PROBLEMS IN HEATING AND VENTILATION

Abstract from a lecture delivered by Mr. Arthur H. Barker, B.A., B.Sc., at the University College, London, published in The Architect.

IN TOUCHING upon the question of economy of heat by thermo-dynamic methods, Mr. Barker suggested that the heat from the air outside a building be used for warming the interior, although of a much lower temperature than that required for this purpose.

The thermo-dynamic method of producing heat consists of the simple operation of compressing a gas, which act is sufficient to raise its temperature in proportion to the amount of energy expended.

Heating engineers have yet to fully appreciate the enormous economy of such methods of heat production which resolve themselves into the provision of a cheap power supply; for it is necessary to have power before heat can be obtained from the air in this way. The provision of electrical energy without the consumption of fuel would be a solution of the problem, although not within sight of realization at the moment.

Further in co..sideration of the possibilities of utilizing waste heat from industrial enterprises for warming inhabited buildings, Mr. Barker suggested several heads, which included:

(1) Heat applied in excess of requirements, and wasted in bringing about results obtainable by a much smaller expenditure of energy if properly applied; (2) heat lost by conduction through inefficient non-conductive material or leaky pipe joints; (3) heat contained in exhaust steam or condenser water; and (4) that which found its way in the form of flue gases direct into the open air.

The heat lost under the first two heads could be regarded as irrecoverable, but there were certain possibilities in the utilization of waste energy of the nature of numbers three and four.

Other forms of energy, such as were contained in coal and dynamite, or, better still, electricity, could be transferred from place to place, but the same operation with heat must always be impossible. It was part of its very nature to get lost, inasmuch as it imparted some of its warmth to anything in contact with it or through which it passed.

At present the only purpose which the heat in the flue gases served was to create a draught through the furnace, a wasteful process when it was remembered that this could be effected quite as efficiently by means of a fan.

The present cost of fuel, however, made the existing methods possible, and it was not thought to be commercially profitable to face the outlay necessary in order to save the heat wasted in this way.

Another factor was the probable distance of the factory or works, where the heat was generated, from the building to be warmed, a consideration which limited the possibilities of the idea. Here again it was at present found cheaper to burn fresh fuel at the point where the heat was required, and the price of this fuel was the root factor of the whole problem.

The waste heat, after being collected and transferred to some medium such as water would have to be pumped from the centre through pipes to the various houses. What system could be devised for charging the consumer for this heat supply? It would be difficult to register the quantity of heat used, for although this would be simple in the case of the quantity of water which passed through the meter, it would also be necessary to take into account its temperature. The charges might be levied according to the area of radiating surface provided on the annual value of the house.

There were many difficulties in the way of adopting such a scheme which would probably prevent the practical consideration of the idea until there was either a rise in the price of fuel or a decrease in the cost of power. In our climate, where prolonged cold was unknown, the saving would be less, compared with parts of America and the Continent, where it might be worth while to incur the necessary capital outlay under present circumstances.

The possibilities of leakages from the pipes would render it necessary to construct subways, preferably of sufficient size to allow a man to walk along them. An expense of probably £8,000 per mile would thus have to be faced at the start. If steam were the medium employed, the water produced by condensation would have to be returned, and any difficulty as to levels would require a system of pumps for this purpose.

Some solution of the problem as to the expansion of large pipes was required, and here there was need for an efficient invention, there being no really satisfactory joint to provide against this.

The whole cost of a system would mean for a 4-inch pipe, £950 per mile, rising to £4,200 per mile for a pipe 9 inches in diameter, to which must be added the cost of subways, say, at 30s. per foot run, and cost of maintenance, power, and interest.

The essential hard fact was that the cost of heat saved must be sufficient to render it commercially profitable to face this capital outlay.

He had made a careful calculation of the requirements of a small establishment such as his own, and he thought that at the outside the heat necessary to warm his house was 35,000,000 thermal units per annum. Taking a thousand houses of this size, which would represent a small town of from 7,000 to 8,000 people, say two miles from a manufacturing centre, the output would need to be 20,000,000 thermal units per hour. Allowing for cost of plant, interest, and depreciation, it would then be necessary to charge each householder £15 per annum for his heat supply, and he did not think that, with coal at its present price, many people would be willing to pay this amount, when they could, with a separate plant, warm their premises at half the cost.

Added to this was the fact that in this country the prejudice in favor of the open fire was so deeply rooted as to be practically ineradicable.