shaft, was an operation requiring care and patience, but it was accomplished without appreciable error by H. T. Fisher and his staff.

A second shaft was sunk, some 70 ft. just to the north of Sherbrooke St., and at the bottom of this the shield was put together.

A third shaft was projected at Pine Ave., but considerable opposition was met with from the wealthy residents of the neighborhood, and it was abandoned, and undoubtedly the advantage from it would merely have expedited the driving of the heading, not of the completed tunnel.

A fourth shaft was sunk on Dorchester St., and it was from this that a large quantity of material was removed, because there happened to be a very large and almost vacant piece of property at this point, on which material could be wasted for the time being, until the tunnel became available for hauling it away.

Anecdotes

The chief engineer in charge of the tunnel construction, S. P. Brown, in his enthusiastic belief in and support of everything connected with the tunnel working, got into some rather amusing situations which he relates himself with considerable humor.

On one occasion he was dining in a house almost over the line of the tunnel, and his host took occasion to remonstrate against the heavy blasting which sometimes shook the house and made his women folk nervous. Brown assured him that this had been stopped altogether and only the lightest of charges were being used, and especially at night.

Just then a tremendous shot was fired, and all the front windows were smashed. It was a very embarrassing moment, and Brown had some difficulty in preserving his dignity and his host's respect.

On another occasion a discussion arose with reference to the effect of the vibration occasioned by moving trains on some of the delicate instruments in McGill University, which is almost immediately over the line of the tunnel; the seismograph, for instance, which is intended expressly for recording terrestrial vibrations.

Brown stoutly maintained that there would be no effect whatever, and that in New York a similar instrument near the subway had taken less notice of the blasting and the subsequent train running than it had of the San Francisco earthquake 3,000 miles away.

He suggested that the instrument be set up in a basement on McGill College Ave. while a blast was being fired, and they would see for themselves how absurdly small the effect was. The suggestion was acted on, the instrument set up, the blast fired,—and the seismograph went out of business altogether!

(NOTE.—The blast was a heavier one than Mr. Brown intended to have fired; and the fact that the weather was unusually cold and the ground frozen very hard, intensified the effect. The shock broke grate bars of furnaces in houses on McGill College Ave., so it must have been severe. We believe that Mr. Brown was correct in his contention regarding the seismograph in New York City.—EDITOR.)

Reasons for Electrification

As mentioned previously, the tunnel was planned from the beginning for electric traction. No effort was made to avoid the inevitable in this respect. It was felt that while very much cheaper in initial cost, a steam service through such a long tunnel would not be popular with the public; fans and artificial ventilation would have to be installed; and that even outside the tunnel, on the city end, there would be a strong opposition to steam operation over the streets, and justly so, for Montreal is already more saturated with coal smoke than even Toronto.

Some will remember the fatal disaster in the St. Clair tunnel, when it was operated by steam locomotives, although this is not much more than one-third the length of the Montreal one. Some minor mishap necessitated a stop at the lowest point in the tunnel, and some of the train hands were asphyxiated by the waste gases from the locomotive before help could be got to them. Even on a passenger train, although the trip lasted a very few minutes, there was a certain sense of suffocation and a feeling of relief when the trip was over. This accident precipitated the inevitable change to electric traction, and in the case of the Pennsylvania and Detroit tunnels, electricity was installed from the very first.

In the Montreal tunnel, in actual experience, the air is just as fresh as it is outside, and there is quite a marked natural circulation through it. The air at the city end is nearly always warmer than that at the west, or country, end, and rises from the terminal excavation, causing a strong draught of cool air from west to east. With the west end warmed up by a westerly sun, while the east is in shadow, the current will very probably be reversed, but the normal conditions seem to be as above.

The electrification work, which is a very interesting study in itself, was under the very able charge of W. C. Lancaster. A study was made for developing power at St. Ursule Falls, on the Canadian Northern line, some sixty miles east of Montreal, and transmitting to Montreal, but the power was not very reliable and to make it so meant a lot of interference with vested rights and privileges, which threatened to raise the capital cost and resultant charges to a point which meant that it would cost more per horse-power than it could be obtained for from the Montreal Light, Heat and Power Co., and an arrangement was made with that company to supply the necessary power.

The system is a direct current of 2,400 volts, much higher than we have been accustomed to up to the present. The 80-ton locomotives take the current from a trolley wire by means of a pantograph. The third-rail system was considered, but on account of the heavy snowfall at Montreal, and occasional accumulations of ice, it was not considered desirable. In actual test these locomotives haul a 7 or 8-car train against the adverse 6/10 of 1% grade through the tunnel in 7 minutes, or practically 30 miles an hour.

May Extend Electrified Zone

The electric zone extends at present only to Cartierville, which on account of its being a convenient point at which to establish a divisional yard with locomotive house and shops, was considered the best point at which to make the change. It is altogether probable that as the intermediate country gets settled up with suburban residences (a movement which has already commenced), it will be extended to St. Eustache, a very prosperous town with beautiful surroundings; and we hope, eventually, to Ottawa. Only the heavy cost of installation prevented this being done in the first place. The route to Ottawa, lying as it does along the banks of the river, and generally within sight of it and of the Laurentian Hills beyond, is quite the most attractive of the four existing ones, and within a mile of being the shortest. It has already made a good start in popularity; and with the additional attraction of electric traction, it should pretty nearly monopolize the business.

At the annual meeting of the Ottawa Branch of the Engineering Institute of Canada held January 9th, the following officers were elected for this year:—R. deB. Corriveau, chairman; J. Challies, secretary; members of the managing committee, A. F. Macallum, C. N. Monsarrat, J. Blizard and G. B. Dodge.

At a meeting of the Sault Ste. Marie branch of the Engineering Institute of Canada, held about two weeks ago, F. F. Griffin read a paper on "Efficiency Acceptance Tests of a 3,200 h.p. Water Turbine." The following were elected as the 1919 executive; J. W. LeB. Ross, chairman; L. R. Brown, secretary-treasurer; R. S. McCormick; B. E. Barnhill; A. G. Tweedie; and J. H. Ryckman.

The Civil Service Commission of Canada (William Foran, Ottawa, secretary) announce that applications will be received not later than January 31st for an engineer on the staff of the chief engineer of the British Columbia Hydrometric survey, at a salary of $1,500 per annum. Candidates must be graduates in engineering of some Canadian or British university, and must have had at least two years' experience in field and office engineering.