, the most perfect, is also the most extravagant; the hot-air principle, either by propulsion or induction; the hot-water and steam systems, both of which involve an elaborate arrangement of pipes and coils in every room where heat is required, have all been tried with more or less success in a variety of forms.

It is impossible for us here to enlarge upon the details of

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these numerous heating systems, and it will be sufficient if we point out the salient objections in most of them.

In the hot-air system there is the danger already referred to of contamination of the flues, and also, as some medical writers assert, the unhealthiness of breathing air warmed artificially to a sufficient extent to impart heat externally to the body, as distinct from heat radiated from the open fire or hot-water coil, which necessarily does not warm the air equally throughout the room.

In the steam or hot-water system the main objections are the presence of pipes and coils in the room, which need constant attention and repair, the interstices in the heating batteries proving most dangerous receptacles for dirt and refuse secreted by patients. It will be objected that if these radiators are regularly and properly cleansed the danger is removed, but we would point out that in phthisical cases, when the patients frequently expectorate into the heating coils, the mischief is done before the cleansing can be effected.

Moreover, in this cleansing there is both difficulty and danger; for if cleaned, as they should be, with damp cloths, it is troublesome, if not impossible, to get to all parts effectually; and if cleaned with brushes, or by other dry methods, the air around becomes immediately laden with the dry and pulverised products of phthisical lungs.

Other objections to heating systems in the wards arise from the mechanical inefficiency of the fittings, such as valves, pet cocks, coil cases, and opening gear to the inlet ventilators; but greater than all is the difficulty of regulating the heat to suit the varying external temperature, the result very frequently being excessive heat in the wards.

In our experience this last-named evil is met with in too many asylums which are artificially heated, particularly in the dormitories, where a temperature is frequently maintained injurious to health, and very much higher than the patients have been accustomed to in their own homes.

It will be gathered from the foregoing remarks that we do not view with absolute favour any artificial systems of either ventilation or heating, and we must admit that we have still much to learn, and until a perfect system of artificial ventilation is discovered we are of opinion that it is better to depend on natural ventilation, and to aim at constructing our buildings in

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such a way as to make the forces of Nature available to the greatest possible extent, rather than resort to artificial means which are open to so many objections.

For phthisical cases we would urge the importance of providing separate buildings properly constructed to freely admit fresh air, with louvred openings all round the rooms immediately below the eaves; and to a lesser degree the same principle might be introduced into some of the wards of the main asylum, so that the air inlets could not be entirely closed, thus rendering powerless the efforts of the attendants to obtain the comfort which frequently kills.

When we have attained the ideal, and, possibly, most economical form of construction, viz. one-storey buildings, for our asylums, we shall be able to do more towards simplifying our methods of heating and ventilation. With a properly constructed and protected stove in the centre of a room, which radiates heat on all sides, as well as from the stove pipe carried up bare to the ceiling, the present wasteful coal fire will become, perhaps, the most economical and effective mode of heating; and by enclosing this pipe, from the ceiling upwards, in an air shaft carried through the roof, a most effective and simple form of extractor is provided. Fresh air can be admitted through draughtless windows of the type before referred to, or by some other simple form of inlet ventilator.

To revert again to the subject of heating; while waiting for the discovery of means to store up the sun's rays by day and release them when he has gone below the horizon, we have conceived the idea of converting the walls of our asylums into heating radiators, the hollow cavities in them filled with warm air, which, circulating again and again through the calorifier, loses none of its heat except by radiation, and thus warms the rooms without entering them, like steam in a jacketed pan. There is thus no danger of the atmosphere becoming vitiated by overheated air, and with the walls maintained at a moderate heat, fresh air may be admitted freely without danger of the patients suffering from chill. We throw out this as a suggestion for some inventive mind to bring to practical effect.

Before concluding we desire to say a word on the improvement of the sanitary condition of old asylums, which,

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according to the statistics submitted, show generally a higher death-rate than that of more modern buildings.

It has been suggested that in an old and decayed building there are greater opportunities for the secretion of dirt and disease germs than in a more modern structure. This is true, particularly when we consider the rough type of construction in asylums of an early date, where the walls were merely pointed and colour-washed, and the floors covered with wide boards, or sometimes stones, both having open joints.

Much, however, might be done, and at no great cost, to restore these older buildings to a sanitary condition; the unplastered walls might be coated with cement, or with one of the modern forms of hard plaster, worked up to a fine smooth surface; the floors laid with papyrolith or some other material impervious to moisture, and without joints or cracks. The woodwork, which would probably require renewing, should be introduced in limited quantities; plain sash window frames; no linings nor architraves, but rounded angles worked in cement; no framed dadoes nor moulded skirtings; no moulded door linings, but solid frames with rounded edges, and doors constructed without ledges to catch dirt.

This form of construction would perhaps appear bald to the educated or artistic eye, but to the majority of the patients a bright coloured dado of paint would compensate for the absence of the more elaborate wooden one.

By thus treating our old asylums we should improve their hygienic properties, and we venture to think that their present death-rate of 4 or 5 per cent. could be reduced to something like 1·6 per cent., as has been done at Hanwell.

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