chemists who have given the subject a careful study, differ to a degree warranting thorough discussion.—Editor.]

* * * *

### Discussion on "Stresses in Circular Pipes."

Sir,—The bending moments in Circular pipes due to an uneven distribution of the internal pressure, the subject of Mr. Hogg's very interesting and timely paper, have been persistently ignored by many alleged experts to the detriment of the structure.

In reading over Mr. Hogg's paper, it appeared to the writer that, besides those formulæ Mr. Hogg has given for the bending moments due to a vertical load distributed over the horizontal section of the pipe and to a horizontal pressure uniformly distributed over a vertical section, it might be useful to give formulæ for the case

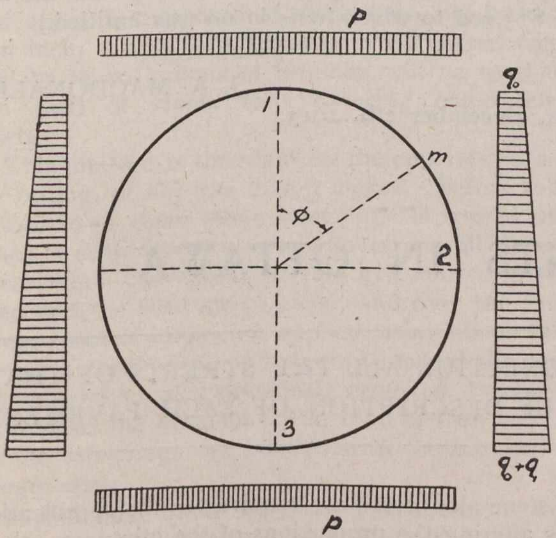


Fig. 1.

when the horizontal pressure is unevenly distributed, as shown in the accompanying diagram.

A circular structure is, generally speaking, three times statically indeterminate, but on account of the vertical diameter in this case being an axis of symmetry for the load, there will be no transversal force at the top of the pipe; by choosing the stresses at the top as the statically undeterminate quantities, it will be seen that there are only two in this case, the horizontal force and the bending moment.

By proceeding in the usual manner it will be found that the bending moment and normal force at the top (point 1) is

$$M_1 = \tfrac{1}{4} r^2 (p - q - 5/12\, q)$$
$$N_1 = -(q_0 + 5/16\, q) r$$

$p$ being the vertical load per unit length, $q_0$ and $q_0 + q_1$, the horizontal load per unit length at the top and bottom respectively (see Fig. 1) and $r$ the radius. The bending moment is taken positive when it produces compression on the convex side of the pipe and the normal force positive for tension.

At the end of the horizontal diameter (point 2) the forces are

$$M_2 - \tfrac{1}{4} r^2 (p - q_0 - 6/12\, q_1)$$
$$N_2 = - pr.$$

and at the bottom (point 3)

$$M_3 = \tfrac{1}{4} r^2 (p - q_0 - 7/12\, q_1)$$
$$N_3 = -( q_0 + 11/16\, q_1) r$$

The bending moment and normal force at the various point in (see diagram) can readily be determined from the values of the statically indeterminate quantities which (acting from the centre of the circle on the top section) are for this loading case

$$\text{(Normal force) } X_n = r (q_0 + 5/16\, q_1)$$
$$\text{(Moment) } X_m = - \tfrac{1}{4} r^2 (p + {}^2q_0 + 5/16\, q_1)$$

and the bending moment $M_m$ and the normal force $N_m$ at the point which has the co-ordinates $X$ and $y$.

$$M_m = M_{01m} - X_m - X_n y$$
$$N_m = N_{01m} - X_n \cos \phi$$

where $M_{01m}$ and $N_{01m}$ are the corresponding values in the statically determinate auxiliary system.

V. J. ELMONT.

Montreal, Dec. 9th, 1913.

* * * *

### The Binnie Contract.

Sir,—The engineering papers are taking considerable interest in the Ottawa pure water scheme, and particularly in the terms of contract which the city of Ottawa has made with Sir Alexander Binnie, who, after proposing the scheme, has been retained as its designing and supervising engineer. A New York engineering paper, which has always taken a sympathetic interest in Canadian engineering matters, apart from the size of the fee, appears to be struck with the peculiar nature of the contract. It points out that he is to substitute his own staff and force for the ordinary city department, which usually has control of the construction of a new waterworks for its own city. It calls this "an extraordinary contract," and decidedly unique "in a civilized, modern city the size of Ottawa." The contract is certainly both unique and extraordinary. One would expect to see such a contract, as the journal suggested, in those out-of-the-way countries where local authority is not sufficient to undertake the establishment of its own engineering force.

It certainly does seem ridiculous, if not manifestly unjust, to pay Sir Alexander Binnie a percentage on the costs of his own services; for, in this contract a sum of $1,000,000 (to be exact, $976,320) has been included for "engineering and contingencies," on which amount Sir Alexander Binnie gets $50,000, or 5 per cent. Again, there is the sum of $500,000 for land damages, and on this amount Sir Alexander is to receive $25,000. One would imagine the lawyers as best entitled to receive this latter sum. What engineering features there exist in the purchasing of right-of-way, and of the lands to be flooded, is difficult to discern, being little more, at any rate, than the survey of the outlines of these lands. Here, then, is a sum of $75,000, which is to be paid Sir Alexander Binnie, but to which, manifestly, he has no right, either by reason or engineering ethics.

By all means let Sir Alexander Binnie be paid his 5 per cent. on the cost of the construction of the Ottawa pure water scheme, estimated, apart from land damages and engineering, at $6,500,000, the percentage allowance of which would be $325,000, a fairly good fee as engineering pay goes; but there is no logical reason, ethically or morally, and least of all from a business point of view, in paying him $75,000 on a percentage basis for "engineering and contingencies" and for "land damages."

The total cost of the new system will be $8,000,000, on which Engineer Binnie, at the rate of 5 per cent. of