cars for many years. It consists essentially of two drums which revolve in bearings, and stationary contact fingers which make contact with points upon the revolving drums. The large, or main drum, opens the main circuit and makes the motor and resistance combinations; the small drum reverses the motors. A multiple control switch is placed at one or both ends of each motor car, and by means of the one at the front of the leading car the motorman controls the action of the controllers on all the motor cars in the train. Some of the points of superiority of the system over other systems may be stated as follows:

It employs compressed air for operating the control apparatus and thereby uses a powerful and reliable agency. It uses the standard type of controller and standard types of valves and magnets, the latter having been used for years in the operation of the Westinghouse electro-pneumatic system of switches and signals upon the largest railways in the world. The control circuit is isolated from the main power circuit, and is, therefore, not affected by a momentary interruption of current due to ice and sleet on the rails, or other causes. With the low voltage current, ground and short circuits at the connectors between the cars during stormy weather or fires resulting from high voltage circuits through the train are entirely eliminated. The current for the motors is simply collected from the third rail, led through the local car controlling apparatus to the motors, and then back to the service rails, and does not pass from car to car. The controlling apparatus is so located that the motorman may have convenient access to all parts from the platform.

The motor circuits on any car are automatically opened or closed at the will of the motorman. All controllers are automatically turned off by the application of the automatic air brakes, which is an important point since in case of a train breaking in two the brakes are automatically applied and at the same time the power is shut off. With other systems under some circumstances, it has been found impossible to shut off the power from some of the cars, while in the Westinghouse system there are a number of ways in which this may be accomplished, greatly reducing the possibility of accident. Both controllers and circuit breakers are opened by a breaking in two of the train, this action being independent of and in addition to the effects obtained by the application of the air brake. The controllers may be operated by hand, thus permitting the train to run to a terminal station in case of any derangement of the controlling apparatus. The operation of both brakes and controllers is effected by a single air hose connection between the cars, the air compressor which furnishes air for the brakes also furnishing air used to operate the controllers.

The Brooklyn Elevated will equip all its new cars with four motors each. The 150 cars now in use equipped with the Westinghouse system have each two motors. The trains on the road are made up of five or six cars, two or three of which are usually motor cars. When these trains reach the suburbs they are broken up into smaller units of one or two cars, each of course containing a motor car, and the smaller trains branch off on different divisions. By the use of this system it is possible to operate cars individually as on ordinary trolley roads, or to make them up into trains of any length. Also, any proportion of motor cars may be used, making it possible to obtain any desired amount of power for starting the trains quickly, which is necessary in any service involving many stops.

ENGINEERS' CLUB OF TORONTO.

The annual meeting of the Engineers' Club, of Toronto, was held in the club rooms, 94 and 96 King St., W., Toronto, on the 7th of January. The reports of the various officers and committees for the past year were presented, showing the club to be in a good position. It has now over one hundred members. The following were elected officers for the ensuing year: President, C. H. Rust; first vice-president, C. M. Canniff; second vice-president, Capt. K. Gamble; treasurer, H. F. Duck; secretary, Willis Chipman; directors, R. A. L. Gray, R. F. Tate, W. H. Patton. The following standing committees were appointed: Finance—T. A. Culverwell, chairman; F. L. Somerville, C. W. Dill, W. E. H. Carter, Norman McLeod. Rooms—J. G. Sing, chairman; W. J. Bowers, A. B. Barry, A. C. Larkin, A. A. Bowman. Library—G. R. Mickle, chairman; C. E. Cooper, H. S. Holcroft, A. J. Van Nostrand, A. M. Wickens.

A special meeting was held January 22nd, when the members of the Ontario Association of Architects and of the Toronto Architectural Eighteen Club were present to take part in a discussion on Concrete Construction. H. F. Duck opened, and was followed by F. W. Barrett, of the Expanded Metal Fireproofing Co., who went into the matter fully, giving the result of numerous tests as to the strength and fire resisting properties of concrete, especially when used in connection with expanded metal. The discussion was taken part in by a number of others, and brought out the fact that concrete is destined to become more and more a material for construction, displacing to a large extent stone.

Arrangements were made for a curling match between the engineers and architects at an early date.

HARDENING ANNEALED NOVO STEEL.

As United States engineering firms have taken up the "Novo" process for tempering and hardening steel with much success the following hints on the working of it on taps, reamers, cutters, drills, etc., will be of interest: After a tap has been machined, and is ready for hardening it should first be placed into a gas furnace and heated up to a good orange color heat, and then taken out and placed into a lead bath covered with powdered charcoal, the lead having previously been heated to a full white heat or as hot as it is possible to heat lead. Heating the tap first in the gas furnace assures the same from any possible danger of warping which might occur were the entirely cold tap suddenly submerged into the white hot lead. In order to get the lead to the white heat, it is necessary to use graphite crucibles, as an ordinary cast-iron pot would not stand the heat and the bottom would be apt to drop out. The tap thus heated in lead to the required full white heat, which is absolutely necessary for the hardening of this steel is prevented from scaling on account of absolute exclusion of air. When the tap has acquired the proper full white heat in the lead, it should be dipped into oil, any good fish oil, linseed or cotton seed oil, will answer the purpose, and entirely cooled off in the oil, but where the shank of the tap is considerably smaller in the diameter than the body of the tap, the shank should not be submerged in the oil, thus allowing the part outside of the oil to remain softer than the balance of the tool hardened in the oil. Taps larger than 1-inch diameter by 6-inches long should be dipped gradually and slowly into the oil. When the tap is taken from the oil, it will have a silvery white appearance and should this not be the case, it is a sure sign that the tap has not been heated hot enough in the lead.

Novo taps hardened in the above manner will come out correct to size and with perfect teeth and no scale, and will be so hard that no file will touch them. The temper of the tap should then be drawn in hot sand to a deep straw color, but the drawing of the temper should not be checked in any way and the tap when it has reached that color should be taken from the sand and allowed to cool off in the air. The lasting and cutting quality of the taps can be greatly improved by giving the teeth of the taps a good backing. It is claimed that the speed of Novo taps can be safely increased three times that of the regular tool steel taps, if the shank is reheated in the lead to an orange heat and the shank only placed into lime and permitted to cool off.

Reamers and drills and all special cutters of this kind should be hardened in the above manner, only with the exception that for reamers above 5/8-in. diameter it will not be necessary to draw temper after hardening, and also the shank may not require reheating or softening.

Milling cutters should be hardened at a white heat, same as the taps, in oil. Cutters which can be ground into shape, and where the scaling is not objectionable, may be heated in an open fire to a white heat and plunged into oil or small cutters and end mills into hot water. The temper