west to the seaboard by some four hundred miles, and would give Canada an advantage which it would be impossible for her to be deprived of. It would be the means of building up the interests of Toronto and Montreal, of developing our shipping and of promoting trade between this country and Great Britain. The cost of a ship-railway is placed at $12,000,000 to $15,000,000. The cost of the proposed American canal is estimated at $110,000,000. If, as is supposed, the saving in cost of transportation in deep draught ships from the lakes to the ocean, would in a single year amount to sufficient to pay this latter sum, there would not appear to be much risk involved in the Canadian enterprise at so much less cost, and in view of its greater advantages. The benefits to be derived from carrying out the undertaking, will depend to some extent upon its early commencement and speedy completion, in order that the volume of trade which, as stated, has already begun to flow in this direction, may be encouraged, instead of being allowed to be diverted into other channels.

SCIENTIFIC NOTES.

THE MONIER SYSTEM OF BUILDING CONSTRUCTION.

By Lewis Angell.

At the meeting of the Science Standing Committee, 4th inst., I called attention to the Monier system of building construction which I have recently had the opportunity of inspecting in actual operation in Berlin. The system consists of a combination of cement or fine concrete with a net-work of wrought-iron wire or small bare forming a core. The system is applicable to a great variety of forms—viz., floors, ceilings, roofs, domes, walls, bridges, retaining walls, waterpipes, circular or oviform sewers, &c., and even the fortifications. Its recommendations are great strength, and economy in materials, space, and time. It is especially fire and damp-proof, and, to a large extent, independent of skilled labor.

The accompanying sketches will generally illustrate the system, which, as above stated, can be applied to various forms of construction.

Fig. 1 is an illustration of a fire-proof floor or arch about 10 feet span and 1¼ inch thickes. Upon an ordinary centre of planks a layer of cement and sand, in the proportions of 1 to 3, is laid one half the intended thickness of the arch. Upon this

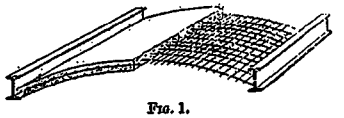

Fig. 1.

are laid longitudinally and transversely wrought-iron wires about ¼ inch diameter, so as to form a net-work with about 3-inch interspaces or mesh, the intersections being secured with fine wire. The net-work is then covered with another equal layer of cement, completing the thickness of the arch, the wrought wire net-work being thus embedded in the cement as a core. The spandrils are filled in with concrete in the proportion of 1 to 8. The thickness of the wire and the cement arch varies with the span and weight to be carried. The Hungarian Government tested a Monier arch, 2 inches thick, of 8 feet span, and 6 inches rise, by a distributed load of 31 tons with safety. Another arch 4 inches thick of 30 feet span carried a distributed load of 42 tons. A bridge has been constructed over the canal at Bremen with a span of 125 feet and 7 feet rise, having a thickness of only 7½ inches on the crown.

It has been proved by tests and expreience that the expansion and contraction of the cement and iron are equal, that cement and iron possess great affinities and become a solid mass, and

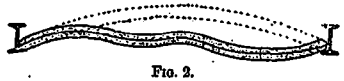

Fig. 2.

that the iron is not oxidized or otherwise affected independently of the cement. This form of construction give a maximum of strength with a minimum of material. It has also been proved by tests of the Hungarian Government that arches constructed on the Monier system will bear five times more weight than a corresponding best concrete arch, and that Monier slabs or landings will bear twelve times more weight than corresponding slabs of concrete. Another valuable quality of the Monier construction is that it will not suddenly break, crash, or collapse as in ordinary construction, but it gradually buckles or sags, retaining the weight above (fig. 2). The chief of the Berlin Fire Brigade has issued an official order that firemen are to enter buildings constructed on the Monier system, as there is no risk of floors and ceilings cracking and falling by reason of either heat or water.

The system has made great way in Germany, Austria, Hungary, and other parts of the continent during the last three years in connection with public buildings, palaces, warehouses, bridges, waterworks, tunnels, drainage, &c.

The foregoing is only a general description of the wonderful results on the continent of this new system invented by Mr. Monier and elaborated by Mr. Wayss, the eminent engineer-architect of Berlin; and capable of such wide application. Its conception in a modified form is not altogether new. There have been proposals to introduce a wire-wove core in various forms, but there has not hitherto been any serious application of the principle to actual construction, nor does there yet appear to be any instance of its adoption in this country. Its first intended application is to be in the deck of the new pier about to be constructed at Brighton, in the form of horizontal slabs or paving, whereby a considerable amount of time and the space it would occupy will be saved. The system is well worthy of the serious consideration of British engineers and architects.

ILLUSTRATIONS.

PHOTOGRAVURE PLATE—PROPOSED NEW UNION STATION, TORONTO.—STRICKLAND & SYMONS, ARCHITECTS.

The main building facing on Front street will be built of red Credit Valley stone for the two lower stories, and pressed brick with red Credit Valley stone dressing for the stories above, the roof being covered with red tile. The main entrance will be built of cut stone, floored in tile and leading into the main hall or rotunda, 40 x 50 ft., finished in oak, with tiled floors, the ceiling being panelled and enriched and the walls arcaded with stone and marble columns. The entrance to the company's offices will be by the tower entrance, which will contain an iron staircase and passenger elevators. Passing through the rotunda where tickets are purchased and baggage checked, the arcade corridor 20 ft. wide leads to the main waiting room. On either side of the corridor the store will be handsomely fitted up in most modern style.

The general waiting room 75 x 80 ft. will be finished in pressed brick and cut stone, with heavy enriched and panelled oak ceiling, with colored glass dome sky-light, light being also obtained from clerestory windows on three sides. The floors of this room and other waiting rooms will be laid with mosaic flooring. The ladies' and gentlemen's waiting rooms will be fitted up in hardwood, with decorated plaster ceilings, and the lavatories in connection with both of these rooms will be fitted up in the very latest and most complete style. Conveniently situated off the main waiting room will be the telegraph and parcel offices and news stand, with their respective fittings specially designed for their various uses. The outer or bridge waiting room will be finished in ash or other hardwood, with plate glass windows and doors. Two passenger elevators each capable of holding 40 persons will connect this room with track level, and also a handsome staircase ten feet wide finished in hardwood.

The new south train shed will be entirely of iron and glass and conform to the latest improvement in train shed construction.

The lighting throughout, and all power for elevators and other machinery, will be by electricity supplied from plant in the basement of main building. Heating throughout will be by steam.

The expenditure for the entire building will approximate $500,000.

POWER HOUSE, HAMILTON ELECTRIC STREET RAILWAY COMPANY, HAMILTON—JAMES BALFOUR, ARCHITECT, HAMILTON.

"CANADIAN ARCHITECT AND BUILDER" COMPETITION FOR A TOWN COTTAGE—DESIGN SUBMITTED BY "VERISOPHT."