

disagreement among themselves. All tests were made at a temperature corresponding to 200 pounds steam pressure.

A comparative test was made in 1895, upon a number of steam-pipe covers on a 4-inch tester, 16 inches long. The results obtained have been published in the circulars issued by the Boston Manufacturers' Mutual Fire Insurance Company, and by the Steam Users' Association. The values given were stated to be purely relative, the specimen being too small to give reliable data on the absolute conduction, and the surrounding conditions not being controlled other than to maintain them constant during the several runs. The ends of the specimen were covered by massive heads, and the whole tester was situated within a few inches of brick wall and a stone pier. It was said that the heat loss was probably high, and while the exposure may have been such as to make it so, being a rather harsh test, yet one which was rigidly uniform in its requirements of the several covers. In short, the actual loss of heat per square foot of the pipe surface was correct for that particular piece, under the conditions of the test, but was not sufficient for the estimation of the actual saving which might be expected from the general use of coverings. It was deemed wise, therefore, to construct new heaters, 4 and 10 inches in diameter, and 36 inches long. These were suspended by non-conducting cords in the centre of the laboratory, so as to hang freely and not be in contact with any conducting supports. Conduction up to the lead wires and stirring rod was found to be negligible.

This seems to have approached more nearly the conditions of actual practice than can be obtained by any other method of testing, except the actual use of a long run of pipe, and the determination of the amount of heat put into such a pipe by the "condensation" method, offers many difficulties, and is open to much uncertainty. Therefore, in adopting this method, a reasonable exposure of the pipe is used, and there is an exceptionally good opportunity to measure the heat supplied.

#### THE INFLUENCE OF PAVEMENTS ON PUBLIC HEALTH.\*

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In presenting to this association a paper on the sanitary aspect of pavements, I have been actuated by a desire to obtain information, rather than to impart it. Ontario has so recently developed from a wilderness into the home of civilization and culture; our villages have grown so quickly into towns, our towns into cities, and the advance of the various sciences has been so rapid, that our people scarcely realize the changed circumstances and the need of carefully directing their energies in meeting the demands of the times. In my visits to different parts of the province I am constantly met with evidences of the good wrought by this association. I find that in very small villages even inefficient drainage, cess-pools, piggeries, slaughter-houses, and impure water supplies are not now tolerated as they were once, and that this is due to the work of your association. It is with considerable hope, therefore, that I have undertaken to briefly lay before you the subject of pavements and public health, confident that you will lend your assistance in aiding our knowledge of this as of other matters pertaining to perfect sanitation; and that where reform is needed your aid will be afforded.

There is no one paving material which possesses every quality desired in a pavement to meet all conditions and uses. The ideal pavement remains to be discovered; but the features which should belong to such an ideal pavement are so numerous and of such varying character as to render the search apparently a hopeless one. The ideal pavement: 1, should be cheap and economical of maintenance; 2, should be durable; 3, should suit all classes of traffic; 4, should offer little resistance to traction; 5, should give a good foot-hold to horses; 6, should be adapted to all grades; 7, should have a good appearance; 8, should not be muddy nor pervious to water; 9, should be sanitary, that is, non-absorbent, not subject to decay, easily cleaned, not dusty, not noisy.

It is apparent then that, notwithstanding the importance of the sanitary aspect of a pavement, there are other features which must be considered. The primary intention of a pavement is to accommodate travel, and to provide one which will do this satisfactorily, which will be durable, cheap, of good appearance, healthful, and possess in the highest degree the other qualities enumerated, in view of the location, nature and extent of traffic, is the problem which presents itself to the paving engineer. Just as no absolutely perfect paving for every time and place has been discovered, it is doubtful if any paving material now used should be utterly condemned. Each has its place in which, until the ideal universal pavement is found, it will be more satisfactory than any other which could be used under that particular set of circumstances of soil, climate, traffic, etc. The purpose of this paper, however, is to treat of the healthfulness of paving in general, of the sanitary aspect of commonly used paving materials; that is, asphalt, stone blocks, vitrified brick, cedar block, and broken stone (macadam), with respect to absorption, decay, ease of cleaning, dustiness and noise.

Of all these, cedar block has received the greatest censure on the score of unhealthiness. Dr. O. W. Wright, a health officer of Detroit, is quoted as saying: "On sanitary grounds I must earnestly protest against the use of wooden block pavements. Such blocks, laid endwise, not only absorb water which dissolves out the albuminoid matter that acts as a putrefactive leaven, but also absorbs an infusion of horse-manure and a great quantity of horse-urine dropped on the street. The lower end of the blocks, resting on boards, clay or sand, soon becomes covered with a fungoid growth thoroughly saturated with albuminous extract and the excreta of animals in a liquid, putrescible form. These wooden pavements undergo a decomposition in the warm season, and add to the unwholesomeness of the city. The street, in fact, might as well be covered a foot deep with rotting barnyard manure so far as unwholesomeness is concerned. Moreover, the interstices between the blocks and the perforations of decay allow the foul liquids of the surface to flow through, supersaturating the earth beneath, and constantly adding to the putrefying mass." Cedar block has been condemned in similar terms by many others. On the other hand, Col. Heywood, Engineer of the city of London, England, has said: "It has been said that wood pavements at all times smell offensively and may be unhealthy; but although some city streets have been paved with wood for thirty years, no complaints that I am aware of have been made to the commission on this head, and the inhabitants at all times have not only expressed great anxiety lest the wood should be replaced by other materials, but have subscribed towards the cost of its renewal. . . . I have at times noticed offensive emanations from it near cab-stands, but am unable to find further evidence of its unhealthiness. These remarks must be

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