

been my life occupation and because the railroads have played such an important part in the building up of our country. The following statistics may be of interest (from the Statistical Year book.) At the end of 1875 there were in operation in Canada 4856 miles of steam railways, and at the end of 1899 17,250 miles.

The number of passengers carried by these railways in 1875 were 5,190,416, and in 1899 19,133,365. In 1875 the freight amounted to 5,760,836 tons, and in 1899 31,211,753. The gross earnings, \$19,470,539, 1875; \$62,243,784, 1899. Proportion of expenses to the receipts was in 1875 81.02%, and in 1899 65.40%, which goes to show how we are improving in our work.

The average capital cost per complete mile of railroad in Canada has been up to 1899 \$55,577, which is lower than in Europe and the U.S.A., but higher than in most of the Australian colonies.

The first railway in Canada was opened on 23rd July, 1836.

Electric railways have come into prominence within the few past years, and made great progress, having taken the place of the old horse railways in all our cities and towns and extending out into the country in all directions, competing to a great extent for suburban and other local traffic with the steam roads, and in many cases making good feeders for these.

It is possible that electricity will take the place of steam power on parts of our railways, particularly through districts where water power is at hand and can be economically developed.

I regret that time will not allow me to touch on all branches of engineering, as I do not consider my address to be complete without it, and I must therefore ask you to accept it as it is.

BLASTING.

Double primers, that is, two primers in one charge of high explosives, are advocated by some, when firing by electricity. In this case the first primer is placed at the bottom of the charge, and the subsequent cartridges carefully compressed upon it. This practice is not to be recommended except when carried out by men of the best experience.

MIS-FIRES.

A constant source of danger arises from holes which have missed fire. Never be in a hurry to examine such a hole under any circumstances. When the firing is done by electricity, a half hour should be allowed; when with fuse, wait several hours. It is best then to loosen up the fuse if possible, retreat quickly, and wait again a few minutes. If no explosion occurs, then proceed to withdraw the tamping with a copper or wooden spoon. Never use iron or steel for this purpose. In the case of high explosives, or of black powder which had been primed with a cap or detonator, remove the tamping to within about 3 inches of the charge, and no closer. Then recharge above this with a large charge of dynamite, and detonate in the ordinary way. If black powder and fuse had been used, withdraw all the tamping, recharge above the old charge, and fire. If dynamite is available, except in quarrying blocks, where this procedure might entail losses of valuable stone, it is safer to explode such a missed hole of black powder with a dynamite primer, which must not be compressed before firing. In general the use of two kinds of explosive in the same hole

is a practice to be most strenuously condemned.

ADAPTATION OF EXPLOSIVES.

Adaptation of explosives to the kind of work to be done is of the utmost importance. Dynamites are not suitable for quarrying except where rubble is being obtained. Only the lowest power (40 per cent.) should then be used. Black powder is the best material for quarrying, although it is claimed that the lower power of jovete develops its explosive effect with sufficient slowness to be adapted to such uses. Also for certain ores, which contain galena and other minerals which may be too highly pulverized by high explosives, a slow acting powder is essential. High explosives pulverize and shatter; black powder fractures. The higher the power of the dynamite the larger is the sphere of pulverization. For railroad work, and for "dead work" in mines, such as shaft sinking and tunnel driving, it is advantageous to use the higher grades of powders, such as 60 per cent. and 75 per cent. dynamites, and their equivalents in other forms of high explosives.

CHAMBERING.

The bore-holes we have been considering are round and slightly tapering toward the bottom. These are suited to blasting

in homogeneous rock. In tough material, such as highly kaolinized felsic rocks, or in clay banks, and in rocks which are extensively cross-fissured (e.g., many felsites), in which latter the gas pressure from the explosion is partly relieved by merely expanding the seams or fissures, it is necessary to employ larger concentrated charges instead of the "extended charge" of an ordinary bore-hole. The commonest method of chambering, or making an enlarged cavity, is to detonate in the end of the hole a small charge of 60 per cent. or 75 per cent. dynamite, using a treble-force detonator, and no tamping. Into the chamber thus produced the charge is filled in the regular way. In the case of short fissured rocks this method often fails. It is then necessary to enlarge the cavity with a special tool, called an expanding bit, made for this purpose.

BANK BLASTING.

Bank blasting is practised in breaking up large masses of more or less firmly cemented gravel in hydraulic mining, so as to admit of washing it out with a monitor.

(To be continued next week.)

DEBENTURES

Municipalities contemplating the issue of Debentures will find it to their advantage to communicate with

G. A. STIMSON & CO.
Investment Dealers

24 and 26 King St. W. - TORONTO

Lyons Electric Co. - Brantford, Ont.

Contractors, Specialists, General Supplies.
Close Figures on High Class Work

PORTLAND CEMENT



HIGHEST GRADE

SOLE AGENTS—

Bellhouse, Dillon & Co.

Largest Makers in the World.

30 St. Francois Xavier Street

MONTREAL

BELLHOUSE, DILLON & CO., 30 St. Francois Xavier St., Montreal

Sole Agents for the Compagnie Generale des Asphaltes de Franco (Rock Asphalt).

PORTLAND CEMENT NORTH'S CONDOR

Paving and Fire Brick a Specialty

"DYCKERHOFF" and "WHITE CROSS" Brands

NORTH'S "CONDOR" BRAND AWARDED FIRST PRIZE AND GOLD MEDAL AT THE ANTWERP EXHIBITION

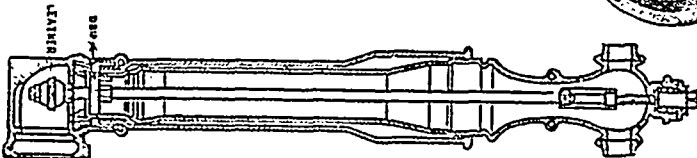
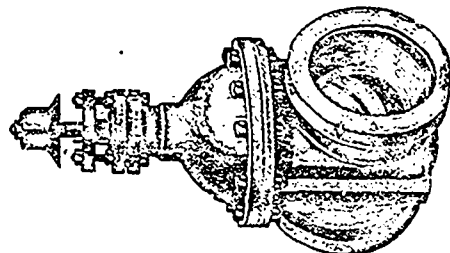
The KERR ENGINE COMPANY, Limited
PUMPING MACHINERY,

HYDRANTS and VALVES

Are our Specialties

Don't fail to write us for Catalogue and prices.

WALKERVILLE, - - - ONTARIO



A. E. AMES & CO.

BANKERS.

18 King Street East, TORONTO.

Buy and Sell

GOVERNMENT, RAILROAD and
MUNICIPAL SECURITIES.

MUNICIPAL DEBENTURES BOUGHT

ÆMILIUS JARVIS & CO. (Toronto Stock Exchange) 19-21 King St. West, TORONTO