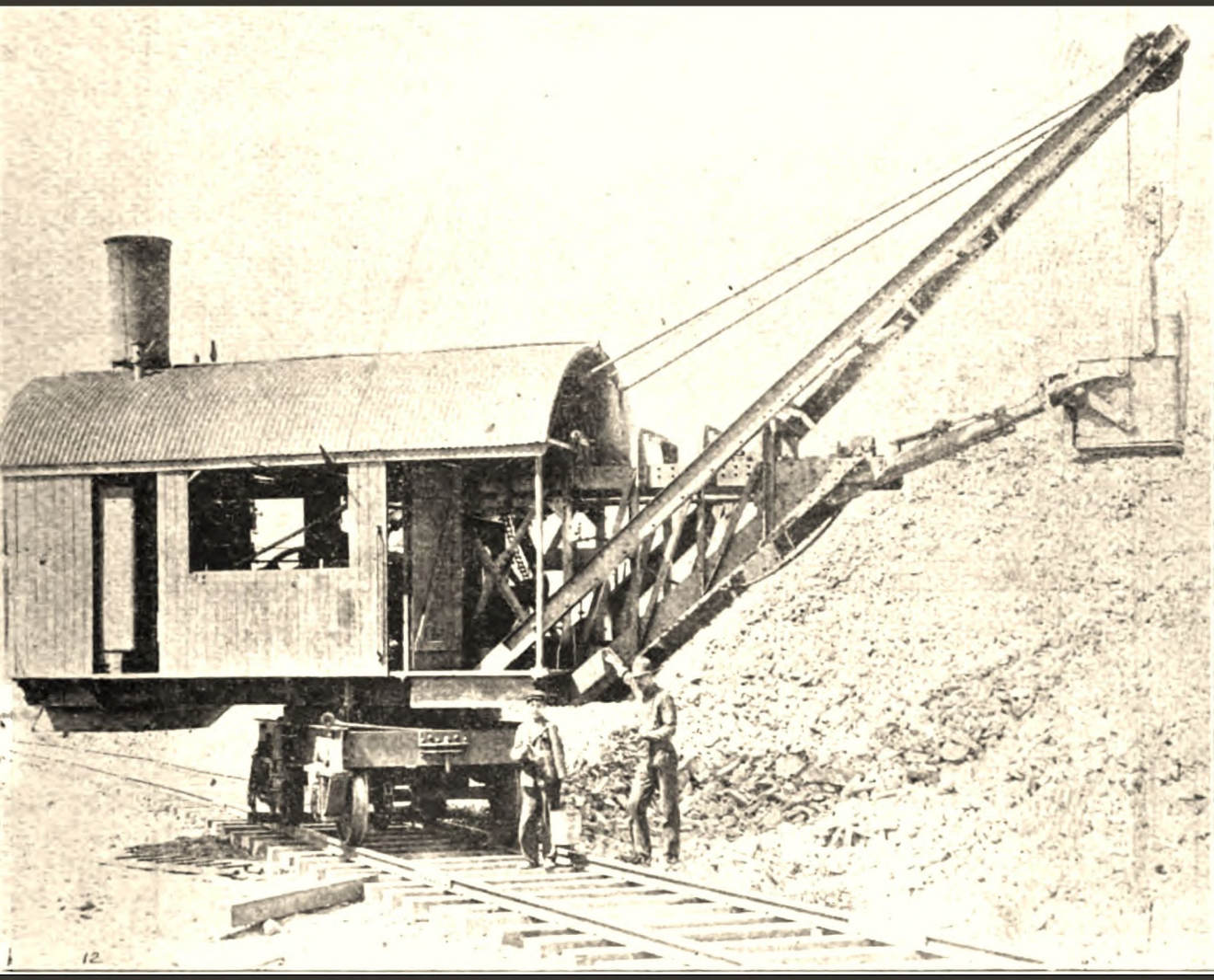
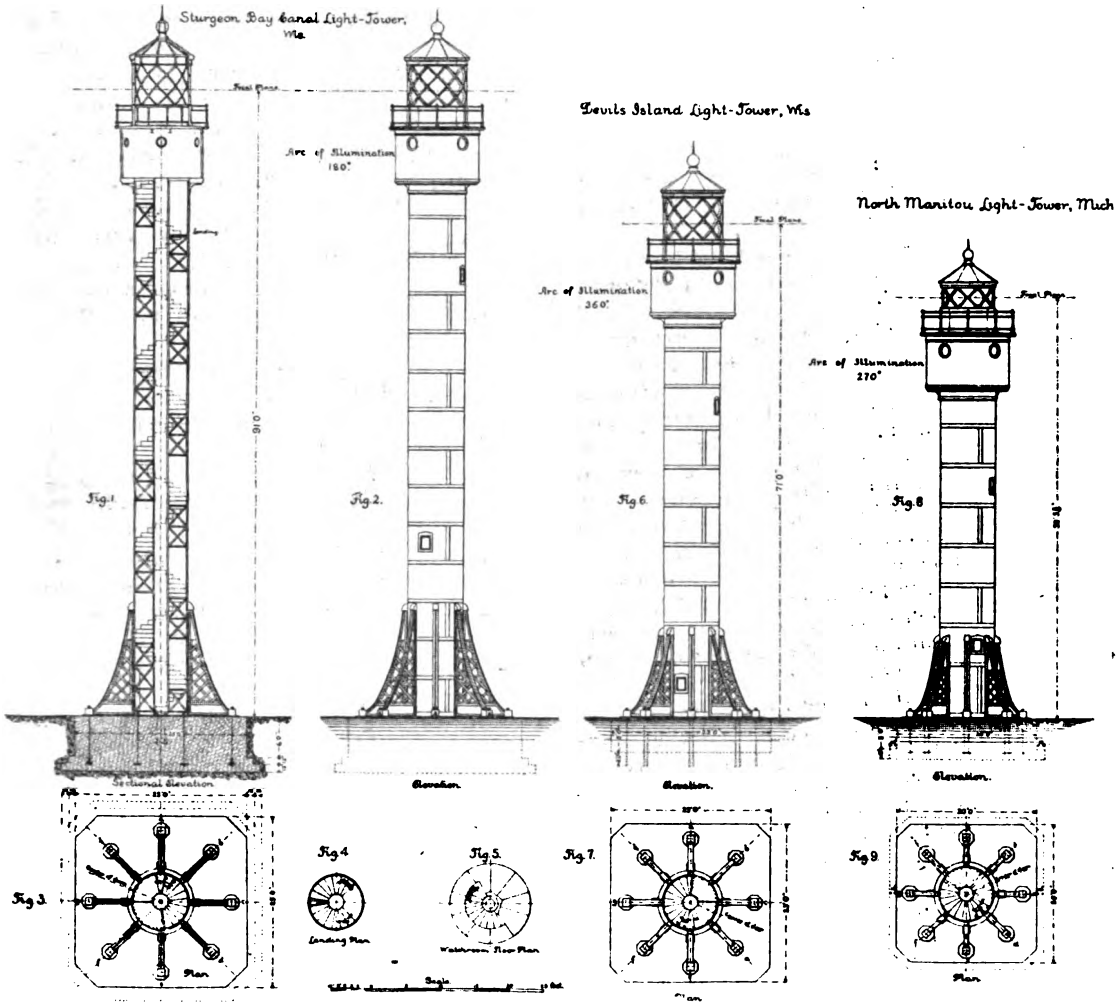


Steel and iron

STEEL LIGHTHOUSE CONSTRUCTION.

BY WALDON FAWCETT.

THE fact that the officials of the United States Lighthouse Board have considered and are considering the advisability of proceeding with the construction of an additional number of steel lighthouses is one of considerable interest and importance to metal working industries in general. Skeleton structures of steel, supporting beacons at a comparatively slight elevation above the surface of the water, have been in very general use for some time past on the Atlantic and Pacific coasts and inland lakes and rivers and have given entire satisfaction but there has been no such extended opportunity to pass judgment upon the qualifications of the lofty steel tower as a substitute for the masonry type of structure which has heretofore been utilized almost exclusively where it is n cessary to display a beacon at a considerable altitude.



Steel Constructed Light-House Towers.

Several years ago the national government authorized the erection on the great lakes of two steel light towers. The establishment of

these has been of an experimental nature and upon the showing they are, upon investigation, found to have made, will depend in a great measure the extension of this class of construction. Already the lighthouse officials have decided to make several very radical changes in structural details in case additional light towers of this general type are erected.

The two experimental towers erected on the shores of the great lakes were built by the Variety Iron Works Company, of Cleveland. One is at Sturgeon Bay canal and the other at Devil's Island, Wisconsin. The two towers although of different dimensions are identical in design. The structure at Sturgeon Bay is 91 feet in height from the ground to the focal plane of the light and that at Devil's Island is 71 feet. The diameter of each is eight feet. Each tower rests upon a cast iron foundation which is anchored to a concrete foundation 29 feet square and eight feet deep, there being utilized in the operation anchor bolts 1½ and two inches in diameter and seven feet and six inches in length.

The outer shell of the tower is ½ inch and the inner shell is three and three-eighths inches open hearth steel of an ultimate tensile strength of from 54,000 to 62,000 pounds per square inch. Each tower is supported by eight buttresses. In the case of the Sturgeon Bay structure these are 16 feet in height and give the tower a total base of twenty-one feet. The height of the buttresses in the case of the Devil's Island tower are 12 feet and give the structure a total base of 16 feet, six inches. In order to afford access to the watchroom, each tower is fitted with cast iron spiral stairs built between the shells and fastened to the inner shell.

The watchroom at the top of each tower is 12 feet in diameter and seven feet in height and the lantern is 12 feet nine inches in height and eight feet seven inches in width. The revolution of the lantern is effected by clock mechanism and the weight utilized in this connection is suspended within the inner tower. The inside shells of the towers are about two feet in diameter and the arrangement of this inner tower affords the opportunity for still further strengthening the structures by the provision in each of the light houses of eight sets of inner bracings extending radially the entire height to the watchroom floor. In the case of the Sturgeon Bay structure these inner bracings have an aggregate height of 78 feet, whereas in the case of the Devil's Island tower the length is 58 feet. The watchrooms are lined with plates of $\frac{1}{8}$ inch sheet steel held together by vertical and horizontal steel battens which are screwed to the [illegible] screws neatly countersunk.

[illegible]t advantage of steel light towers is found in the wonderful saving in the cost of construction which they afford as compared with the masonry structures. The Sturgeon Bay tower above described cost only about $8,000 while the cost of the tower at Devil's Island did not greatly exceed $7,500. The towers were first erected at the construction plant and were then taken down and shipped in sections to the places of destination as is done in the case of the steel steamers furnished for interior navigation in Africa. Of course the phase of steel light house construction into which the experimental element has entered, is found in the demonstration of whether or not the new type of structure will withstand the buffetings of wind and wave. If it develops that the plan of anchoring a steel tower to concrete foundation is effectual, the improved system will enable the saving of much time and money that has been deemed a necessary expenditure under the old plan of providing foundations. As a result of the observations made at the towers at Sturgeon Bay and Devil's Island and at a similar structure which the Variety Iron Works erected at North Manitou, Mich., it is probable that similar structures to be built in the future will be somewhat modified. In fact, Major D. W. Lockwood, the Engineer Secretary of the United States Light-House Board stated a short time since that one of the principal modifications favored contemplates placing the bracing on the outside instead of inside the tower.

A fair idea of the amount and quality of the metal work involved in one of the skeleton steel light-house structures provided at various points on the coasts is afforded by the Bull Bay light station, South Carolina, a recently completed and thoroughly up-to-date structure. The Bull Bay beacon is a steel structure having the shape of a frustrum of a square pyramid, 18 feet square at the base, 38 feet high, and 12 feet eight inches square at the top. The structure is supported by four concrete piers to which it is anchored. The foundation bolts are 1¼ inches in diameter and five feet six inches in length.

The four main columns of the structure consist each of a six inch by six inch by $\frac{1}{8}$ inch steel angle about 38 feet two inches long, drilled for the ¾ inch rivets which secure the gusset plates and the one-half inch rivets which secure the service or watch room lining. The twenty struts securing the top, bottom and intermediate points of the structure consist of six inch by six inch by one-half inch steel angles. The sixty-four gusset plates employed are each one-half inch in thickness. The eight I beams are 3.58 by six inches. In the upper part of the structure are eight by four by five by one-half inch steel tees.

The service or watch room is lined, the lining

consisting of twelve pieces of sheet steel ½ inch thick. Most of the sheets are secured to the structure by one-half inch round head rivets although at the gusset plate, I beam and tee studding connections, ¾ inch rivets are provided. Filling pieces one-half by six inches were inserted all around the gusset plates and tees in order to secure a plane surface on which to fasten the lining. The service or watch room floor consists of sixteen plates which are secured to each other, to the truss and I beams by ⅝ inch bolts.

The Light-House Board is fairly exacting in regard to materials furnished for these skeleton steel structures. The steel used may be either open hearth or Bessemer but specimens cut from the finished material for tests must show an ultimate tensile strength of 52,000 to 62,000 pounds per square inch, an elastic limit of not less than one-half of the ultimate tensile strength, an elongation not less than 25 per cent in eight inches and a bending test 180 degrees flat on itself without fracture on outside of bent portion. All castings must be of such quality that a rough bar one inch square, supported at points 12 inches apart, will break under a load of not less than 2,250 pounds applied at the center. Wrought iron must be capable of bearing a tensile strain of not less than 50 pounds per square inch of cross section. Bolt heads and nuts are always hexagonal unless otherwise specified and the diamond checkering wherever specified, is to be at an angle of 30 degrees to one side of the plate and the checkers must not be more than 1 ¼ inches in length.

On all government light-house contracts for the erection of steel structures, it is invariably specified that the beacon is to be completely erected at the shop prior to shipment, by temporarily assembling and bolting the various parts together and riveting those pieces which will not interfere with its being taken apart after inspection or its proper shipment to the place of delivery. It is not allowable to take down the structure until it has been inspected and marked according to a system prescribed by an agent of the Light-House Board. The marks are cut in with a chisel and when the work has been painted, they are duplicated in large figures painted on with white lead. Under ordinary circumstances metal work for one of the skeleton structures must be delivered at destination within nine or ten weeks after acceptance of bid and payment is made upon delivery.

The Alan Wood Iron & Steel Company, of Philadelphia, Pa., has been chartered with a capital stock of $1,250,000.

Fischer Company Expanding.

The Fischer Foundry & Machine Company one of the pioneer producers of rolling mill and plate glass factory machinery of this city, is planning enlargements in operations, which, with the present investment, will aggregate property assets of $500,000. George L. Fischer, the founder of the business and who until recently has been the proprietor, may retire permanently. The company has just been incorporated under the laws of Pennsylvania with a capitalization of $200,000 and, at a meeting to be held soon for the purpose of effecting a permanent organization under the new charter, it is planned to increase this capitalization to $350,000 and possibly $500,000.

At this meeting to organize Fred F., H. B., George L., Jr., and Albert Fischer will be elected directors. Fred F. Fischer will probably be elected president and H. B. Fischer, secretary, holding the same offices as in the present organization.

The company has just entered the market with new grinding and polishing machinery for plate glass factories, which bids fair to open a new epoch of advancement in the plate glass industry. The new plate glass machinery is to be manufactured after patents secured on the inventions of Fred F. Fischer, president of the company. It is held that the new glass machine will reduce the cost of plate glass manufacture fully five cents a foot. Largely on account of the promising scope of the business in the new plate glass machinery the plans for a new plant are being considered.

Lead Enamel On Iron.

A new and successful process for applying a coating of lead enamel to iron surfaces by mechanical means, and invented by M. A. Dormoy, was recently described in La Nature. The articles to be coated, after being heated to redness, are placed in a double hermetically sealed chamber with glazed sides: each half of the chamber can be worked alternately, and the surplus enamel powder, dusted over the metal by means of a sieve, is removed from the chamber by the draft from a high chimney. The necessary movements of the iron can be effected from the outside of the chamber, and the vibration of the sieves for the purpose of distributing the lead powder is provided for by an electrical beater.

John F. Young, Thirty-fourth street and A. V. Ry, this city, is in the market for a 60 or 70 horse power boiler.