providing, of course, that the masonry is well laid in Portland cement mortar, the concrete being generally mixed in the proportion of 1:2:4.

The design of the profile submitted is based on the dam's being subjected only to the hydrostatic pressure of the water, acting on its upstream face, and also, to the ice pressure mentioned above. With these forces acting upon the dam, the profile is considered safe although, theoretically, the line of pressure would fall outside of the middle third limit for part of the height of the dam. A similar condition exists in some of the dams built for the city of New York, but these structures stand, nevertheless, successfully. In these dams the margin of safety is greater near the bottom than at the top, which is a good condition.

Having determined the profile in this manner, the effect of the greatest conceivable upward pressure acting on the dam has been calculated. Even in this case the

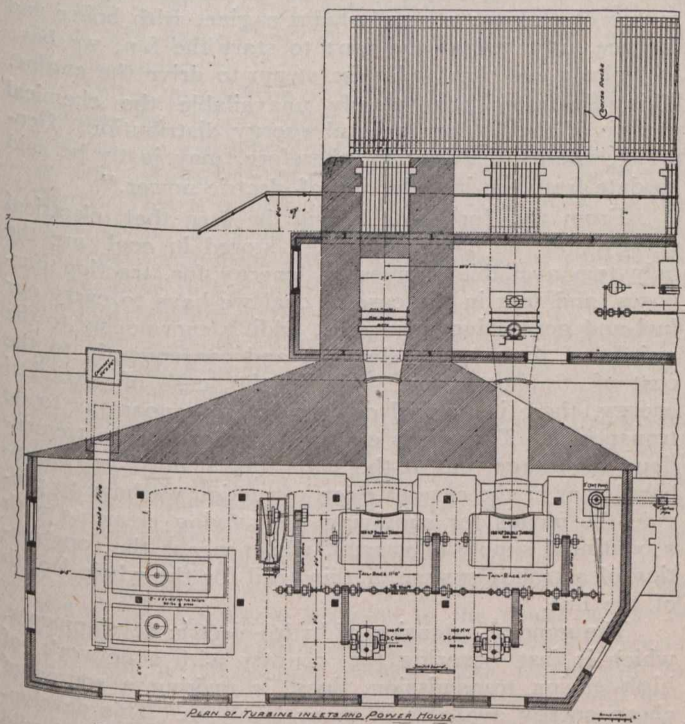

Fig. 8.—Plan of Proposed Power House.

lines of pressure would be kept within the profile of the dam. Some tension would be caused in the masonry, but such an extreme case of upward pressure can never occur and even if it did, the dam would still stand, owing to the cohesion of the masonry.

The width given to the top of a dam must be sufficient to enable the wall to resist shocks from waves and floating bodies and also ice pressure. On account of the thickness of the ice that will form in the proposed reservoir, it is recommended that the dam be made 20 feet wide at the crest. Theoretically this would not be enough to enable the upper part of the dam to resist the combined thrust of the ice and water by its weight alone. The cohesion of the masonry would have to be counted on to insure the stability of the upper part of the dam. From practical examples a width of 20 feet at the crest is felt to be sufficient.

At the top of the overflow weir, however, some reinforcement with steel bars will be required, as this part of the dam has not the weight of masonry, 20 feet wide and 10 feet thick, above the assumed ice line to add to its strength.

THE DEVELOPMENT OF ELECTRIC TRACTION.

By John R. Hewett in "General Electric Review."

THE steam railroad is just about a century old and the electric railway about a quarter as old, and when we think of the astounding developments that have taken place in this comparatively short space of time, we can hardly refrain from asking ourselves why this development has come about. The answer to this question would seem to be that the civilization of the world is absolutely dependent upon rapid communication between man and man—the communication of thoughts and of material matter. The invention of the steam engine and locomotive pointed the way, and then, with the introduction of the electric telegraph and the submarine cable, the different peoples of the world became so much more closely connected in thought that the general extension of a more rapid means of physical communication seemed imperative. The stage coach on land and the sailing ships on the seas had to be replaced by quicker methods of communication. It was about the beginning of the nineteenth century that people began to recognize that the country which developed the best means of rapid communication with other countries would be the leader in the commerce of the world—those that had most ships would control the seas and the markets of the world; and, similarly, that it was only those countries that developed an efficient system of land transportation that could develop their natural resources, and, consequently, become manufacturing countries.

The recognition of these great economic truths came about just at a time when the whole world had been well nigh torn asunder and rent by a series of wasteful and disastrous wars. In looking back at the history of this period, the development seems miraculous. All sections of the civilized world would seem to have taken on a new form of life, and commerce became to be recognized as a better trade than war. The development of better means of communication aided the rapid spread of civilization, and the spread of civilization stimulated industrial developments of all kinds. Thus was started an action and a reaction which has been continued up to the present time, with the result that to-day a man living in New York knows more about the capitals of China and Japan than his grandfather knew about many towns scarcely a hundred miles from his own door, and that each of us individually to-day are virtually in connection with the whole rest of the world. It is easier to make a trip around the entire globe to-day, in comfort and in luxury, than it was to travel from one end of New York State to the other, at the cost of hardships and dangers, a hundred years ago.

These developments have absolutely changed our modes of living, and during the transition stage one thing of vital importance has happened, viz., we have let these means of communication become our masters as well as our servants. When we stop to consider the enormous populations congested into our large cities, and the distances from which their daily food supplies have to be transporated, it is apparent that our means of communication are the masters of the situation. Should they for any reason fail to fulfill their functions in the community for even a brief time, it would spell death by starvation to hundreds and thousands of human beings.

So in this brief period of one century we have built up a set of conditions that has so complicated our modes of living and increased our dependence on the labors of others, living at a great distance from us, that now our transportation facilities have become just as much one of the necessities of life as are food and clothing. The