

## THE WATER TRANSPORTATION OF GRAIN.

BY WALDON FAWCETT.

The grain trade of the United States, or rather that phase of it which is embraced in the transportation of the grain from the harvest fields of the Northwest to the seaboard, is in what might be termed a transitory stage. Some radical new methods, designed to effect a saving in cost as well as economy of time, are just being introduced, and affairs have not as yet wholly adjusted themselves to the new influences.

In the first place, there has been a sudden development within the past year or two of new ports of export. Formerly New York had the lion's share of the business connected with the reshipment of grain designed for European consumption, but of late other ports, notably Newport News, Va., and Galveston, Tex., have entered the field as most aggressive competitors, and the opening of the Chicago drainage canal and the advocacy of a system of waterways to connect the Great Lakes with the Gulf of Mexico has served to revive the old project for a line of steel barges for the transportation of grain on a large scale via the Mississippi to the seaboard. Second in importance comes the project of an American and Canadian syndicate headed by W. J. Conners, of Buffalo, for the construction of great elevators at Montreal and the provision of an outlet for the export grain via the St. Lawrence route. This plan has the advantage that will accrue from the fact that the grain will have to be rehandled but once, for, by using the enlarged Canadian canals just completed, grain-carrying vessels may be operated from the elevators at ports on Lake Superior clear through to Montreal.

Finally we have the appearance of the railroads as more active competitors than ever before of the grain-carrying vessels of the Great Lakes. Partially from the fact that Duluth, Chicago, and Buffalo, three of the greatest elevator centers in the country, are situated on the Great Lakes, and partially from the low carrying charges secured, from two-thirds to three-fourths of all the grain shipped to the Atlantic seaboard from the Northwest was transported, previous to last year, by the water route. It became apparent from the outset of the season of 1899, however, that the railroads intended to make a fight for this business, impelled in part, possibly, by the fact that there was a prospect of the adoption of higher freight tariffs on the lakes. How well they succeeded may be imagined when it is stated that in the case of Chicago there was an absolute reversal of the conditions whereby the lake boats handled 65 per cent of the grain trade.

From estimates based on the latest statistics it is figured that the movement of grain on the Great Lakes each year amounts, if flour be included as wheat, to fully 350,000,000 bushels. To convey an idea of the magnitude of this aggregate is rather difficult, but it may be stated that fully 50,000

cars or 1,250 ordinary sized trains would be required to transport such a bulk of freight. Of the total given, about 125,000,000 bushels comes from the American and Canadian ports on Lake Superior and fully 160,000,000

bushels may be apportioned as Chicago's share. Milwaukee ships annually by water some 30,000,000 bushels of grain, and the other ports handle smaller fractions of the whole. The grain in its journey eastward follows, for the main part, the principal arteries of traffic. More than three-fourths of all the flour and grain which comes down the lakes by boat each year is consigned to Buffalo, where there are elevators with an aggregate storage capacity of 20,000,000 bushels and where the daily receipts of grain will amount at times to fully 2,000,000 bushels. At Buffalo the grain is transferred to Erie canal boats or to the railroad trains which carry it to the ports on the Atlantic seaboard. Much of the grain which does not come to Buffalo takes the Canadian route by way of the Welland Canal and St. Lawrence River. It is this traffic which the new American syndicate, above mentioned, seeks to develop and enlarge. Finally, a very small proportion of the business goes through ports on Lake Erie, which have elevator and ware-

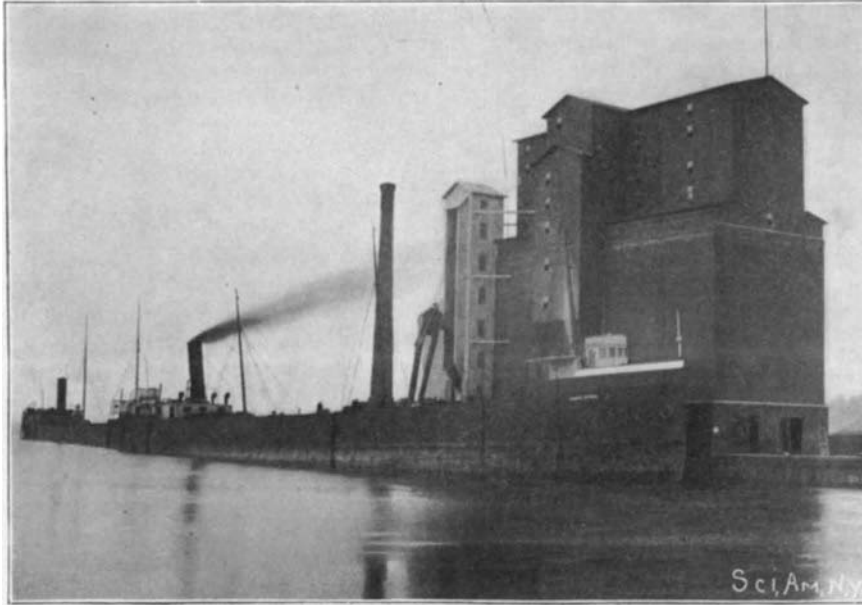
house facilities for transferring the grain to railways. The charge for carrying the grain has differed considerably at different times. The year following the Civil War the average rate paid for all the wheat which was moved by boat from Chicago to Buffalo was over 12 cents per bushel. Then it dropped, until, during the six years ending with 1898, the average never once reached 2 cents per bushel. In addition to this there are charges in connection with the "trimming" of the vessel, the tallying of weights, and the shoveling of the grain in the hold of the vessel to bring it to the elevator spouts when unloading, which amount, under present conditions, to about \$4 per one thousand bushels. The proportions of the different kinds of grain may, perhaps, be best indicated by the receipts at Buffalo. In years when the total amount of grain brought to Buffalo reaches 275,000,000 bushels, the apportionment will be approximately as follows: 83,000,000 bushels of wheat; 67,000,000 bushels of corn; 45,000,000 bushels of oats; 11,000,000 bushels of barley; with the remainder distributed almost equally between rye and flaxseed.

Perhaps the best idea of the important place which the grain trade holds in the commerce of the great inland seas may be obtained from the reports of the Sault Ste. Marie Canal, through which there passes in the eight months of navigation each year two or three times as much freight as passes through the Suez Canal in the full year. As the Sault Canal is in the river connecting Lakes Superior and Huron, only a portion of the grain, that from Lake Superior ports, passes through it, and the shipments of the commodity from Chicago are not represented. During the year 1899 there passed through the canal upward of 90,000,000 bushels of grain. This was valued at \$61,000,000, or more than any other commodity. The shipments of iron ore and general merchandise were the

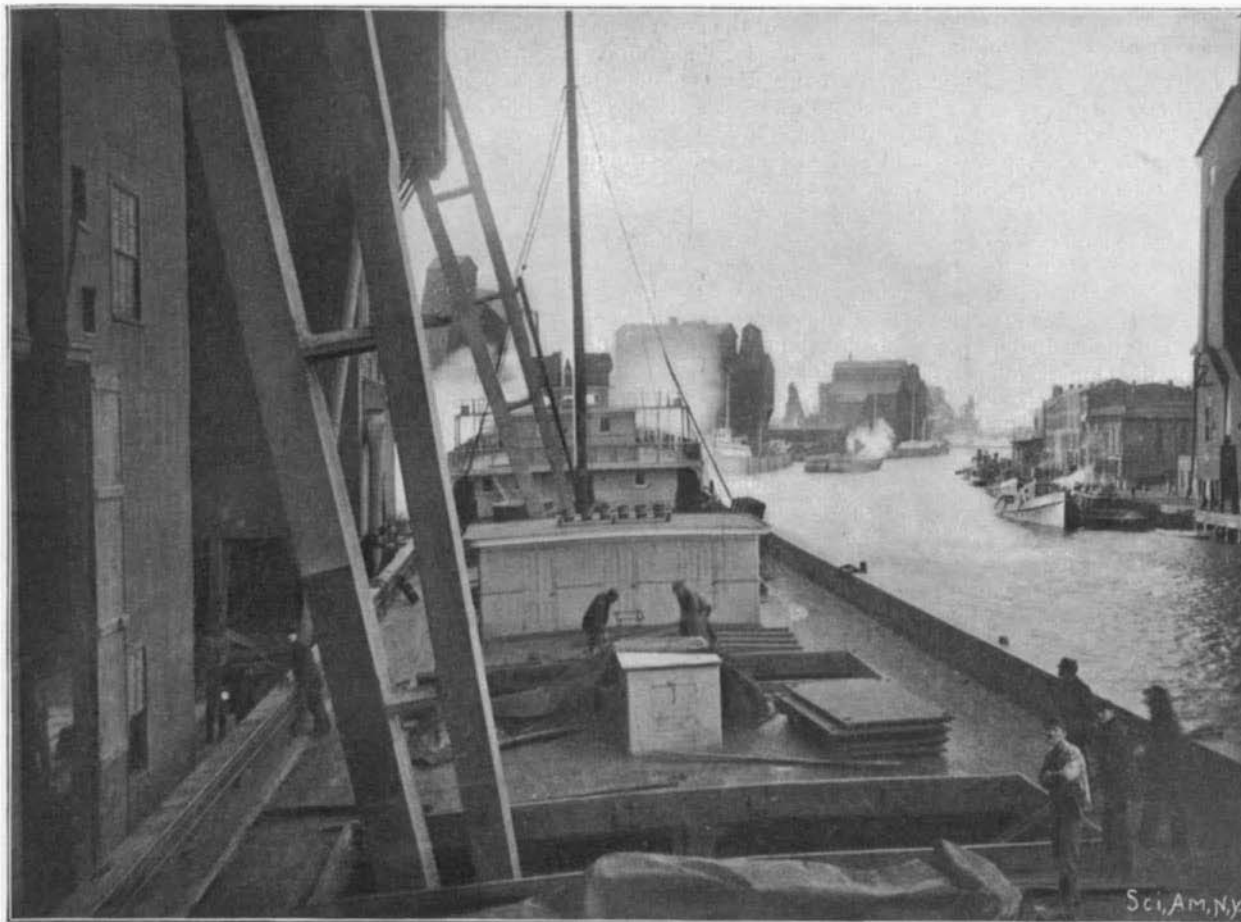


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THE GRAIN ELEVATORS AT BUFFALO.



LOADING GRAIN VESSELS AT OWEN SOUND, CANADA.



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TRANSFERRING WHEAT FROM A BARGE INTO ELEVATORS, BUFFALO.

closest competitors, each being valued in the aggregate at \$52,000,000. If flour be included with the grain, the total valuation would be brought up to \$85,000,000. For purposes of comparison it may be noted that the total value of all freight passing through the canal during the year was \$281,000,000. Some of the steel steamers engaged in carrying grain on the Great Lakes have made remarkable records. They are, many of them, vessels of 400 or 500 feet in length, in some instances towing another vessel almost as large behind them, and it is not an infrequent occurrence for one of these huge freighters to travel more than 40,000 miles during a season of ordinary length. The steamer "Malietoa," which is owned by the Minnesota Steamship Company, of Cleveland, enjoys the distinction of having carried the largest cargo of grain in the history of lake commerce. Some months ago she moved from Duluth to Buffalo 195,000 bushels of flaxseed and 70,000 bushels of wheat, the whole being equal to 7,500 net tons. The steamer "Superior City" carried 266,000 bushels of corn, equivalent to 7,460 tons, and third place must be accorded to the steamer "Andrew Carnegie," the 5,300-ton cargo of which consisted of 332,000 bushels of oats. If any evidence were lacking of the confidence of the men in the grain trade that its development has only just commenced, it might be found in the immense sums of money being invested in the construction of new elevators, particularly at Chicago and upper lake ports. Really magnificent structures many of them will be, constructed of steel throughout, with a capacity of from one to two and a half million bushels, operated by electricity, fitted with new, improved machinery for scouring, cleaning, and drying the grain, and fully protected against fire by most elaborate systems. The largest elevators now under construction are building at the head of Lake Superior and at Chicago. The present elevator capacity at the latter city amounts to about 65,000,000 bushels, and this will be somewhat increased by the new elevators, one of which will have facilities for unloading four hundred cars of grain every twenty-four hours. Undoubtedly the most interesting elevator

fireproof as possible. The entire plant when completed will have cost fully \$700,000. The Canadian ports, such as Owen Sound and Fort William, which constitute the gateway for the immense grain fields of the Canadian northwest, which hold such unlimited possibilities for the future, have also shown a marvelous development during the past few years. At Owen

thousand bushels as his net profit, that have caused the serious labor disturbances at Buffalo within the past year or two. When it is remembered that the largest grain-carrying vessels on the lakes are loaded or unloaded in the interval of a few hours, and that the cost of moving freight on the Great Lakes is only a fraction above a mill per ton per mile, whereas a cost of four mills per ton per mile is about the lowest reached on the railways, it will be appreciated that the water transportation of grain as conducted in the United States indeed constitutes one of the marvels of the commercial world. Moreover, improved unloading machinery and larger ships and elevators are coming, so that it is hard to predict the ultimate outcome.



A TYPICAL NAVAHO HOGAN.

HOUSES AND HOUSE DEDICATION OF THE NAVAHOES.

BY COSMOS MINDELEFF.

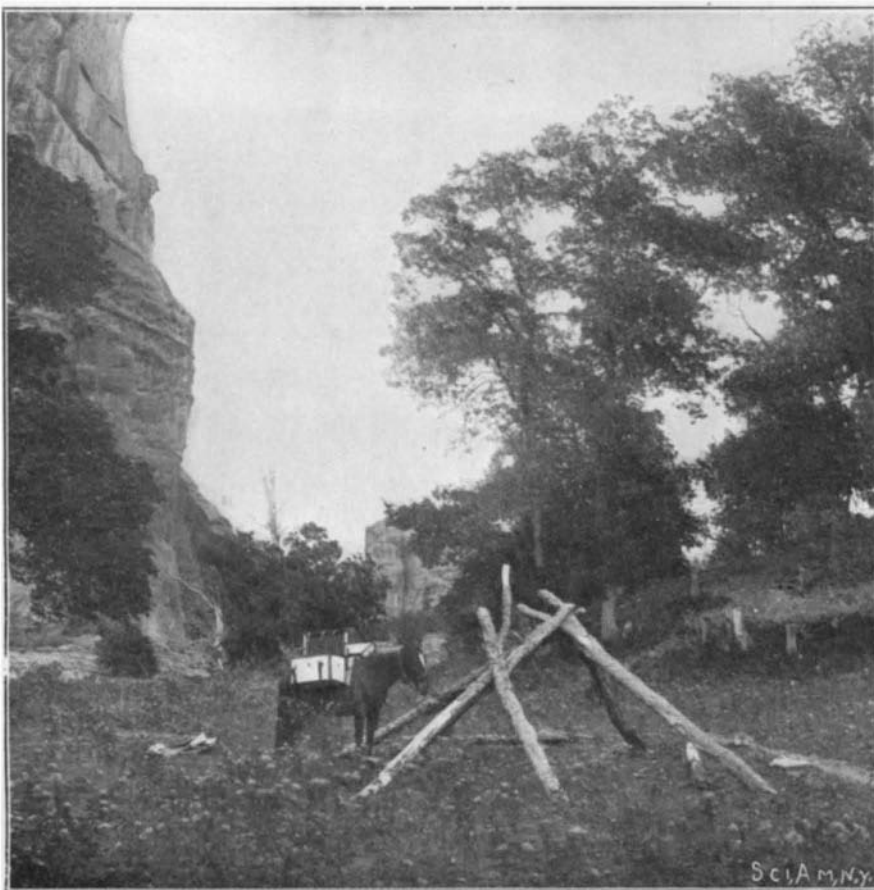
The study of the houses and house-life of the American aborigines, inaugurated by Lewis H. Morgan more than a quarter of a century ago, has progressed to that point that America is no longer open to the reproach made by Ferguson in his "History of Architecture," that the only chapter in the great work which could not be

Sound there have been erected elevators capable of holding between one and two million bushels of grain. At Fort William the Canadian Pacific Railroad Company has expended \$2,000,000 in providing four large elevators which have an aggregate storage capacity of considerably more than 5,000,000 bushels and the largest of which is capable of shipping 40,000 bushels per hour. This elevator is unique. It is constructed with two dozen cylindrical steel storage tanks, each 60 feet high and almost as broad, and which are not only absolutely fire and damp-proof, but are rendered impervious against rats, insects, etc. A distinctive feature of the structure is found in the fact that the machinery for cleaning, separating, and weighing the grain is in an entirely separate building.

Possibly the most dramatic phase of the water transportation of grain is found in the unloading of the grain at the elevators. The grain is conveyed from the hold of the lake steamer by means of an endless chain of buckets working in a spout or "leg," which is lowered through a hatch. Inasmuch as the lake vessels have anywhere from

written was that pertaining to the Western Hemisphere. Since that day a large amount of work in the way of investigation has been done and much has been written, but singularly enough attention has been largely confined to the Pueblo and Aztec architecture, while the more primitive, although not less interesting forms have been practically ignored, except by Morgan himself. No tribe of Indians offers a better opportunity to supply this deficiency than the Navahos of New Mexico and Arizona, who, until quite recently, were but little affected by the march of civilization, and in their houses retained almost unchanged the ideas and the customs of centuries ago. An exhaustive article on the subject by the writer is now in press and will soon be issued by the Smithsonian Institution.

Rude and primitive as the houses of the Navahos appear, or the hogans, as they themselves term them, every detail is dictated by rules rigidly adhered to, and the erection of one of them is a real ceremonial, almost always followed by an elaborate ritual of dedication. The omission of any part of the ceremony or of the ritual, or its performance out of its regular order, would be followed, it is believed, by the most disastrous consequences. It is only with the passing of this belief in



FRAMEWORK OF A HOGAN.



A HALF-HUT OR SUMMER SHELTER.

yet constructed will be the initial plant now under construction for the new American and Canadian syndicate at Montreal. The main structure will have a capacity of 1,000,000 bushels, and the annexes will provide storage for at least 2,000,000 bushels additional. Steel, concrete, and wood will be the materials used in the construction of the buildings, which will be as near

twelve to fifteen hatches, several of these legs may, of course, be operated simultaneously. Large gangs of men, assisted by steam shovels, must be employed to draw the grain to the mouths of the spouts, and it is the grievance of these men, who have objected to the plan of awarding the contract for unloading all the grain boats to one man, who retains several cents per

the last decade or so that variations from the fixed type have crept in, but thousands of examples of the old form are still to be found on the Navaho Reservation, and hundreds are built every year.

The hogans are usually hidden away so effectually that the traveler who is not familiar with the customs of the people might travel for days and not see more