

A NOVEL RAILROAD BRIDGE.

Some time since, when the Chicago & Northern Pacific Railroad acquired the right of way from the Stock Yards Company for the location of its line to the Chicago Stock Yards, one of the provisions in the agreement for additional right of way was that a new swing bridge should be put across the south branch of the Chicago River at Blue Island by the Chicago & Northern Pacific Company. As the Pan Handle road crosses this branch of the Chicago River at a point so close as not to permit room for a one span swing bridge, a double swing was first determined upon, but this proposition was abandoned on account of its expense, and it was finally decided to construct a counter-weighted lift bridge of a new design based on the principle of loaded buggies running on elliptic shaped tracks and acting as counter weights. We herewith illustrate two views of this bridge now in the course of construction,

which shows the progress that has so far been made upon the work and indicates the general principles of the bridge. It consists of three upright posts, the middle post double the size of the outside ones. From the top of these towers in the form of a section of an ellipse run four girder tracks to carry the loaded buggies acting as counter weights. These elliptic tracks extend away from the towers at the base 99 feet. It is a four-track bridge of two spans of 60 feet 4 inches each and one middle girder span of 34 feet, but only one span of the bridge is designed to lift under the present construction. It is so arranged that in the future, when desired, posts of the same design can be erected on the opposite bank of the stream and the other half of the bridge lifted in the same way. The bascule consists of eight 70 foot girders 6 feet 2 inches deep that weigh about 21,400 pounds each. The tower posts stand 64 feet 9 3/4 inches high over all. Sheaves are fitted at the top of all the towers, the outside ones having three grooves each and the sheaves of the middle tower three grooves in the middle sheave and two outside sheaves with one groove each. The four counter weights are attached to the lifting girders by 1 1/4 inch steel cables running over the sheaves. They weigh 58,500 pounds each. Chains are also attached to the girders and run over the sheaves at the top of the posts to a stationary engine located immediately above the tracks on a floor built between the posts and the elliptic track. When the bridge is in position for traffic the components of the weights of the buggies and of the bascule are such as to favor the latter. By the action of the stationary engine, working an endless screw, this is overcome and the platform is raised to a perpendicular position, the girders hinging at the bottom of the posts at the bridge seat. When the platform is entirely raised for the passage of boats the components are changed in their relation and the platform is held in an erect position, requiring action of the engine to lower the lift. The engine is double and manufactured by the Crane Elevator Company, of Chicago, and is arranged so that half of the lifting portion of the bridge can be operated independently if desired. It also can be operated by hand when required. The width of the posts, center to center, is 59 feet 6 inches. Mr. George S. Morison, acting jointly with the officials of the Chicago & Northern Pacific Railroad, determined this to be the best design for this particular location under the existing circumstances, and Mr. Morison has given the facts in this article. Mr. H. R. Stanford, of Mr. Morison's

office, associate member of the American Society of Civil Engineers, is the inspector. For our engravings and the particulars we are indebted to the courtesy of the Railway Age and Northwestern Railroader.

Soapstone Quarries of Virginia.

Albemarle County, Virginia, is the home of many industries, but perhaps the most interesting one is the soapstone quarry of Alberene. Among the foothills of the Ragged Mountains is a tract of 1,950 acres, fringed with woods and dotted with tidy homes, a little world in itself, its interests centering where the great derricks mark the sky and long buildings cover busy saws. Twelve years ago it was a quiet farm, but one day a horseman appeared riding slowly, with observant eyes, a man of experience, an expert in soapstone. Here he found outcropping a vein of soapstone, the finest in

ries in operation. Large Ingersoll channelers are used in them to drill out the blocks; they are run by steam, and, in spite of the hardness of the stone, cut about the sides of each block with amazing rapidity. The average block weighs nine tons, but the derricks used are capable of raising as much as twenty tons. Once out of the quarry the blocks are put on steam trucks and carried to the factory, where they are cut into slabs of varying thickness. This is done by abrasion. Gang saws swing to and fro over chilled iron globules that wear away the stone, as they are kept continually moving. Each slab is then examined and moved on its truck to be cut into the shapes for which it is best adapted. The manufactured output is about sixty-three tons per day.

As acid has absolutely no action upon the stone, it is used to make tanks for jewelers; dissecting rooms and laboratories are fitted up with it, and, on account of its non-absorbent qualities, it is in great demand for laundry tubs and sinks. It is also used for fire-place linings and for griddles, the latter having a great advantage over the iron griddles, as they never require greasing.

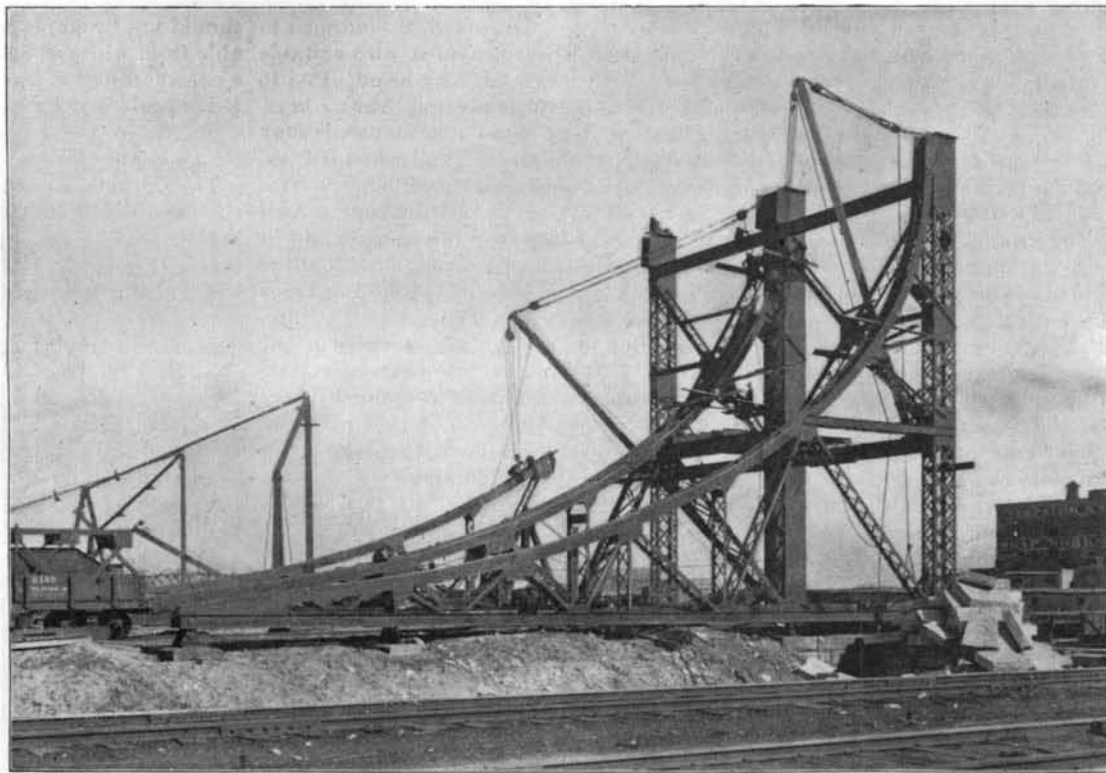
The Alberene soapstone is exported all over the world, for its smooth texture and hardness render the articles manufactured from it absolutely time-defying in their durability. Four car loads of this stone are in the laboratory at Yale; at Tiffany's there are acid tanks; the Hahnemann Hospital, at Chicago, and the Vanderbilt Clinic, of New York, by their use testify to its merits, and the University of Mississippi has set an example which the South and West are speedily following.

For years this soapstone was put on the market at a loss. The very quality which gives it superiority made the difficulty. No machinery could match its hardness. Machines had to be invented that could cope with it, and in the struggle raw recruits have become trained workmen. These workmen are nearly all whites of the laboring classes from the country round about. A couple of Swedes, a German or two and a Frenchman represent the foreign element, and the force of negroes who fill out the necessary quota of employes are those who, in the twelve years of the quarry's existence, represent the survival of the fittest. Altogether, it is a thriving, bustling colony, and what was a venture is now an established business on firm footing, its success adding much to the steadily growing prosperity of Albemarle.—C. S. Coles, in The Tradesman.

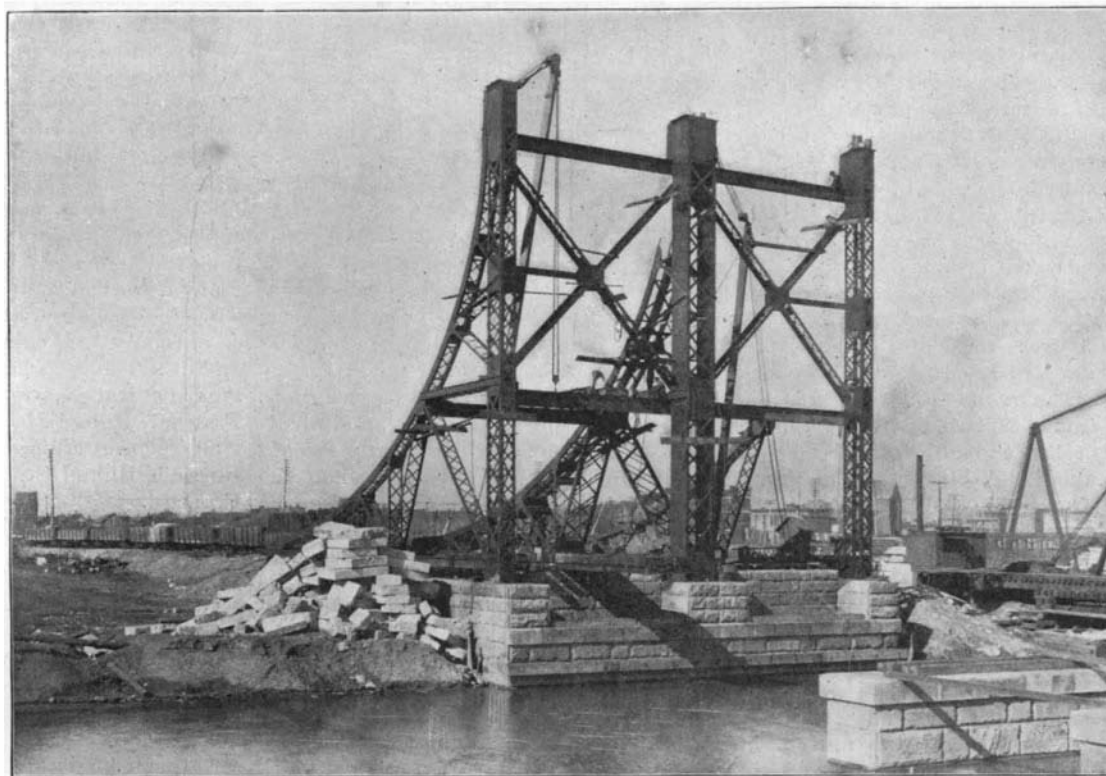
D. E. PACKER, of South Birmingham, England, has

lately given out some results of experiments in photographing the solar corona in daylight. By placing screens of tin and lead foil or thin sheets of copper over wide camera apertures, or better still over a pin hole aperture, he has succeeded in receiving impressions on sensitive plates of the corona alone, the sun itself appearing black as in a total eclipse. Some of his deductions are extremely interesting, notably that of the intimate connection of the coronal streams with sun spots and sun spot groups. Indeed, he says that "it may be regarded as an axiom that every sun spot has its coronal ray." He has also detected a decided heliacal structure in the radiations. He concludes that the corona is an electrical phenomenon

THE University of Edinburgh has received a bequest of \$100,000 from the late Earl of Moray as an endowment fund for the promotion of original research.



A NEW TYPE OF LIFT BRIDGE—SIDE VIEW.



A NEW TYPE OF LIFT BRIDGE—END VIEW.

the world. He looked long and carefully, then he went away, but it was to form a company which bought the place. They began operations at once.

With a force of thirty-five men and inadequate machines enough soapstone was put on the market to establish its reputation and create a demand. To-day, with a force of two hundred and twenty-five workmen and highly improved machinery, the output does not supply the demand. Extensions and improvements are constantly in progress, and the capacity of the vein is practically limitless.

The first quarry opened showed a vein from thirty-five to forty feet wide, inclined at an angle of sixty-three degrees. Excavated to a depth of one hundred and sixty feet, it still yielded fine blocks of workable stone. At the end of six years this quarry was abandoned, and a bout twenty feet away another quarry was opened and worked in the same way. There are now three quar-

Science Notes.

The fourth centenary of the discovery of India by Vasco da Gama will be celebrated by an exhibition in Lisbon next year of Indian products, in which Senor Aronca is instructed to invite England to take an important part.

A phosphorescent 5 o'clock tea was recently given in Paris at 8 in the evening, at which no lights were used, the light coming from the ceiling, carpets, chairs, pictures, teacups, and flowers. The ladies wore phosphorescent dresses, and their faces, shoulders, and arms gleamed with light. M. Henry, of the Académie des Sciences, has invented a phosphorescent starch which was used on the occasion and which may be employed as a face powder.

Litmus is an admirable indicator of acids and alkalis, but for this purpose can only be relied upon when pure. Its preparation in a pure state is not easy. A new and convenient means of making litmus paper is provided in the litmus pencil. Thus, by merely rubbing paper with the pencil, marks are obtained which are very sensitive to minute quantities of acids and alkalis, according, of course, as to whether the blue or the red end of the pencil has been used.

A sanitary engineer of this city is responsible for the following: A new danger has been found in the tall buildings of our largest cities. It is that draughts of sewer gas from the escape pipes of overtopping buildings come into the windows, chimneys and light shafts of adjacent office buildings or houses. A well known sanitary engineer states that the entire family of a superintendent of a large office building surrounded by loftier buildings suffered from severe forms of zymotic disease including repeated attacks of malarial fever and that even growing plants were destroyed.

William P. Mason, of the Rensselaer Polytechnic Institute, Troy, was once requested to state the weight in grains of a United States gallon of water at 60° Fah., and upon investigation found that much confusion existed on this point. He gives the following results, which are presented in the Pharm. Record:

U. S. Pharmacopœia. 1870	58328-8862 grains.
" " 1880	58329-6 "
Miller's Chemistry	58317-3 "
Am. Chemist, Vol. I, p. 318	58319-8 "
U. S. Dispensary	58328-886 "
Oldberg's Weights and Measures	58335-218 "
U. S. Treasury Department	8-3312 lb.

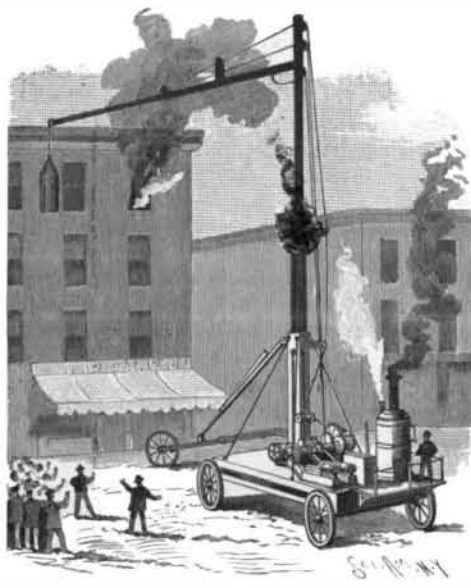
The Astrophysical Observatory at Potsdam is to have a large refracting telescope, says the Astrophysical Journal. With the 11 inch refractor hitherto used for the spectrographic researches of Profs. Vogel and Scheiner, the motions in the line of sight of 51 stars were determined with great accuracy, but it was impossible to photograph stars appreciably fainter than the second magnitude with the large spectrograph. It is reported from Berlin that the aperture of the new telescope will be about thirty inches. The light collecting power of such an instrument should be sufficient to bring stars of the third magnitude and some even fainter ones within reach of the largespectrograph, whose range will thus be trebled if not quadrupled.

A correspondent in Nature recently tried some interesting experiments with formic acid, which has so repeatedly been recommended to promote a magical growth of plants. The seeds used were those of the Scotch thistle. He used formic acid diluted 1-5000. The experiments were carried on in a greenhouse where the temperature ranged from 55° Fah. to 75° Fah. The seeds showed no sign of life, though those planted under ordinary circumstances did. He then procured pure concentrated formic acid; the result was the same. Various other seeds were then tried with no success. His conclusions are that the acid retarded the growth of the seeds, but seemed to increase their density. He also tried the injection of formic acid (1-5000) into growing seeds and bulbs with no effect.

In a recent Chemical Society paper on "The Temperature of Certain Flames," by W. N. Hartley, F. R. S., the author mentions that he found no practicable means of measuring their temperature, owing to the disproportionate size of the measuring instrument—a thermo-electric couple, for instance—compared with the effective volume of the flame. He measured the temperature of flames by means of gold leaf and with fine wires of platinum 1-3000 inch diameter, such as were drawn by Wollaston and used by Faraday, also with pure platinum wire 1-1000 inch thick. He furnishes evidence of the high temperature of a candle flame, not only from the melting of gold and of platinum in the flame, but by an examination of the spectrum to be seen in the mantle. Experiments made with platinum wires heated in a batswing gas flame are described, which proved that the carbon does not lower the melting point of the platinum, at any rate in any appreciable degree. A small carbon monoxide flame melts platinum wire 1-1000 inch in thickness, and a cyanogen flame was shown to be intensely hot, for it melted such wire with extreme ease. The author believes that his experiments have dissipated the doubt that was cast on Professor Smithells' statement of the high temperature of the mantle of the Bunsen flame, and confirm his own estimate of the high temperature of the Bessemer flame.

A NOVEL FIRE ESCAPE.

The invention shown in the illustration has been patented by Mr. John Alexander Dobkins, of Lebanon, Oregon. It is intended to provide a portable fire escape, specially adapted, by means of a laterally extended arm, to reach the windows of a building which are above the level of such obstructions as electric wires, etc. A stout sill frame, which is mounted upon wheels for convenience of transportation, is provided with a framed platform, or turntable, in which is securely fixed the base of a vertical telescopic mast, the heel of the same being stepped in a suitable pivotal support on the frame of the car. The mast is in three sections, and each section is provided with a wire rope by means of which it may be hoisted to the required height, said ropes passing over suitable pulleys and leading down through the mast to a sheave, from which they lead to the hoisting engine. Near the upper end of the top mast is provided an extensible horizontal swinging arm, which is formed in two parts, the outer one being provided with suitable pulleys and wire rope whereby it may be adjusted to the desired length. This arm is pivoted near its junction with the mast, so that when not in use it may be folded down upon the platform, and when it is extended, and in use, it is supported from beneath by a curved brace and from above by a wire rope, which passes over a sheave at the top of the mast and is carried down to a winch drum over loose pulleys which are adjusted on short laterally extending arms attached to the lower sections of the mast. A fireproof cage is provided to receive the inmates of the burning structure. It is hung from the end of the extensible arm by means of a wire rope, which passes over sheaves at the end of the same, and near the top of the mast, and is then carried down to the drum of the hoisting engine. To assist in bracing the mast an extensible arm is provided, having at its outer end a



DOBKINS' FIRE ESCAPE.

suitable wheel which bears upon the ground. At its inner end said arm is pivotally connected to the base of the mast. Attached to the center of the extensible arm is an extensible prop brace which is carried up to the top of the lower section of the mast, and pivotally connected to the same. By this arrangement the arm may be conveniently folded up when the fire escape is in transit. It will be seen from the above description that, upon arriving at the scene of a fire, the apparatus may be quickly adjusted to the required height, and the fireproof cage may be placed at any desired window for the rescue of the inmates of the upper floors.

Visibility of Lights at Sea.

As a result of the discussion of the subject of anchor and running lights by the International Maritime Conference in Washington, in 1889, says the New York Sun, special investigations were undertaken by officers of the governments of the United States, Germany, and Netherlands to determine the intensity of light needed to fulfill the requirements of the law governing the rules of the road, which says that "the word 'visible' in these rules shall mean visible on a dark night with a clear atmosphere." The result of a large number of observations by the German committee gave as the distance at which a white light of 1 candle power became visible, 1.40 miles for a dark clear night, 1 mile for a rainy one.

The American experiments, undertaken at Long Beach light station, gave the following results in very clear weather: A light of 1 candle power was plainly visible at 1 nautical mile and one of 3 candle power at 2 miles. A 10 candle power light was visible with a binocular at 4 miles, one of 29 candles faintly at 5, and one of 33 candles visible without difficulty at the same distance. On a second evening, exceptionally clear, a white light of 32 candle power could readily be distinguished at 3, one of 5.6 at 4, and one 17.2 at 5 miles.

The Dutch governmental experiments, conducted at

Amsterdam, gave the following results: A light of 1 candle power was visible at 1 nautical mile, 3.5 at 2, and 16 at 5 miles.

In the experiments with colored lights it is only necessary to use the green, as it has been conclusively proved that if a light of that color fulfills the required tests, a red one of the same intensity will more than do so. It was found that the candle power required for a green light to be visible 1, 2, 3, and 4 miles at sea was 2, 15, 51, and 106, respectively.

The extraordinarily rapid diminution of the visibility of the green light with the distance, even in good observing weather, and the still more rapid decrease in rainy weather of a character which will but slightly diminish the intensity of a white light, show that it is of the utmost importance to select for the glass a shade of color which will interfere with the intensity of the light as little as possible. The shade recommended is a clear blue green. Yellow green and grass green should not be employed, as they become indistinguishable from white at a very short distance. For the red a considerably wide range is allowable, but a coppery red is probably the best.

The Fleets of the Great Nations.

The Carnet de poche d'officier de marine contains a classified list of the fleets of the great nations, according to which, taking into account only the latest types, England, Italy, Germany, Austria, Russia, France and the United States possess the following ships:

Armored vessels:

(1) Battleships of 13,000 tons and a speed of at least 18 knots: England 7; 10,000-13,000 tons and at least 16 knots: England 11, Italy 4, Germany 4, Russia 3, France 6 and United States 3; 8,000 tons and from 14 to 16 knots: England 11, Italy 3, Germany 1, Russia 6, France 7; and of less than 8,000 tons and less than 16 knots speed: England 1, Germany 9, Austria 4, Russia 1, France 4, United States 1.

(2) Coast defense ships of 8,000 tons and at least 16 knots: England 2; 6,000-8,000 tons and 14-16 knots: England 2, France 9; and of less than 6,000 tons and 14-16 knots: England 1, Germany 6, France 2, United States 2.

(3) Armored cruisers of 4,000-6,000 tons and at least 18 knots: England 9, Russia 3, France 5, United States 2.

(4) Armored gunboats or monitors of 1,500 tons and at least 13 knots: Austria 2, Russia 3, France 8, United States 1.

Other armored vessels: Italy 3, France 5.

Total armored vessels of the latest type: England 44, Italy 10, Germany 20, Austria 6, Russia 16, France 41, United States 9.

Unarmored vessels:

(1) Protected cruisers and torpedo dispatch boats of 8,000 tons or more and at least 18 knots: England 2, Russia 1; 4,000-8,000 tons and at least 18 knots: England 21, Italy 1, Germany 5, United States 8; 4,000 tons and 14-16 knots: England 7, France 3; 2,000-4,000 tons and at least 17 knots: England 31, Italy 13, Germany 1, Austria 2, Russia 3, France 5, United States 6; 2,000-4,000 tons and at least 14 knots: England 6, Italy 4, Germany 7, Russia 8, France 12, United States 2; and of less than 2,000 tons and 14 knots or over: England 19, Italy 5, Germany 17, Austria 1, Russia 10, France 7, United States 8.

(2) Torpedo cruisers of 20 knots and over: Italy 8, Russia 6, United States 1; of 15-20 knots: England 9, France 4.

(3) Torpedo boat destroyers of at least 25 knots: England 11, Italy 5, Germany 4; of 20 to 22 knots: England 11, Italy 1, Germany 6, Austria 6, France 19.

Other unarmored vessels: England 21, France 1, Russia 4, Italy 6, and Austria 6.

Total unarmored vessels: England 133, Italy 43, Germany 40, Austria 15, Russia 32, France 51, United States 25.

Torpedo boats:

Torpedo boats of 120 tons and from 20 to 25 knots: England 2, Germany 15, Russia 17, France 9, United States 1; of 100 tons and at least 20 knots: England 10, Italy 2, Germany 18, Russia 3, France 21, United States 1; of 40-100 tons and at least 20 knots: England 54, Italy 92, Germany 59, Austria 22, Russia 23, France 149, United States 1; of 40-100 tons and at least 18 knots: England 12, Germany 25, Austria 34, Russia 10; and of less than 40 tons and at least 18 knots: England 27, Italy 67, Russia 2, France 37.

Total torpedo boats: England 105, Italy 151, Germany 117, Austria 56, Russia 55, France 216, United States 3.

Grand total:

The total number of vessels of latest type is, therefore, England 287, Italy 204, Germany 177, Austria 77, Russia 103, France 308 and United States 37.

Besides these there are a number of armored vessels of older type, which will be available for defensive purposes as well as in second line. Of these England has 21, Germany 14, Austria 5, Italy 4, France 9 and United States 18.—Journal of the United States Artillery.