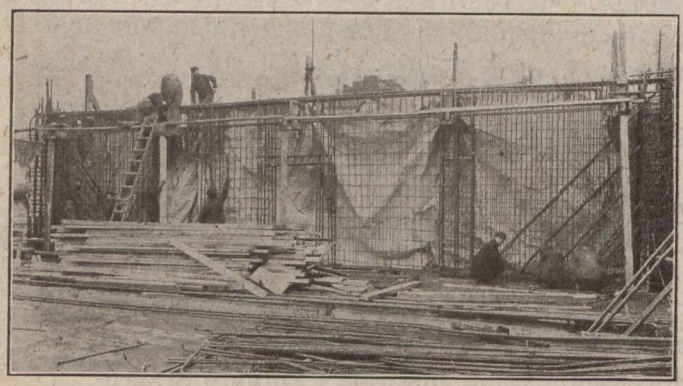
brittle, owing to the greater distance from the centre. In this special bar, the section adopted to give maximum efficiency is a round with 3 flats on it; that is, somewhat triangular with well rounded corners. The cross-sectional area is 95% that of a true circle. When this rod is cold twisted,



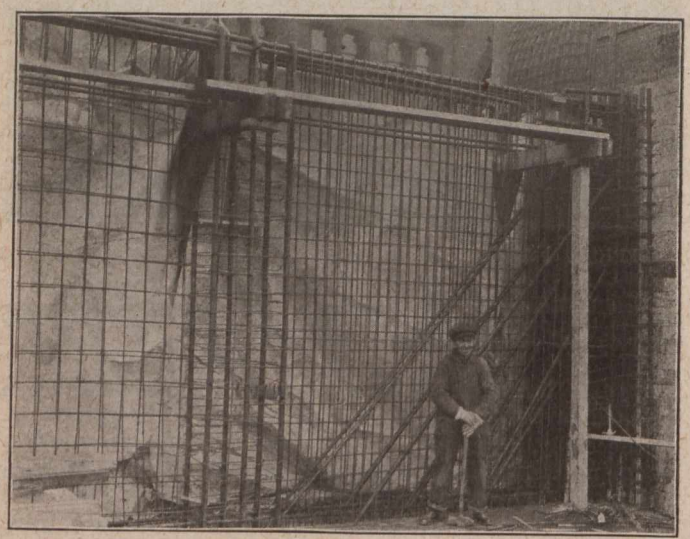
50-Ft. Beam to Carry 10 Stories

One of five similar beams in the Trusts & Guarantee Bldg., Toronto. This beam takes the place of a partition wall, and has openings for main corridor and office door. It is 14 ft. 6 in. deep, 21 ins. wide and 50 ft. long, overall. Apparent depth of construction at corridor opening, 24 ins.

the outer fibres do not become overstressed and the rod is just as convenient to handle and bend as an ordinary round rod.

The ultimate strength of this rod is about 85,000 to 95,000 lbs. per sq. in., and the stress at the yield point is about 55,000 lbs. per sq. in. It is safe to stress this steel to 22,000 lbs. per sq. in. and yet have the same factor of safety as ordinary mild steel at 16,000 lbs. per sq. in.

Now, if one were to design a bridge or a building taking the fullest advantage of these materials, and provide a factor of safety of, say, 10 at three months, these structures would not pass either the Ontario Railway and Municipal Board



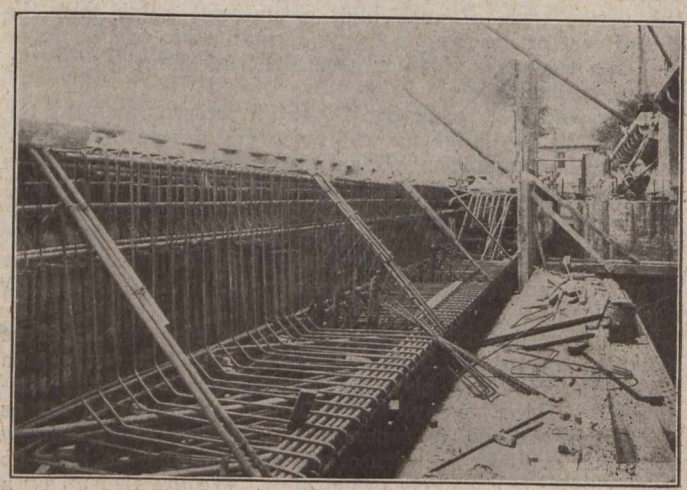
Closer View of Part of Trusts & Guarantee Beam, Showing Reinforcement at End

specifications nor the Toronto city by-laws. Yet steel structures having a factor of safety of only 4, can be built under these regulations.

At present there is no legislation to permit engineers to take full advantage of reinforced concrete as it now stands, let alone any recent improvements. Regarding the economy of concrete structures, such structures would be considerably cheaper than steel although they would be 2½ times stronger. The Birks building, Vancouver, built in 1912, cost 6.2 cents per cu. ft. for the reinforced concrete frame; i.e., columns, floors, retaining walls and foundations complete. The Trusts & Guarantee buidling, Toronto, built in 1915, cost 7.5 cents for the complete structural work. These structures could be built to-day for about 10½ cents, so that the increase in cost of reinforced concrete amounts to only about 50%. The reason for this low advance in cost is that the handling of concrete mechanically saves considerably in labor, and by designing a building so that the formwork can be used several times, one also saves considerably.

There is something wrong in the way in which reinforced concrete is controlled, and the reasons are likely as follows:—

1. Reinforced concrete is a buidilng material which is manufactured on the site; the contractor is the manufacturer. Considering the component parts of reinforced concrete—cement, sand, stone, steel and formwork—the only component part which is a finished manufactured product is the cement. The sand and stone are raw materials having a very low bulk cost compared to any manufactured product. The lumber used in the formwork is rough material, and the steel is in the form of ordinary round rods which bear a very low cost of manufacture—so low, in fact, that they might be classed, comparatively speaking, as raw material. The commercial power of vested interests in the manufacture of cement, sand, stone and reinforcing steel is small compared to the commercial power of the manufacturing interests of other building materials, such as structural steel, terra cotta tile, brick, timber, etc. Apart from the cement manufacturers, no one possesses any real power or is able to provide the necessary funds to advertise and push reinforced concrete as other materials have been pushed.



Reinforcement in Long Span Beam

Curtain wall of LaSalle Bridge, Montreal, forming continuous beam, 65-ft. span, to relieve the Stoney sluice gates of ice pressure. The limited dimensions of concrete called for heavy reinforcement.

2. It is comparatively easy for an architect or an engineer to design in steel, timber, etc., and superintend the construction. The calculation and construction are simple, and he is able to do the work himself. In the case of structural steel, the shop drawings are invariably prepared and paid for by the fabricating works, and the engineer or architect is relieved of that responsibility. If the architect or engineer employs reinforced concrete, he does so only at considerably increased trouble to himself, and corresponding increase in the expenses. It pays him to employ reinforced concrete specialists, but in so doing he has to obtain permission from his employer or client, and this reflects sometimes upon his own ability in the eyes of the client or employer. This is due to entire lack of understanding.

A reinforced concrete engineer who has made a life study of the work, and employs an expert staff to do the work, can save tremendously, compared with the efforts of anyone who is not familiar to any high degree with the subject. The actual cost of special engineering service in connection with reinforced concrete construction is absolutely negligible compared to the saving it is possible to effect over other materials of construction or the employment of engineers who lack practical experience.

3. As previously stated, reinforced concrete is manufactured on the site. Now, generally speaking, in the process of manufacturing any material, the work of manufacture is