FIREPROOF STEEL AND BRICK GRAIN ELEVATOR.

(Continued from first page.)

is nothing more nor less than a brick vault with brick and steel ceiling.

The main grain floor is fireproof, underlined with tiling with convenient openings; so that, in place of its being necessary to sweep it in order to keep it clean, it can be flushed every night with water and drained into the canal alongside of the building. The upper floors, joists, rafters, girders, garners, scale bins and all other parts of the building other than the brick wall surrounding the structure are built of steel. The power necessary to run the machinery is transmitted to all the different elevator legs, conveyor belts, marine towers, and other necessary machinery, by electricity conveyed from Niagara Falls, twenty-three miles distant.

The building has a pile foundation, the piles being driven down from 30 to 48 feet below water to solid rock. Stone piers 8 feet high were laid on top of this foundation, supporting the columns. The elevator bins are built cylindrical in form, with a cone-shaped bottom, and consist of thirty bins 38 feet in diameter, 70 feet high; eighteen bins 15 feet 6 inches in diameter, 70 feet high; eighteen exterior small bins 9 feet 9 inches in diameter, 60 feet high; furnishing a combined bin capacity of 3,000,000 bushels. All the 38-foot and 15-foot 6-inch bins are built on a patent circular girder plan as suggested by President James J. Hill and patented by Mr. D. A. Robinson, the builder. The steel in the bins varies from ¼ inch to ½ inch in thickness and the total weight of metal in the bins is 6,000 tons.

The dock facing on Blackwell Canal is 24 feet wide, and is built of stone, with two standard gage railroad tracks, on which the movable marine towers rest. There are three marine towers constructed of steel throughout, each equipped with a marine leg, capable of elevating from vessels 20,000 bushels of grain per hour, and as each of these marine towers can be moved to connect with the hatches of a vessel, by means of a wire cable run by an electric motor, it is possible to unload 60,000 bushels of grain per hour from a ship. The grip for moving the marine towers is practically on the same principles as applied on cable lines. The machinery in each marine tower is driven by a 100 horse power motor. The main building is equipped with ten elevator legs, and each of these is driven by an independent 50-horsepower motor.

The cupola, which is built the whole length of the main building, is 40 feet wide, 400 feet long and 67 feet high. The top of the fourth story of the cupola is occupied by the elevator heads and gearing for reducing speed. The third story is occupied by 27 steel garners of 1,500 bushels capacity each. The second story is occupied by 10 (1,400 bushels capacity each) steel hopper scales. The first story on the top of the bins is equipped with ten of the Simpson & Robinson patent double-jointed distributing spouts for distributing the grain from the scales and various bins. There are also two of these spouts used for distributing the grain from the four cleaners to the various bins. There are two belt conveyors, 60 inches wide, on the spout floor, equipped with reversible motors and Robinson's patent reversible self-moving trippers. These are the largest conveyor belts in the world, and have a capacity of 40,000 bushels per hour each. Each one of the ten elevator legs in the main building is driven by an independent motor of 50 horse power, the power being transmitted from the motors of the geared counter-shaft at the elevator heads by Robinson's single leg rope drive.

There are four cleaners on the second floor of the cupola, driven by a countershaft from a 100 horse power motor, and on the same floor are two double fans, one for dust collecting purposes and the other for running the sweeper system in the top of the elevator. There is a 50-horsepower motor on the work or ground floor, which is used for running the cable to move the marine towers. It also runs a cable operated under the building and through the railroad yard, enabling the elevator company to do its own car-switching by electrical power. This same motor, also, runs the dust collector fan which is connected with all the elevator boots, as well as the double sweep-up fan, which runs the sweepers. There is a double system of dust collectors, upstairs and down, and a system of sweepers, each independent of the other. This method is entirely new and has never been used before.

The walls and roof of the steel cupola are covered with corrugated iron. There is an electric passenger elevator running from the work floor to the scale floor; and, also, a passenger elevator in each of the marine towers, which runs from the lower floor to the machinery and sheaves in the top of the towers; and in addition there are also spiral steel stairways in each marine tower, and two spiral steel stairways in each end of the elevator building. In addition to the motors above enumerated, the plant is equipped with a 10-horsepower portable motor on the portable shovel machine, which can be used for unloading cars or shoveling grain from the floor to the elevator boots, in case the basement of the elevator is filled with grain, at the close of navigation. A steel awning on one side of the building covers double tracks for loading cars, protecting grain so loaded from adverse weather conditions. There are nine shipping spouts that go between the cars, loading nine cars at a time on either track.

The three marine towers have an unloading capacity from boats of 600,000 bushels per day of ten hours, and the warehouse has a shipping capacity of 400 cars per day, as well as a shipping capacity of 100,000 bushels per day at the end of the elevator for canal boats, and a shipping capacity of 200,000 bushels at the side of the elevator on the Blackwell Canal.

The power is brought into the building on three wires, in the shape of a three-phase alternating current, at 2,200 volts. These wires are connected to a primary panel of white marble, which contains three plug switches and three high potential fuse blocks. From this primary panel leads are run to two 500-kilowatt transformers, which convert the current to two-phase at 420 volts. From these transformers four leads of 1,000,000 circular mils each are run to the distributing switchboard. This distributing switchboard is also built of white marble, and consists of nine separate panels, upon each of which are mounted starting and controlling devices for two of the motors. The starting devices consist of choke coils introduced between the 420-volt mains, for the purpose of cutting down the potential in order to reduce the first rush of current. The motors are operated by means of a double throw switch, one set of terminals being connected to the choke coils and the other set to the full potential. Upon starting, the switch brings the choke coils into circuit with the motor, and, when full speed is reached, the switch is thrown over to the full potential terminals. The motor equipment consists of eighteen two-phase induction motors with a capacity aggregating 1,000 horse power. These motors are of the brushless type, the wires being attached to binding posts mounted upon the frame of the machine. This insures absolutely sparkless running, as there are no sliding electrical contacts. All the motors are started and stopped from the switchboard with the exception of three motors in the moving towers, which have the switches and auto-starters mounted at the motors. This system of controlling all the motors which are located in the house from a central switchboard was adopted to prevent the ignition of the explosive grain dust likely to be caused by sparking.

The wiring from the switchboard to the motors was done on the three-wire system. All wires are run in the open and are supported on porcelain insulators attached to 2-inch by 6-inch wooden strips, which in turn are fastened to the brick walls and iron beams by means of lag screws and hook bolts. Wires throughout are kept uniformly a distance of seven inches apart. All wire was tested to a breakdown potential of 9,600 volts before being installed. The current is carried to the moving marine towers by a trolley system. The three trolley wires, which are of the figure 8 section, are fastened to and run the entire length of the dock side of the building, the current being taken from these wires by trolleys mounted upon the side of the towers. The height of the trolley wires is 40 feet above the dock. Owing to the large amount of current being carried, trolley shoes 6 inches long and grooved to fit a figure 8 trolley wire were used instead of wheels.

The building is lighted by incandescent lamps run on a two-phase system at a potential of 104 volts. The current for these lamps is supplied through two separate transformers, which are also located in the transformer room and whose primaries are connected directly with the 2,200-volt three-phase mains.

The transformer room is a solid brick vault with arch brick sills resting on steel girders. The construction of the building is such that it is absolutely proof against fire, and the protecting of grain stored therein by insurance is almost a sentimental safeguard. The structure has been so recognized by the Board of Underwriters in the making of the rate for this hazard so low that the cost of insurance is of but little moment.

Just six months from the time the building was started it was put in full operation; a remarkable fact, when the great size and novelty of the structure are taken into consideration.

Compressed Flour.

The British Admiralty and the War Department are testing, under various climatic conditions, the new method for preserving flour. One objection to the establishment of national granaries has been the difficulty of storing grain for any length of time. The grain germinates and is ruined, and to keep large quantities in sound condition has been pronounced impracticable. Experiments are being made with a system of compression into bricks by hydraulic pressure. The trials show that the flour so treated is not affected by damp, even under unfavorable conditions, and is free from mould. The compression destroys all forms of larval life and the flour is thus rendered safe from the attacks of the insects. The saving in storage is enormous, as the cubic space occupied by 100 pounds of loose flour will hold more than 300 pounds of the compressed article.

Correspondence.

Beet Sugar Industry in Nebraska.

To the Editor of the SCIENTIFIC AMERICAN:

In the continuation of your article on "The American Beet Sugar Industry," page 338, in No. 22 of the SCIENTIFIC AMERICAN, there is an assertion about Nebraska which I cannot allow to stand without correction, in the interest of the farmers and business men of this State. As an old practical European expert I have personally no interest whatsoever whether or not the group California-New Mexico or the group Nebraska-Utah is of greater promise as a sugar producing district. I am only interested so far that the beet sugar industry will prosper with the best results in the United States. You may classify me, therefore, to be entirely impartial and unbiased, although being accidentally a resident of Nebraska, and you will undoubtedly follow the maxim of equal rights to all, not wishing to inflict an injustice to the farmers and business men of Nebraska by possibly a one-sided presumption of your informant.

I wish to state that I had more than thirty years of practical experience in the line of beet sugar industry in Europe. Besides this, I have been for years a correspondent of the Viennese imperial meteorological central bureau, and as such I studied the weather observations in Europe carefully.

After this introduction, I request you to give space in your highly instructive and esteemed publication to the short correction; for it is not so much what your informant does say in conclusion of the article about the beet culture in Nebraska as what may be deduced therefrom between the lines by diligent reading capitalists or investors.

The American beet sugar industry is at present a topic of more than ordinary interest, for it means an important development of our rich agricultural resources to the lasting benefit of the whole country. In weighing the possibilities of different localities for beet culture, it is absolutely necessary to observe fairness and correctness in the assertions. If it is said in the said article on the subject, "to sum up, therefore, the future of the industry in California and New Mexico is quite rosy; in Nebraska and Utah it is somewhat problematical, though by no means dark," then it seems that the last inference is somewhat hasty, because there have been working with the best results beet sugar factories in Nebraska.

Comparisons between the European meteorological observations and those of the United States Weather Bureau for the Nebraska eastern and center sections (furnished by Mr. G. A. Loveland, section director) show that the normal annual precipitation, 25$\frac{6}{10}$ inches the average for the last twenty years in east Nebraska,* has been decidedly about one inch more for beet culture in the two eastern sections and in the central section of the State than the normal annual precipitation in the principal beet districts of Germany and of the Bohemian and Moravian parts of Austria. The average annual temperature in these three sections of Nebraska (48$\frac{5}{10}$°) is about 4° to 5° Fah. higher, and therefore somewhat more unfavorable than in the German and Austrian beet districts, but this seems to be neutralized by the better soil and by the significant fact that in Nebraska (ill reputed for so-called deficiency in moisture) 67 per cent of the yearly precipitation has fallen, during the twenty years of official observations, in the period of vegetation, in the months from April to August inclusively. The maturing period of the beets extends very far into October. A better showing cannot be made by any European beet growing district, hardly as good a one by any one of them. The mistaken idea that Nebraska must be devoid of sufficient moisture for beet culture seems to be traceable to the exceptionally dry years 1893, 1894, and 1895, remembered by all the people in the United States as the years of the great drouth, and perhaps to the fact that the arid western part of the State has been taken as a criterion for the whole commonwealth.

The reports of the Weather Bureau are easily obtainable and ought to be made the basis of all such deliberations, for they are the only reliable source of information on subjects in regard to this new industry. A study of these reports bearing on the climatic conditions of the eastern half of Nebraska will convince every unbiased observer that these conditions are most favorable for the successful development of the beet sugar industry. Essential tests, quality and quantity, of beets grown in the State, in the existing sugar factories have proved this to be the case beyond any doubt or negation. SARKANDER.

Omaha, Neb., December, 1897.

ZAANDAM, in Holland, has been celebrating the two hundredth anniversary of Peter the Great's stay in the town, where he worked as a ship carpenter. They had historic processions and boat races, and performed a play. "Peter Michaeloff," by a local playwright. The Czar sent a special envoy, and the Russian minister at the Hague was also present.

* Respectively northeast, southeast and central.