iron ore, coal, wheat, flour, and merchandise go to the steamers for low rates and quick transit. And the present tonnage of the lakes is kept in an absorbing chase of distances by the enormous traffic turned over to the vessels by the railroads at deep water terminale like Chicago, Buffalo, and Superior.
In the mad rush of invention upon the land, marine architecture was allowed for a quarter of a century in this country to suffer somewhat. Land transportation absorbed all the powers of men's invention. But it was only a slumber for a season. Cheap transportation between the East and West became so important a factor that human nature could not resist the pressure, and so it happens that from the deep water's end in the middle of this continent, where land and water have their final junction, so to speak, from the head of Lake Superior, within dinner call of the farmers of Minnesota and Nebraska comes the latest and most wonderful innovation on marine architecture that has met the waters since Fulton'ssteamboat was put afloat. Alex. McDougall, of Superior, Wis., an old lake vessel master and agent, is the inventor, and is now at the head of the practical operations of a ship yard at that place which has keel blocks for the simultaneous construction of ten steel vessels, and from which the American Steel Barge Company, the owner of the plant and patents, expects soon to turn out 52 vessels per year, or one each week
These vessels are built both as tow barges and as steam propellers. The first boat of the fleet (there are now eleven afloat), the tow barge " 101 ," a small craft of 437 tons registry and 1,400 tons carrying capacity, excited unlimited ridicule and amazement among lake vessel builders, but her cost was only $\$ 45,000$, and in two seasons she has netted her owners over $\$ 70,000$, in the face of active competition, so that the laugh is now differently located. This boat was built in the summer of 1888 , and was immediately denominated "the pig" by vessel men-a name that clings to all of her kind.
The first steam propeller, the Colgate Hoyt (named after the president of the American Steel Barge Cowpany). was built in the winter of 1889-90, and has been in successful commission during the season of 1890 in the ore, grain and coal carrying trade between Superior and Lake Erie ports. She carries 2,800 tons of iron ore on a 15 foot draught, and readily makes 12 miles an hons.
2,400 tons.
The Joseph L. Colby, launched November 15, is a somewhat swaller vessel than the Colgate Hoyt, being designed for passage through the Welland Canal and St. Lawrence River to Montreal. Her dimensions are as follows: Length over all 265 feet, width of beam 36 feet, depth of hold 22 feet. All subsequent steamers of this pattern will be built 38 feat beam and 24 feet depth of hold.
The tow barges 102 and 103 are of 1,132 tons registry and 3,000 tons carrying capacity; the tow barges 104, 105,107 , and 109 are each of 1,216 tons registry and 3,300 tons carrying capacity.
The Colgate Hoyt is registered at 1,008 tons, and 3,000 tons carrying capacity, with a speed of 15 knots per hour on 800 horse power. This statement will be understood when it is said that the fine steamers on the lakes of 1,800 tons registry, 15 knots speed and 3,000 tons carrying capacity, require 1,600 horse power for their work.
The "whalebacks" are all built upon the same pattern. They are round decked, flat bottomed, and ended up like the pointed end of a cigar. The wheel house on the tow barges is in a mere turret, and the men's quarters (it takes five to man one of them) are under the wheel house. On the steamers, the cabin
and wheel house are set up on three turrets. These are the peculiarities that make of these boats a complete revolution in ship building. There is no pon derous bulk above the water to catch and fight the sea in a storm. The water washes over them, not against them. The round deck may make of them the most formidable naval vessel ever built. The flat bottom may make of them famous river boats.
The ship yard at Superior has six "slips" and ten piers or ways for keel blocks, so that ten of these boats can be under construction at one and the same time And Manager McDougall speculates with some enthusiasm upon the fleet of "steam pigs" which he will send to the St. Lawrence in the fall of 1891 to engage in the Atlantic coasting trade for the winter season.
There is at present a whaleback tow barge lying on a dry dock in New York City, that was constructed at the Erie Basin for the coast and river trade, while two McDougall propellers are expected here in a short time, one of which is to be sent across to Liverpool and one to Puget Sound, on the Pacific coast.

Contract has been let for the construction of a railroad from San Diego to San Quentin, Lower California, a distance of 162 miles. The road is to be built as soon as the Mexican government approves the survey. A cargo of supplies for the road is now on the way from England. The company is to receive

## stimutifir shmerical.

ESTABLISHED 1845.

## MUNN \& CO., Editors and Proprietors. published weekly at <br> No. 361 BROADWAY, NEW YORK.

O. D. MUNN.
A. ह. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN. One copy, one year, for the U.S., Canada or Mexico...
One copy, six months, for the U.S., Canada or Mexico.
ne copy, six months, for the U.S., Canada or Mexico................ 150
One copy, one year, to any foreign country belongmg to Postal Union.
400 Remit by postal or express money order, or by bank draft or check.
MUNN \&CO., 351 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement.


The safest way to remit is py postal order, express money order,
or bank check. Make all remittances payable to order of MUNN
Readers are specially requested to notify the
allure, delay, or irregularity in receipt of papers.
NEW YORK, SATORDAY, JULY 4, 1491.


TABLE OF CONTENTB OF
SCIENTIFIC AMERICAN SUPPLEMENT No. 809.
For the Week Ending July 4, 1891. Price 10 cents. For sale by all newsdealers.





THE CASINO AND PIER AT THE EXHIBITION. One of the novel buildings at the Exposition will be the Casino and pier. The Casino, which will stand out in the lake 1,000 feet from the shore, is intended to reproduce Venice on a swall scale in Lake Michigan. Burling \& Whitehouse, of Chicago, have completed the design for this structure, and the architecture is of course of Venetian order.
The Casino will be built on piles and connected with the shore by a pier 80 feet wide. The base dimensions of the Casino will be 180 by 400 feet. The building will consist of nine $p$ vilions, two stories in height, and, with the exception of the central one, 80 feet above the surface of the water. The center pavilion will be 10 feet high. There will be communication between the nine $p$ vilions both by gondolas and bridges. Completely surrounded by water, this structure, with its fleet of boats and numerous waterways, is expected to have a decidedly Venetian flavor. Surrounding the central pavilion will run a gallery fifty-six feet wide. The pier connecting the Casino with the shore will form a broad promenade. At the west end of the pier will stand the thirteen columns designed by Sculptor St. Gaudens to represent the thirteen original States. In front of the Casino will be a harbor for small pleasure craft. At night this harbor will be lighted by incandescent lamps sunk beneath the surface of the water on floats. The material of the Casino will be of wood and the walls will be covered with staff. A striking combination of high colorings will be effected. The contract for the construction of the pier and Casino has been let.

## FAST BOATS FOR THE NAVY.

We have repeatedly urged upon Congress the importance of high speed for some of our war vessels. Some progress has been made, but our neighbors still excel us. As yet we have nothing that can compare in speed with the best English and German mail steamers regularly em ployed between New York and Europe. Some of these ships have maintained a speed of over 20 knots per hour throughout the Atlantic voyage. The regular speed rate of several of them is $191 / 2$ knots at sea. They are specially built for naval service whenever the need for them occurs. No United States ship could compete with them at sea in point of celerity.
The advantage of high speed is conspicuous in the naval warfare now going on in Chile. At the outset of the war the insurgents had a great advantage in holding possession of the principal vessels belonging to the navy. There remained, however, to the government a few boats, among them two gun boats, not very large it is true, but they are among the fastest in the world, the Almirante Lynch and the Almirante Condell. In consequence of their high sea speed and rapidity of motion they steam with great celerity from port to port and threaten the enemy. They have become the terror of the insurgent fleet, which comprises ironclads such as the Huascar, Esmeralda, and Cochrane. The two gunboats in question lately torpedoed and sank the rebel ironclad Blanco Encalada, which was the strongest and proudest ship they had. This was a dreadful blow to the rebels.
An eminently successful trial of a torpedo boat just completed by Messrs. Thornycroft \& Co., for the government of the United States of Brazil, took place in the estuary of the Thames on the 2 d of June. The new vessel is 150 feet long by 14 feet 6 inches beam, there being four torpedo guns suited for the 14 inch Whitehead torpedo. Two of these torpedo tubes are mounted on racers on deck and two under deck in the bows, arranged not in the ordinary way, but with gear enabling them to be protruded through doors in the skin of the boat. The machinery consists of two sets of triple compound engines, supplied with steam by two Thornycroft water tube boilers. The trial consisted of two parts-first, a series of six runs on the measured mile, with a load of nineteen tons on board, during which a speed of twenty-five knots was guaranteed by the builders; and, secondly, a continuous run of two hours' duration, during which a speed of twenty-four knots was guaranteed. The results of the six runs were as follows:

|  | Knots. | Mean revolations per |
| :---: | :---: | :---: |
| First run, with tide. | .27629 | 1,165:5 |
| Second run, against tide. | .23.529 | 1,289 |
| Third run, with tide. | .28•346 | 1,034 |
| Fourth ran, against tide | .23377 | 1,200.5 |
| Fifth run, with tide. | .2834 | 1,0i2'3 |
| Sixth run, against tide. | . 23 | 1,282 |

The mean of these speeds computed by the Admiralty method being $25 \cdot 858$ knots, Messrs. Thornyeroft's guarantee was more than fulfilled. The mean number of revolutions required to do a knot was found to be $1,165 \cdot 4$. At $1: 18$ P. M. the vessel was put upon her two hours' run, and at $3: 18$ it was found that the mean number of revolutions of the screws amounted to 59,174, which, being divided by $1,165 \cdot 4$, the number required to complete a knot in still water, gives a distance of 50.775 nautical milss, or 58.4 statute miles, covered in the two hours. This

