Each part of the structure shall be so proportioned that the maximum condition of stress in pounds per square inch shall not exceed the following:

Axial tension on net section of rolled plates and shapes 16,000

Axial compression on gross section of rolled plates and shapes:—

For flat or fixed ends, $16{,}000 \div \left(1 + \dfrac{L^2}{18{,}000\, r^2}\right)$

For one flat and one pin end, $16{,}000 \div \left(1 + \dfrac{L^2}{12{,}000\, r^2}\right)$

For pins at both ends, $16{,}000 \div \left(1 + \dfrac{L^2}{9{,}000\, r^2}\right)$

where L is the length of the member in inches and r is the least radius of gyration in inches.

Bending, on extreme fibres of rolled shapes, built sections, and girders, net section 16,000

Shearing, shop-driven rivets in reamed or drilled holes 10,000

Power-driven field rivets in reamed or drilled holes 9,000

All other field rivets 8,000

Lathe-turned bolts in reamed or drilled holes ... 8,000

Webs of girders, gross area 10,000

Bearing on diameter of rivets, twice the shearing value given above.

Bearing on pins 22,000

No compression member is to have a length exceeding 45 times its least width, nor an unsupported length in any direction exceeding 100 times its least radius of gyration about an axis perpendicular to that direction, excepting wind bracing and lateral struts, which may have an unsupported length of 120 times the least radius of gyration.

The preliminary work has been done, and the bridge designed, by the staff of the Department of Works, City of Toronto, assisted as regards architectural features of piers, approaches, and handrail, by Mr. Edmund Burke, Toronto, in the capacity of consulting architect. Considerable controversy has been created in connection with the proposed development as to the material, steel or concrete, that should be used, the nature of the soil structure having a very important bearing upon the question. The City Council has permitted the submission of tenders for both steel and concrete, and, as already announced in this journal, four of the former and five of the latter are under consideration.

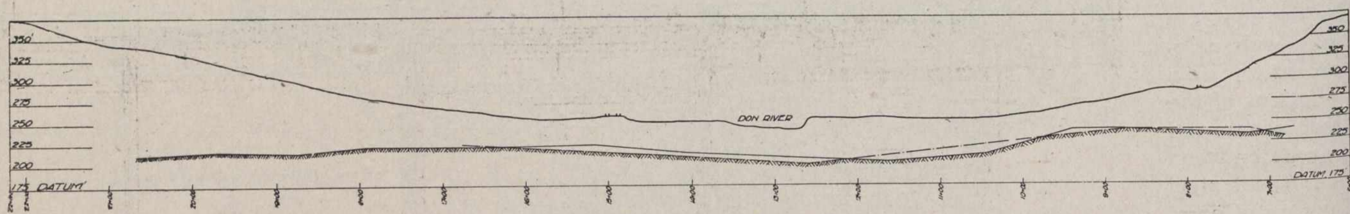

Fig. 4.—Profile of Don Section.

THE PITOT TUBE THEORY.

In *The Canadian Engineer* for May 28th, 1914, Page 784, a paper appeared entitled "Remarks on the Theory of the Pitot Tube," by N. W. Akimoff. The following discussion of the paper has recently appeared in the Journal of the American Water Works Association. The writer is Mr. J. W. Le Doux:

There has been recently a large amount of discussion of the apparatus known as "Pitot tube," the points of greatest interest being the shape and arrangement of the openings; the methods of calibration; the influence of disturbing factors; the formula of flow, particularly as to the term "g" representing the acceleration of gravity, and the constancy of the coefficient throughout the range of the velocity.

In regard to the first it would seem to the writer that as any particular form requires calibration, that which is the simplest and easiest to handle, offers no material obstruction to the flowing water and produces the highest deflection of head for a given velocity should be the most satisfactory.

It has been held that the results are different if a tube is moved in still water from what they are if the tube is stationary and the water moves. It is hard to see how this can be so, providing the conditions are alike in each case; for instance: if a long column of water of the same uniform cross-section be used for each determination. If a Pitot tube be made to advance at uniform speed through the centre of a canal of uniform cross-section, the coefficient thus determined should be the same as if the Pitot tube were stationary in the same relative position and the column of water advanced at the same velocity. If, however, the coefficient were determined under the first of these conditions and afterwards placed in a circular pipe under pressure, it is conceivable that the coefficient would be different, although if moving and still water determinations could be made for the pipe itself, the results might be the same.

The influence of disturbing factors, such as the proximity of fittings or variation in the shape of the conduit or pipe, can never be allowed for in advance, and the proper thing to do is to avoid them as far as possible.

The formula of a Pitot tube, as well as that of the flow through all orifices or contractions in a pipe, is almost universally recognized to be that of a parabola, which is the simplest formula of a conic section, there being but two terms and two variables, one of these being in the first power and the other in the second. The first variable is the head or pressure, and the second the velocity, or quantity flowing. The parabola formula can be placed in the form of $v^2 = c\,h$, in which h is the head, v the velocity, c a constant.

If this formula is true and c is a true constant, it is only necessary to obtain the value of h and v experimentally which will determine c by calculation, and when this is once found it is good for all other values.

As the formula is one of bodies moving under the action of gravity, it is evident that the constant is influenced by the term "g"; that, however, need not concern us as long as we have to determine the constant anyway by experimental methods, and it is very important that this determination be made under such conditions as will obtain in subsequent practical use.