and found the home signal against it, it would be necessary to back to the station again in order to climb the grade. To overcome this condition, a telephone was installed in the cabin with connection at the station in order that the operator could be informed of the train movement and keep the line clear.

The second condition was in the matter of placing the derail east of the diamond on the Canadian Northern Ontario Railway, where it was found that 500 feet would interfere with the proper operation of the yard. In this case, the Board of Railway Commissioners sanctioned the position of derail at 400 feet, which made a satisfactory settlement of the difficulty.

The cost of single track grade crossing, protected by derails and home and distant semaphores, is made up as follows:—An easer rail diamond (ordinary type), $350; signal cabin complete, $525; interlocking and signal plant, $3,600; extras for incidentals, say, $100; total, $4,575. This amount may vary a slight degree either way as local conditions governing cost of labor and materials differ somewhat. It is, however, a close estimate of the present cost of such a plant.

The first cost of an interlocking plant is not as serious, however, as the future maintenance and operation, which amounts to about $100 a month, made up of wages for two signalmen at $45 per month each, and the balance in supplies and repairs. If $1,200 per annum be capitalized at 5 per cent., it amounts to $24,000, to which can be added the saving of the cost of grade crossing, making a total of approximately $30,000. It would thus pay a company to put that amount into the cost of any scheme which would eliminate the grade crossing, without taking into account the great advantage of having no delays to traffic and risk of accident.

ESTIMATING THE VALUE OF A WATER POWER.

Charles T. Main, Mill Engineer, Boston, Mass.

A water power may be of more value for one kind of business than another, and its value is very largely determined by its location. But passing these by for the present, the value of a water power depends upon:—

The quantity of water, the fall, and the uniformity of flow during the year and for a succession of years. This is an axiom, and we should be obliged to go no further than this to dispose of the method of estimating values as stated at the outset. The effect of the fall is to increase or decrease the cost of construction per horse-power. If the fall is low, the cost per horse-power of plant will be very much more than that for a high head. The value of that power of low head cannot be as great as that for the high head, other things being equal, for the first cost of plant and the fixed expenses, such as interest, depreciation, repairs, taxation, and insurance will be greater for the lower head per horse-power; so also will be the running expenses; and to get the same return for the money expended, as more money is required in the construction of the plant with a low head, less value can be placed on the power itself.

The effect of variable flow upon the value is more difficult to estimate, and to determine at what point of variability the power becomes of no value.

Other things being equal, the value of a water power depends very largely upon its location.

If the value of the water power varied directly as the cost of fuel, then the farther away from a railroad the power is located, and the more it costs to haul coal to it, the more valuable would be the power. If there is raw material to be brought to the mill and finished product to be taken away, it is a self-evident fact that the nearer the railroad or seaport the mill can be located the more valuable the power which drives it. This reasoning can be carried to reductio ad absurdum by saying that a water power is more valuable in the wilds of Maine, where there is no railroad, and consequently where fuel is expensive, than in Lawrence, Lowell, or Manchester.

The value depends largely upon the fact whether or not the social conditions are or can be made such as to cause good operatives to locate and remain in the place; upon the sanitary conditions; and sometimes even, in the case of a developed power, upon the management of municipal or town government. All of which cannot be estimated in dollars and cents, but which determine to a certain extent the profits or losses.

There is in almost every business need for steam for other purposes than power, if for no other purpose, in colder climates, than for warming the buildings in cold weather. This steam can usually be used after being exhausted from an engine, requiring the consumption of little or no more fuel than is required to produce steam for the engine alone.

The plant required for producing the steam is a necessity when water is used for power, and should be included in the cost of power plant, and the expense of running included in the cost of producing power. This item may be so large as to make a positive loss by running the boiler plant for steam for heating and using water for power, over and above the cost of producing the power by a steam plant and using the exhaust steam for heating purposes.

CEMENT BRICK CONSTRUCTION IN THE NEW PLYMOUTH CORDAGE COMPANY'S MILL.

The new No. 3 Mill recently erected by the Plymouth Cordage Co. at Plymouth, Mass., is distinguished by the fact that it is built entirely of cement brick (not concrete brick) made upon the ground. Two other mills of this company had previously been built of clay brick, but when the third mill was planned the price of such brick was extremely high. As the company owned a huge bank of clean, sharp, silicious sand and a bed of gravel containing a liberal percentage of stone, it was decided, after preliminary tests on short-time set, to use cement brick. The outside profits were thereby minimized and the entire work was conducted by a force built up from the regular organization.

The mill is about 114 ft. wide by 430 ft. long, with two stories and a basement. For the entire work of construction about 2,400,000 cement bricks were used, requiring about 7,500 barrels of cement for making. The bricks were made in four standard cement brick machines, operated by hand. Each machine made twenty bricks at a time. The mixture generally used was three parts sand to one part cement. For lightly loaded walls a few brick were made of four parts sand to one cement. The experience gained in the construction of this building led the owners to the opinion that for any ordinary building work these brick could be made safely in proportion of four and five parts sand to one of cement. All brick used on the outside of the buildings had a facing (1/8-inch thick after compression) of two parts fine sand and one part cement, with the addition of 2 per cent. waterproofing to the cement. Enough water was used to make a mortar of such consistency that it would hold its shape under compression without flushing water to the surface so as to cause the mortar to stick to the plates. The amount of water used averaged about 8 per cent. Although this amount would seem likely to produce a porous brick having a strong attraction for water, it was shown by tests that the bricks so made were quite impervious. The cement bricks appear to greater advantage as compared with clay bricks in regard to the bond. In fact, the former formed such perfect bond with the mortar that the resulting wall was practically monolithic. A valuable feature of the cement brick appears in the ability to cut it for special places. It was possible to make a cut half an inch thick for the full length of the brick and width. In the laying of cement brick anything can be done that it is possible to do with faced brick, every brick being the same in all dimensions, equal in appearance and quality, requiring no culling.

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