A NEW LAKE STEAMSHIP.

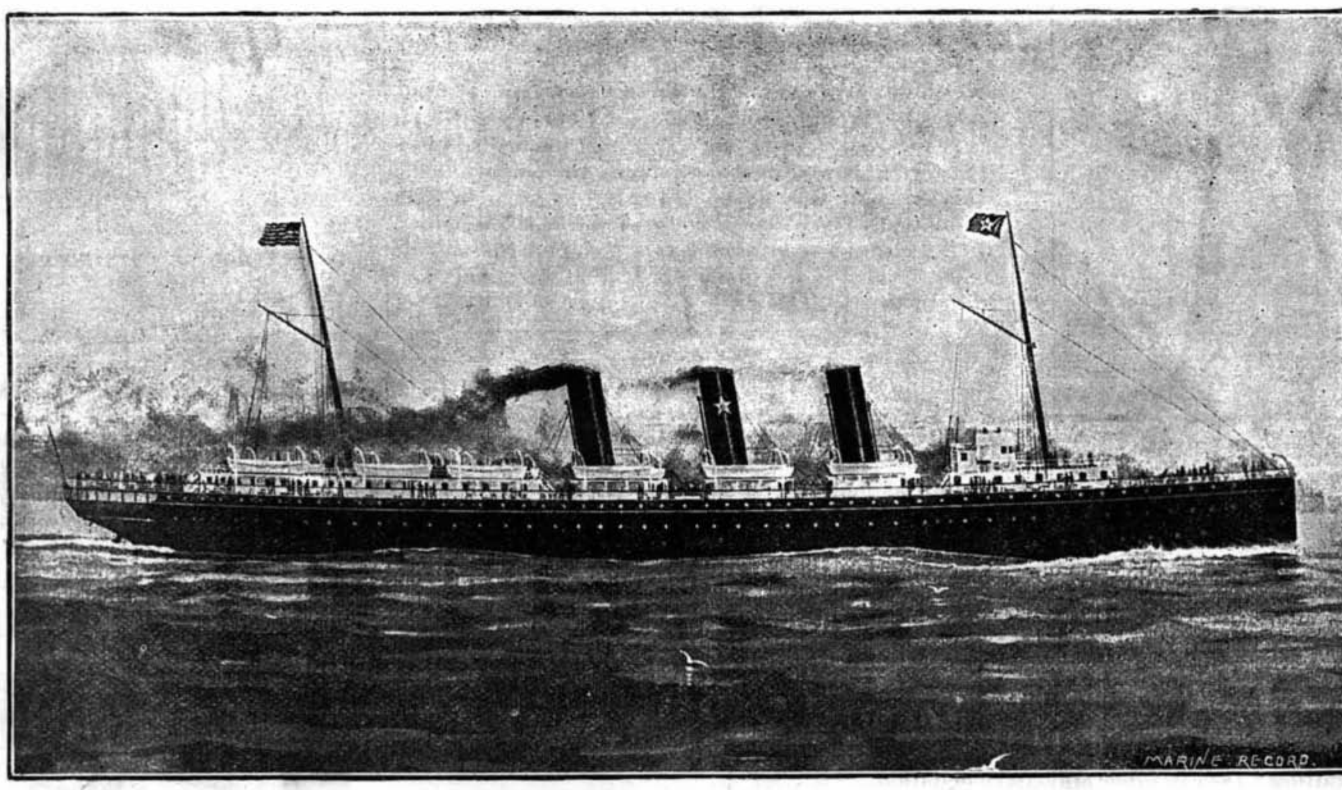
The rapid progress which is being made in steamship building in the West is well illustrated in the latest production of the Globe Iron Works, at Cleveland, O.

The steel steamer Northwest, the largest and certainly the finest built and equipped vessel that ever floated on fresh water in the United States, built for the Great Northern Line, was successfully launched from the shipyard of the Globe Iron Works Co., Cleveland, O., on the 6th of January, in the presence of a vast crowd of spectators. Nearly every lake port between Buffalo and Duluth was represented by delegations of vesselmen. A number of Atlantic coast shipbuilders were also present.

Her general dimensions are as follows: Length over all, 383 feet; length between perpendiculars, 360 feet; breadth, moulded, 44 feet; depth, moulded, 26 feet; depth to spar deck, 34 feet 5 inches.

The vessel has been built of mild steel throughout, with an inner bottom extending from the collision bulkhead forward to the afterpeak bulkhead aft. She has been built under special survey in order to obtain the highest classification in the United States Standard Register of Shipping.

The hull has been specially strengthened and subdivided through transverse and longitudinal bulkheads into numerous water-tight compartments. The construction throughout has been planned and carried out with the view of making the vessel not only the most modern and luxurious, but also the strongest and safest on the Great Lakes. She is fitted with two vertical quadruple expansion engines of 3,500 horse power each. The engines, when turning 120 revolutions per minute, will indicate 3,500 horse power each, and with a total horse power of 7,000 the vessel is expected to make an average speed of over twenty statute miles per hour. The propeller wheels are four-bladed, sectional, 13 feet in diameter and 18 feet pitch. The vessel cost about $600,000. We are indebted to the *Marine Record* for the foregoing particulars and for our illustration.



TWIN SCREW PASSENGER STEAMER NORTHWEST.

The Borgalle Tunnel.

The Borgalle tunnel on the Parma and La Spezia railroad, of Italy, has recently been completed. The tunnel is five miles long, 20 feet high and 25 feet wide, and accommodates two lines of rails. The cost of the tunnel was about $7,500,000. The new line will shorten the trip from Milan to Spezia and will prove of special value to travelers from Venice or other cities in the northeastern part of Italy. As Spezia is an important naval station, the new line will prove of great benefit to the government.

Beams and Floors of Concrete.

As the strength of concrete is much less in resisting tensile than it is in compressive stress, its employment for beams has not met with much success. It is true, indeed, that for floors, lintels, staircases, concrete has been used with considerable advantage, as being conveniently handled and placed *in situ*, yet there exists the disadvantage of not being able to test its strength transversely with any degree of reliability. The data furnished by authorities are not generally satisfactory; the proportions of cement and aggregate differences of age and other conditions are varying in the tests given. The proportion of sand is a material factor: the greater the quantity the weaker the result. It is obvious, moreover, that to obtain an approximate estimate of the transverse strength of beams made of concrete, a series of experiments, including a variety of aggregates and ages, would have to be made. One fact is pretty clearly established, and that is that the transverse strength of good concrete is quite equal to, if not greater than, natural stone. To take a few of the tests made with concrete beams supported at the ends: Kirkaldy gives for a beam of 1 of Portland cement and 1 of coke breeze, 7 days old, 3 inches broad, 5 inches deep and 72 inches clear span, loaded at center, an average breaking weight of 3·85 hundredweight, allowing one-half weight of beam between supports 0·22 hundredweight, or a total central load of 4·07 hundredweight; with an aggregate of 2 crushed bricks, 2 or 3 months old, a beam 12 inches by 8 inches deep and 60 inches span, gave in center an average breaking weight of 13·25 hundredweight, and a total center load of 15·08 hundredweight. Another result of a beam of 1 of cement to 0·6 of gravel, 90 days old, 12 inches by 12 inches, 36 inches span, gave an average breaking weight of 46·67 hundredweight on central 6 inches. These are taken at random from a table in Mr. E. L. Sutcliffe's useful book on "Concrete" we lately noticed; but they differ so much in composition, age and scantling that no reliable result can be obtained. It is evident that the addition of sand very considerably reduces the transverse strength, the beam made of neat Portland cement being three times stronger than one of 1 of cement to 2 of coarse sand, the average breaking weights being given as 57·80 hundredweight for the neat specimen and 18·30 for the one with sand.

But we place little confidence in tables of tests, though we gather from them the general fact that good concrete is quite equal, if not superior, to many natural stones for beams, lintels, flooring slabs and other purposes in which transverse strength is necessary. When the ends of concrete beams or slabs are fixed or "pinned" into the wall or built upon, considerably more strength is gained than when they simply rest on the walls. Mr. C. Colson's tests of two beams of concrete 9 feet long, 21 inches wide and 9 inches deep, are instructive in this connection. He placed one of these beams simply resting on supports. At the end of 14 days the scaffolding below was carefully removed, when the beam at once broke with its own weight; the other beam was prevented from spreading by counterforts at the ends, and showed no sign of weakness. After remaining unsupported for 16 days longer, a weight of a quarter of a ton in the center produced a faint crack; with 0·635 ton the crack increased to half the depth. The load was increased to 1·292 tons, when the beam gave way. The experiment at least shows the advantage of preventing spreading or lateral movement. In point of fact, the beam with its ends backed up becomes practically a flat arch, as the crack only appeared on the upper half of the beam, the lower segment of the mass adding nothing to its strength. The same experimenter found by other similar tests that confining the ends of the beam increased its strength nearly three times, and he also proved that flat segmental arches of concrete had great strength. Whatever the value of these experiments may be, they at least establish the assumption that a beam of concrete with its ends securely supported or confined becomes a flat arch, the resistance of the material being mainly compressive and confined to the upper half of the section, within a curve or segmental line from this point of the center to the beds of the beam. In other words, we may imagine a segment struck within the thickness of the lower half or depth of the beam, all below which curve may be cut away. We have a notable example of this fact in the concrete arched floors which spring from the bottom flanges of girders, of which we have instances in Dennett and Ingle's fireproof floors and in those of Homan and Rodgers. When all the four edges of a concrete slab are fixed into walls, as in the case of stair landings and floors, the increase of strength is more than double that in which only two ends are fixed.

It is clear from these experiments that if we can incorporate into the body or mass of the beam or slab iron ties in the lower half of the concrete, we shall greatly add to the strength. Some years ago we remember seeing some beams and floors at Stoke Newington which the late Mr. Allen had introduced, in dwellings let out in flats, in which floors iron tie rods were embedded. Mr. Hyatt, whose treatise we noticed some years ago, inserts iron ties or tension plates in the lower section of his concrete beams, which materially adds to their strength, and the idea of inserting iron rods in the lower half of beams and slabs to assist in the tensile resistance has been greatly developed in several ways. Blocks, soffits, beams, cupolas, and entablatures of concrete, with iron bars introduced, were largely used in the S. K. Art and Science Schools, the details of which are illustrated. One of the first objects was to prevent the rods slipping or drawing through the concrete; but experiments have proved that the iron bars under a considerable strain on the beam preserve their hold when they are left with their natural surface. The use of twisted rods gives a better grip. It has been found that the most advantageous position for the iron tension rod is near the bottom of the beam, and that the ratio of iron rods to the concrete (coke breeze) should not be less than 1 in 20. The tension rods or plates should be so proportioned and at such a distance from the neutral axis of the beam that the compressive resistance of the concrete of the upper half of beam shall not be greater than the tensile resistance of the iron rods. The ratios between these two resistances of concrete vary according to the cement and aggregate used, so that we can only ascertain the sectional area of iron rods required when we know the actual ratio subsisting in a given beam. It is safer to make the iron rods equal to the crushing strength of the concrete, neglecting the tensile resistance of the latter.

The architectural use of concrete for beams, lintels, floors, and as a substitute for stone, has already been tried. In blocks of dwellings, in flats, in which a large number of window heads, door heads, floors, and landings of one type is necessary, the value of concrete is undeniable, and a considerable saving in cost must accrue. More has yet to be accomplished in extending the material constructively. In pier building we may yet hope to see progress made, so that we should not altogether have to rely upon iron stanchions and pillars.

For beams, floors, bressummers, arches, and domes, the combination of concrete and iron promises to yield results even greater than we have seen, when once the practical difficulties of manufacture have been overcome. Whether deposited *in situ* or laid in large flags, concrete has become an important material for town paving, and many manufacturers of artificial stone—like the Victoria stone, the patent artificial sandstone, the granite concrete flooring of W. B. Wilkinson & Co.—have solved the obstacles that were once apparent. For wall building and for architectural purposes the material has not yet appeared to have made much progress, owing to the advantages offered by brick and terra cotta; but for sea, river, dock and quay walls, the value of concrete blocks has long since taken the place of natural stone. For town dwellings the external facing concrete, or slab, offers several advantages, if only architects could adapt this superficial mode of treatment to their wants.—*The Building News.*

Prickly Heat.

Photographers in some parts of the country no doubt suffer from this distressing affection, and will thank "Brown Slick," of the *Journal of the Photographic Society of India*, for the following, according to him, "magical" remedy. He says: "Simply rub the skin with the hand wet with the ordinary fixing solution, and allow it to dry. In a couple of days there will be no trace left of the irritation."