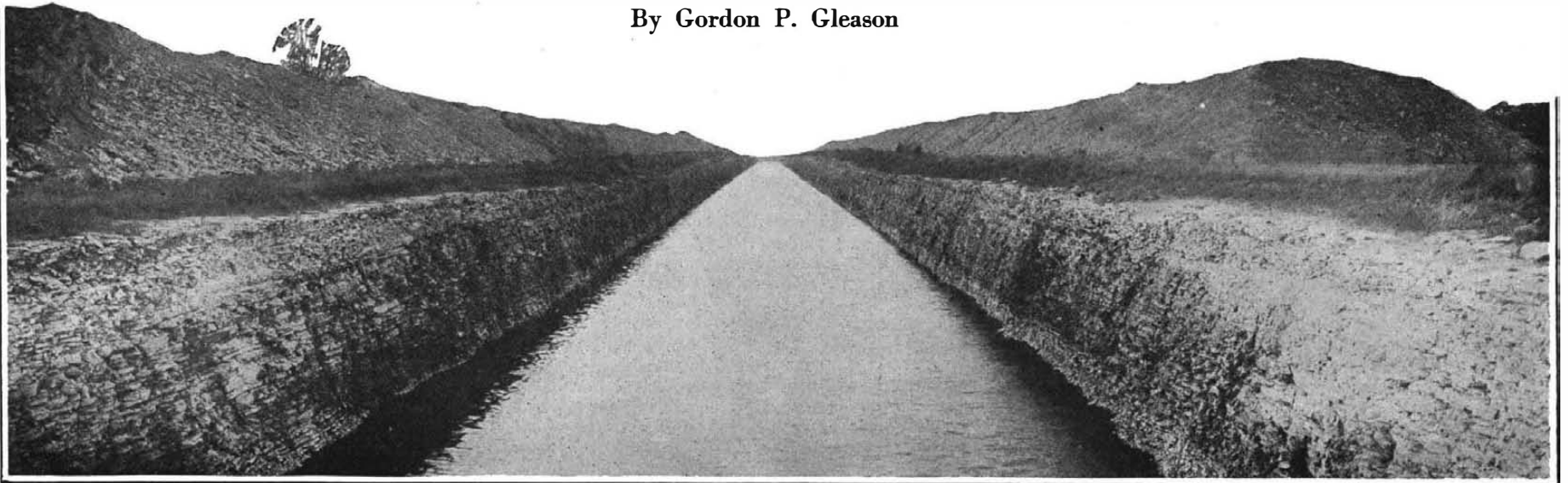


The New York State Barge Canal—III

The Type of Barge Best Adapted to Our New Waterway

By Gordon P. Gleason



Rock cut on a long tangent of the Barge Canal. In all rock cuts the channel is 94 feet wide

WITH interest in waterway improvements aroused throughout the nation, the question of what type of boat is best adapted for use on our existing channels and projected improvements has assumed much importance among transportation authorities, and the need of a standardized barge has become so apparent that the United States now seeks to solve the problem. In European countries the need of standardization has long been realized. Accordingly France, Belgium and Holland, years ago, adopted the 300-ton barge drawing 5½ feet of water as a standard, while Germany whose waterways, prior to the war, were second to none, was operating on its canals and rivers standard barges carrying from 400 to 600 tons and drawing from 7 to 8 feet of water. In this country, however, there has never been any attempt made at standardization, with the result that we have had a motley collection of boats on our rivers and canals.

Now that we have a merchant marine, the relation of the inland waterway to our trans-oceanic lines can be readily appreciated. Furthermore, eminent authorities are agreed that waterway improvements afford the only relief we can obtain from the railroad congestion which has been and will continue increasing until some agency is provided to relieve it. Most of our projected waterway improvements such as the Lake Erie and Ohio River, Lake Erie and Lake Michigan and Lake Michigan and Mississippi River canals, call for a channel with dimensions sim-

ilar to those governing the recently completed New York State Barge Canal. This modern canal with the proposed improvements in the Middle West, would give the nation a direct inland waterway system extending from the Atlantic Seaboard to the Great Lakes, Ohio River, Mississippi River and reaching into the industrial and productive centers of the nation. Thus, if present plans are carried out, there will be provided an inland waterway system having a minimum depth of 12 feet and a minimum width of 75 feet, the locks all having chamber dimensions of 310 by 44½ feet and a barge capacity of 3,000 tons. With such a system the standardization of barges should be a simple matter and, if brought about, would have a very healthy and economical effect upon our industries and foreign trade.

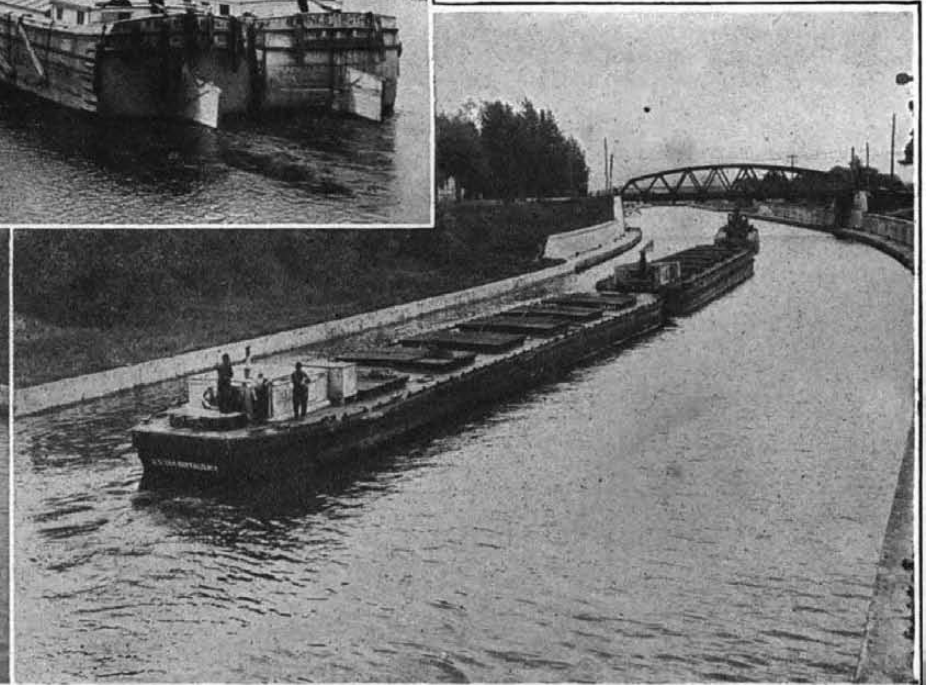
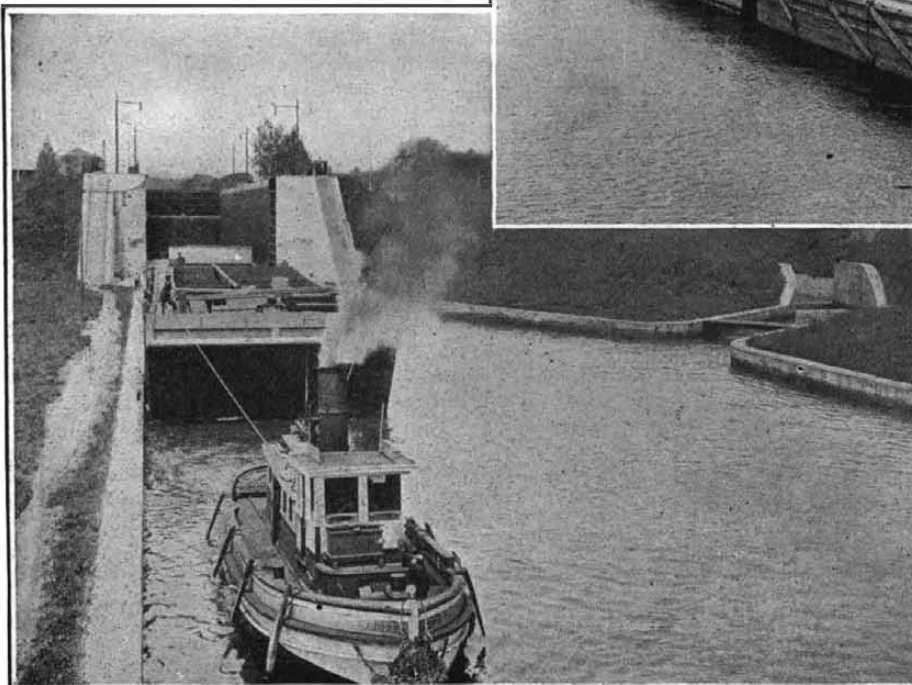
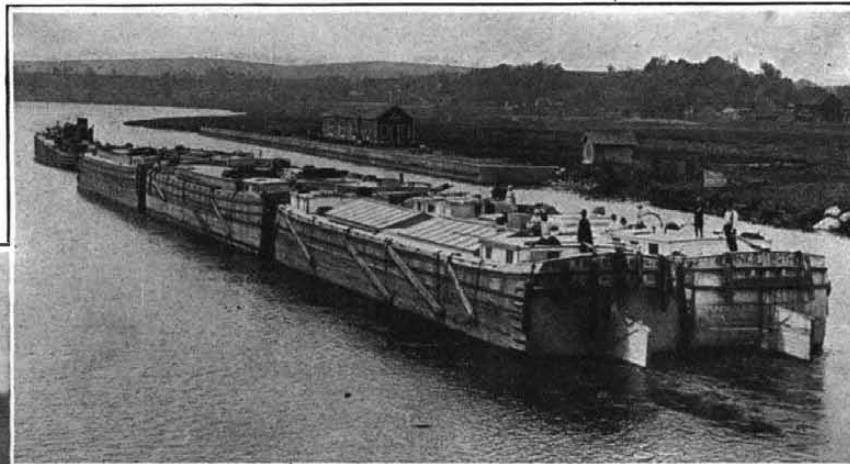
New York State authorities have been making a study of the types of boats best adapted for use on its canals. This study started in 1906 and, during the discussion of types which followed, a number of barges were advanced as combining all the elements neces-

sary to the efficient and economic transportation of freight between the Great Lakes and Atlantic Ocean.

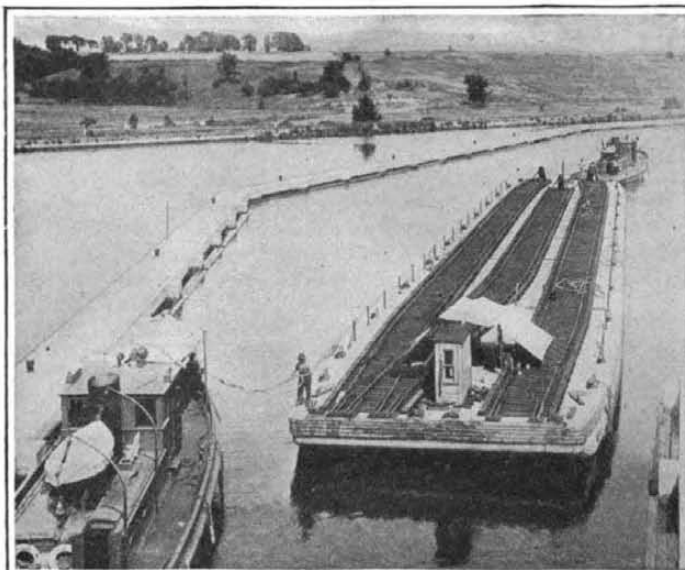
One of the first barges considered was a vessel 276 feet long, 40 feet wide and carrying 1,500 tons on a draft of 11 feet. A model of this was made by the Buffalo Steamship Company of Buffalo, New York, and, after considerable discussion, the type was discarded. Two reasons were given. First, the boat could not have passed another in the narrower parts of the canal. Second, but one barge could be locked through a lock at one time.

The Ohio steel river barge was another type advanced. This boat takes its name from the barges used on the Ohio River. These are 200 feet long, 36 feet wide and have a carrying capacity of 1,500 tons on a draft of 11 feet. This type found very little favor in the eyes of the state's authorities owing to its length and width and the fact that but one barge could enter a lock at a time. Furthermore, such a barge, because of its draft and width, would be forced to operate at a greatly reduced rate of speed in the more restricted sections of the canal. The cost of operating the barge under such conditions would have been excessive when the amount of freight carried is considered.

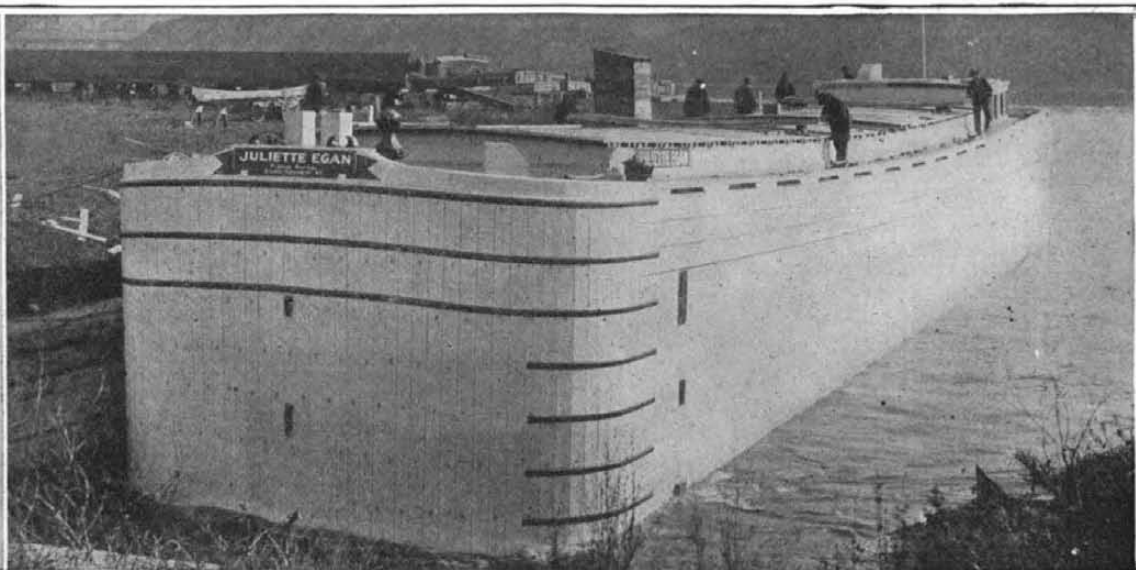
Shortly after this a group of men interested in establishing a barge line on the canal, advocated the utilization of the Delaware and Chesapeake Bay barge. These vessels are 210 feet long, 23 feet wide and have a maximum capacity of



Left: Navy coal barge, 150 feet by 31 feet by 10 feet draft, en route to New York Harbor by way of the Canal. Right: Government 650-ton steel barges, carrying wheat from Great Lakes to Atlantic Coast. This will probably become the standard barge on our inland waterways. Top: Fleet of old Erie Canal boats in the new Canal. Only 200 of these left; they will soon be displaced by standardized barges, probably of steel or concrete



Concrete car float built on Lake Superior making its way through the State Barge Canal after crossing the Great Lakes



This wooden barge, measuring 110 ft. by 25 ft. and carrying 700 tons was recently built for use on the Champlain branch of the canal, not a standard type because two could not enter locks abreast

1,100 tons on a draft of 9 feet. One of the features tending to bring adherents to this type was the fact that it could be utilized on Long Island Sound and the Great Lakes as well as the canal, thereby placing Boston and other New England ports in direct water communication with the Middle West. Authorities questioned the value of this, pointing out that New York State had provided a modern public terminal system for the transfer of freight and that the insurance rates and crew cost on a barge operating in Long Island Sound and upon the Great Lakes would more than overcome the cost of transferring cargoes at the state terminals. Furthermore, the barge could not have utilized the full capacity of the locks.

Following the discussions over the Delaware and Chesapeake Bay barge, a boat was especially designed for use on the Barge Canal. This was to be self-propelled and would have had a capacity of 2,400 tons on a draft of 11 feet. According to the plans the boat would be 310 feet in length and 40 feet wide. The fact that such barges could not have passed each other in sections where the canal has a bottom width of but 75 feet caused the plan to be abandoned.

The so-called Danube River barge found favor with many. This boat is used in Europe with great success and is 200 feet long, 30 feet wide and has a capacity of 700 tons on a 10½-foot draft. It is provided with cranes and derricks for the handling of freight and was so equipped owing to a lack of suitable terminals along the Danube River, where it has been utilized. It was neither big enough to warrant its adoption on our waterways nor small enough to be successfully operated on our canals.

The all-steel German barge was advanced for consideration. This boat is in general use on German waterways and is standard. It is 178 feet long and 26 feet 3 inches wide, having a draft of from 4 to 8 feet and a capacity of from 400 to 600 tons. Only two of these barges, with a total capacity of but 1,400 tons could be locked through the Barge Canal locks at

one time, leaving 1,600 tons of capacity to be utilized.

The Philadelphia steel barge, used on the Delaware River and capable of making short trips along the coast, was considered by those interested in the lumber trade. This barge is 210 feet long, 23 feet wide and has a depth of 17 feet and a capacity of 600,000 feet of lumber on a 9-foot draft. It, however, has the disadvantage of a high deck house which would have to be removed were it to operate on the Barge Canal owing to the bridges spanning the channel. It would likewise have left considerable waste space in the canal locks.

The first barge actually constructed for the Barge Canal was the Occo-100. This is a wooden boat owned by the Ore Carrying Corporation of New York and is utilized to transport iron ore from Port Henry, New York, to Elizabethport, New Jersey. The Occo-100 is 152 feet long, 25 feet wide and has a maximum capacity of 1,000 tons. For general purposes the boat has been loaded to a draft of 10 feet and is used with a fleet of the old type of 240-ton Erie Canal boats, increasing the fleet's capacity from 1,400 tons to 2,000 tons and permitting a more efficient handling of the cargo.

Shortly after the launching of the Occo-100 the first official suggestion relative to barges for our internal waterways was made. This was contained in a statement by State Engineer Frank M. Williams of New York, who suggested that barges 150 feet long, 21 to 22 feet wide and having a capacity of 650 tons on a draft of 10 feet would be ideal. In pointing out the advantages of this type, Mr. Williams said that the boats could be moved in fleets of four, one being self-propelled and that the entire fleet, carrying a cargo of 2,600 tons could enter a lock at one time. The boats could also pass each other in the most restricted parts of the canal and would allow a water cushion of 2 feet between the bottom of the barge and the canal bed, eliminating all danger of crowding the bottom while operating at a rapid rate of speed.

Shortly after this suggestion was made a group of

men, operating fleets of boats on the Barge Canal, planned the construction of ten steel barges. These were to be utilized for the movement of package freight and were to be 150 feet long, 22 feet wide and

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New Point of View of a Ship's Battery

SOME photographs of the salving of the battleship "Leonardo da Vinci" which are supplementary to those which we showed in a recent issue, have come to hand, and two of them are so striking that we venture to present them. Both were made after the battleship had been unwatered in dry dock. One of them was taken from a point forward, looking aft, on what would be the starboard side of the ship were she not upside down. It shows four of the anti-torpedo battery of 4.7-inch guns. These guns, as will be seen, are recessed inwardly from the side of the ship, each casemate being recessed sufficiently to permit of fire ahead, parallel to the longitudinal axis of the ship.

To the dockyard man the illustration is of particular interest as showing in detail the system of supporting bents employed and the points at which the great load of the ship was supported. To the right in the picture is the line of bents which is placed at the side of the ship where the massive internal frames meet the deck. The bents are built up apparently of 12" x 12" timbers with bottom and transverse sills and caps and inclined posts interposed between them. The bents are held in place by iron strapping, which is stud-bolted to each bent with a couple of stud screws.

In taking the other photograph the photographer has swung his camera around and pointed it toward the bow of the ship. On the right-hand side of the picture will be seen a timber crib upon which one of the barbettes rests. Forward will be noticed two sets of bents, one on each side of the bow, and a third bent placed transversely to the bow. Aft of this last-named bent will be noticed the heavy anchor chains and other gear, hanging from the deck and the hawse holes.



The starboard 4.7-inch anti-torpedo battery of the "Leonardo da Vinci" as seen in the inverted position of the ship in drydock

Fore deck of the "Leonardo," showing, to the right, a barbette minus its turret, and the blocking below the same

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do all and a little more than he claimed for it in increasing speed and control and thus allowing more cars per mile of track.

Then came the contracts for the Brooklyn and Boston Elevated, and finally the absorption of his company by a larger one. The story of the adoption of what is now known as the Sprague-General Electric multiple-unit control would take volumes and need hours for its reading. But the inevitable end came at last, and today Mr. Sprague can ride in trains controlled by his invention in New York, Boston, Chicago, Berlin, London, Paris and a host of other places, and has the satisfaction of knowing that without this system of control there could be no such thing as subways on their present basis of large carrying capacity, and that upwards of a hundred million of dollars must have been saved the city of New York alone by using it in place of the at first projected locomotives.

As one of the members of the Commission which supervised the electrification of the New York Central terminals, Sprague was largely responsible for the decision made as to that equipment, especially for the adoption of direct current for operation, and has ever been prominent in the controversies which raged with regard to electrical systems. The story of his persistent fight for the use of high tension direct current in electric railway operation, against deep and vested financial interests, is a romance in itself. But his views seem to have won out, for according to the report of the French Technical Commission, the Chicago, Milwaukee and St. Paul Railway, now operating at 3,000 volts for hundreds of miles over the Continental Divide and the Cascade Mountains, is the most important and successful of all electric trunk line installations.

If a man may ride in thousands of elevators, all electric, and say to himself, "I did it!"—if on any one of tens of thousands of miles of trolley lines he can have the comfortable feeling that both the motor which drives it and the conception of operation were originally born in his brain, if on dozens of elevated and underground roads he can realize that it is *his* system, *his* invention, which makes quick starting, long trains, quick stopping, small headway, and consequent large number of trains per mile possible, it might well be considered reasonable if said man should stop and draw breath and decide he had done enough. But Mr. Sprague is not the stopping and breath-drawing kind. He loves a fight too much for its own sake, and an active brain which has spent its life first in evolving and second in forcing the results of such evolution upon interests which had to have them and didn't know it, is not content to stop.

Mr. Sprague believes firmly that automatic train control is something which must come on main line operation, that the present-day idea, which makes the only connection between the wayside block signals and the engineer a visual one, is radically defective. He points to the many grave accidents which have occurred because of the failure, not of the signal system, but of the engineer to see, understand or obey the signal, as proof that the weak link is too weak for modern high speeds, short blocks and crowded tracks.

Hence he has devised and for several years has been engaged in perfecting a system by which automatic train control is made to completely supplement manual control. The unique thing about this system is the elimination of mechanical contact between engine cab and signal, and the fact that the control of the train is only taken out of the hands of the engineer *when the engineer makes a mistake*. If he sees and heeds the signal the train is left entirely under his control as in the present system, but if he goes to sleep on the job, or sees and

does not heed, or does not see, the automatic control takes hold and brakes the train for him.

Of the details of this Mr. Sprague is not willing to talk except to railroad and Government officials. But he is as firmly convinced of the need of such a system and of the capabilities of it, as he ever was of the future of motors, electric cars, elevators and multiple-train control, and it would surprise no one if he offers to equip some large railway division with automatic control and bet the price of his contract against the judgment of the incredulous officials of the road—and wins out in doing it.

Mr. Sprague has many patents to his credit, here and abroad, but does not take out patents except when he considers the object sufficiently important. He has been really more prolific of new ideas, subject to patent, than almost any inventor now before the public. Unlike many who have obtained many patents, Mr. Sprague's several life-works speak for themselves, in electric installation the world over, of the success and practicability of his ideas.

His success has come entirely from hard thinking, plus hard fighting, and his career cannot help but be an inspiration to all those who have invented what they know to be good, and suffered some of the discouragements which so often come to the pioneer.

"If you want something, ask for it," says Mr. Sprague. "If you can't get it by asking, fight for it. If what you have to offer is good, it will win in the end. But it will win against prejudice and inertia only if you believe in it, work for it and fight for it."

The New York State Barge Canal—III

(Continued from page 91)

have a draft of from 6 to 9 feet. Each boat would be self-propelled and carry from 400 to 600 tons of freight.

The outbreak of the war, however, resulted in a lull in barge building operations and no barges were constructed until the latter part of 1918. At this time the United States Government, which had early in 1918 taken over the operation of all barge and boat lines on our inland waterways, announced that fleets of steel and concrete barges were to be constructed by the United States for use on our waterways. These boats very closely followed the dimensions suggested by Mr. Williams, each steel barge being 150 feet long, 21½ feet wide and having a maximum capacity of 650 tons on a 9½-foot draft. This type of barge has been accepted as standard by government and other authorities and a large number of them are being built in various sections of the country. Over 200 of them are to be constructed for use on the Barge Canal and 76 are now operating upon that canal system.

There are two departures from the general rule, however, and these are the concrete barges, which have been constructed as auxiliaries to the steel fleets, and the steel tank barges which independent corporations have placed on the canals. The concrete barges are all 150 feet long and 21½ feet wide but carry only 500 tons. They, however, cost but \$30,000, and can be constructed in three months, while the steel barges cost \$60,000 each and take from 6 to 8 months to build. Despite the fact that the concrete boat carries less than a steel barge with like dimensions it has proven itself better adapted than either wooden or steel boats for the movement of heavy and bulky commodities such as iron ore and pig iron.

It cannot be said that all barge construction is being limited to the 650-ton steel barges or the 500-ton concrete boats. Barges of wood, each 110 feet long and 23 feet wide with a draft of 10 feet are being built at a number of yards, for independent operating companies. At the same time a number of steel tank barges with varying dimensions are being con-

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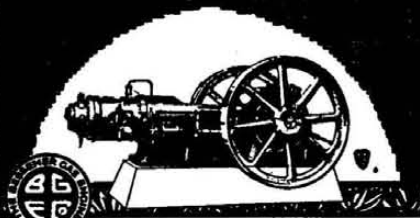
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structed and are in use on the waterways. However, as traffic on the waterways increases and new projects are undertaken, it is assumed that all boat builders and transportation companies will realize that a standard barge is a necessity. On the other hand, experience will prove that there are certain types of boats better adapted to the movement of distinct types of freight than are the standardized boats. This, however, is a matter that will in no way interfere with the standardization of general freight carriers and, those familiar with the problem, believe that the new 650-ton and 500-ton barges will become the standard on American waterways.

The Tower Telescope

(Continued from page 92)

descending light does not pass through several temperatures of air and other atmospheric disturbances, but through a body of air of almost uniform temperature.

Probably the most interesting feature of the Mount Wilson installation is the construction of the tower itself. It will readily be seen that it is practically impossible to construct a steel tower nearly 170 feet high upon a mountain where high winds are common and where the air is very seldom still, and expect to project through it for a distance of 150 feet a beam of light which would be steady enough for photographic work. This problem was solved by the design and construction of two separate and independent towers, each resting upon different foundations, and one incasing the other member for member throughout the entire construction. By the use of these two towers it was possible to mount the dome and support the louvre tube on the outer tower and allow the inner tower to carry only the coelostat, second flat mirror, and other optical parts in addition to its own dead weight. In this way the inner tower, being relieved of the wind load, became a very light and simple affair, its members being constructed entirely of steel angles. It was supported upon four small concrete piers which were insulated from the piers of the outer tower by sand packed between them, thus reducing to a minimum the amount of vibration transmitted from the piers of the outer tower. The outer tower, carrying the hemispherical dome, was constructed of box members built of plates and angles. The legs of this tower were supported by steel beams which delivered the load of the tower upon concrete piers located several feet distant from the inner tower piers.

The spectrograph pit under the tower is ten feet in diameter and seventy-eight feet deep. It is sunk entirely in a granite formation and lined with concrete. A spiral steel stair was also constructed from the base of the tower to the bottom of the pit in addition to a small freight or dummy elevator. After the construction of the tower a passenger elevator cage was also added. This elevator is a small affair however and runs up the outside of the tower.

Blazing Wisconsin Ways

(Continued from page 93)

way Commission supplies stencils and printed directions for carrying out the plan uniformly along all five thousand miles alike. The original blazing was done in about a week by the effective co-operation of the employees in all the counties, the cost being about \$9,000. It was found that 1 gallon of thick white lead and oil paint would spread 18-inch white bands, each with two coats, on 60 poles. In different localities the cost varied with the degree of care taken, the complexity of the roads, and with the portion of their length coming within city boundaries. The highest county rate per mile was \$5.25; the lowest, \$1; the average, \$1.70. While the Trunk Highway System comprises but 5,000 miles the marking aggregates 5,300 miles, because in

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