These results have been verified at temperatures as low as 14° Fah., at which, however, there was little cloudiness produced, owing to the small amount of vapor in air so cold. The sources of this dust are many and various; for instance, finely ground stone from the surface of the earth, the ash of exploded meteorites, and living germs. Mr. Aitken showed experimentally that, by simply heating any substance, such as a piece of glass, iron, or wood, a fume of solid particles was given off, which, when carried alongwith pure air into a receiver, gave rise to a dense fog mixed with steam. So delicate is this test, that the hundredth of a grain of iron wire will, when heated, produce a distinct haziness in the receiver. By far the most active source of these fog-producing particles is, however, the smoke and sulphur given off by our coal fires; and as even gas grates will not prevent the emission of these particles, Mr. Aitken thinks it is hopeless to expect that London, and other large cities wherein such fuel is used, can ever be free from fogs. However, inasmuch as more perfect combustion will prevent the discharge of soot flakes, these fogs may be rendered whiter, purer, and therefore more wholesome, by the use of gas grates, such as that recommended by Dr. Siemens. Mr. Aitken also drew attention to the deodorizing and antiseptic powers of smoke and sulphur, which, he thinks, probably operate beneficially in killing the deadly germs and disinfecting the foul smells which cling about the stagnant air of fogs, and suggests caution lest, by suppressing smoke, we substitute a greater evil for a lesser one.

THE NAVIES OF EUROPE.—TEN YEARS' PROGRESS IN SHIPS OF WAR.

In recent issues of this paper considerable space has been given to the consideration of our coastwise and maritime defenselessness, and to the pressing need of attention to our naval weakness.

The past decade has been a period of remarkable activity and creative progress in all the navy yards of the world save ours. During this time the great powers of Europe have substantially reconstructed their navies on a scale previously undreamed of; and even the third and fourth rate powers of the world have so increased their war fleets as to place us in a decidedly precarious position navally should a controversy with either or any of them suddenly arise. There is happily no present indication of foreign war, but a war is always possible; and it ill-becomes the richest nation in the world to be doing nothing for the protection of the exposed wealth of its seaports, or for putting itself in position to command respect—the surest guarantee of peace.

According to the recent report of the Navy Department the strength (more correctly, weakness) of the United States Navy is summed up as follows:

In Commission—Steamers, 29, sailing ships, 4; monitors, 8; torpedo boats, 2; total, 43. In Ordinary—Steamers, 18; sailing vessels, 8; monitors, 7; steamers, 3; sailing ships, 3; monitors, 1; steamer, 1; sailing ships, 3. On Stocks—Steamers, 5, sailing ship, 1; monitors, 4; ironclad, 3. Repairing—Steamers, 9. At Naval Academy—Sailing ships, 3; monitors, 1. Public Marine School—Sailing ship, 1. Tugs of all kinds at yards and stations, 25. Total number of vessels, 139.

Of these vessels, constituting the general service fleet, six are double-turreted armor belted monitors, only one of which is finished or near completion—the rest are rotting on the stocks; fifteen are single turreted monitors built from fifteen to eighteen years ago, and now practically worthless; five are unarmored screw steamers (frigates), the youngest, the flag ship Tennessee, being fifteen years old; twelve second-rate and twenty third-rate corvettes, all but one second-rate (the Trenton) and half a dozen third-rates being ancient and of small value; four paddle steamers, all ancient; two torpedo vessels, and a dozen small gunboats, only two of which are yet armed. Some of these vessels carry small rifled guns (altered from smoothbores), and all are slow, very few exceeding ten knots.

The navy of Great Britain presents a remarkable contrast. It now comprises, according to the careful summary of Mr. King ("War Ships and Navies of the World," by Chief Engineer J. W. King, U. S. N. Boston: A. Williams & Co. 1880), nearly four hundred vessels of all kinds, excluding those laid up or employed in permanent harbor service. These vessels are divided into three classes: ships for great naval battles, ships for coast defense, and unarmored cruising vessels. Of the first class of heavily armored sea going fighting ships, armed with powerful guns, there are now twenty-eight, carrying 254 guns, weighing in all 4,493 tons. Eleven of the ironclads are sea-going turret ships—nine masted less and two rigged—and seventeen are broadside ships, of which three are armor-belted cruisers. The coast defenders number fifteen, and the iron broadside ships of the original type number ten. In addition, two iron-plated wooden ships remain serviceable. These are all large ships; nearly all are of recent construction, the average expenditure on new armored ships, according to Mr. King, being about fifteen million dollars a year, while nearly four millions are spent on other new vessels. The first-class turret ships range between 270 and 330 feet in length; 6,200 to 11,406 tons displacement; carry guns of from 25 to 80 tons; and can steam from 12½ to 15 knots an hour. The first-class broadside ships are from 230 to 325 feet in length, and, with one exception, exceed 6,000 tons displacement, rising as high as 9,500 tons. They carry guns of from 12 to 25 tons, and all make better time than the fastest American corvettes, or between 12 and 15 knots. The armor belted ships are but slightly smaller and less powerful. The coast defenders are improvements on our monitors in size, speed, and armament. Most of the old-type iron broadside ships are larger than our Tennessee; are armored, carry guns from 6½ to 12 tons, and can steam from 12 to 15 knots.

The lately built unarmored ships of the British Navy include three iron frigates, six iron corvettes, two steel dispatch vessels, nine steel and iron corvettes, six composite corvettes, fourteen first-class composite sloops, and six second-class, with a hundred composite gun vessels and gun boats. The frigates steam from 15 to 16 knots; the first class corvettes from 13 to 15 knots; the second-class 11 knots; the dispatch boats, both as large or larger than the Trenton, have exceeded 18 knots.

The old-type steam cruisers of wood and iron in the general service fleet are by no means of small importance, though they do not properly fall within the scope of this article. This fleet comprises fifteen ships of the line, twelve frigates, twenty corvettes, ten sloops, thirteen troop ships, supply ships, dispatch steamers, yachts, surveying vessels, etc.

The new fighting fleet of France practically dates from 1872, when a programme was drawn up for the construction of 217 vessels of various types, costing in all upward of $121,000,000. The finished armored vessels comprise eight sea going ships of the first class, iron or iron and steel rams, from 311 to 322 feet in length, from 8,123 to 10,332 tons displacement, and of speeds ranging from 13 to 14½ knots; seven or eight sea-going ships of the second class, about 250 feet in length, from 4,000 to 6,000 tons displacement, and speeds of from 13 to 14 knots; fifteen coast defenders, from 216 to 241 feet in length; sixteen first-class wood and iron ships of old types, and eight of second-class, the former from 2?2 to 284 feet in length, the latter 230 feet. All of these ships are armed with breech-loading rifled guns. When Mr. King's table was made two first-class sea-going ships were building, each to carry three 100-ton guns. All the French sea-going armored ships are rigged; the mastless vessels for coast defense include six turreted vessels; all the rest are on the broadside principle, or have the broadside and turret principles combined. The heaviest guns are mounted *en barbette*. Both the armored and unarmored modern ships have the ram bow.

Of the latter type of vessels the programme of 1872 contemplated eight first-class, eight second-class, and eighteen third-class cruisers, eighteen dispatch vessels, thirty-two gun boats, and thirty-five transports. A large portion of these are already afloat. By 1885 it is expected that the entire fleet will consist of new vessels of the most approved modern types armed with the best modern guns, all in perfect condition for service.

The list of the old-type steam cruisers, mostly of wood, given by Lieutenant Very ("Navies of the World," by Lieut. Edward W. Very, U. S. N. New York: John Wiley & Sons. 1880), includes nine ships of the line, six frigates, ten corvettes, twenty one sloops, eleven dispatch vessels, and forty-two transports.

The fleets of Germany and Italy are almost entirely the work of the past decade or so. It is only since 1860 that Germany has had any navy at all, to speak of, and since 1873 that any attempt has been made to acquire a navy commensurate with the importance of the empire on land. The armored ships afloat or building comprise six casemate ships, 213 to 280 feet in length, 7,135 to 7,560 tons displacement, speed of 14 knots, and armed with Krupp guns of from 18 to 36 tons; two armor-belted turret ships, with casemate around turret, 298 and 308 feet in length, about 6,500 tons displacement, 14 knots speed, and armed with Krupp guns, the largest being of 18 tons; three large broadside ships; one corvette, and eight or ten coast defenders, of 1,000 tons displacement and slow speed. The latter carry each a 36-ton Krupp gun, in a movable turret protected by an armor parapet. None of these will be able to match the larger ironclads of England, or the Italian Duilio or Dandolo; but will have a strength sufficient, perhaps, to meet the French under any conditions proffered.

The modern unarmored ships of Germany include seven fast iron corvettes, 2,460 to 3,8?3 tons displacement, carrying from 12 to 16 guns each, having covered gun decks; and six open deck corvettes of 2,160 tons displacement; three fast dispatch vessels (16 knots), and five gun boats.

The modern war fleet of Italy dates from 1877, and comprises the most powerful and heavily armed vessels ever built. The Italian ships are specially remarkable for the heavy guns they carry and their great speed. The broadside ships Italia and Lepanto, now building, are 400½ feet long, 13,480 tons displacement, are expected to steam 16 knots, and will each carry four 100-ton Armstrong guns, mounted in pairs *en barbette*, and 18 smaller guns. The mastless turret ship Duilio lacks an inch of 341 feet; its displacement is 10,401 tons; it carries four 100-ton guns, and makes 15 knots. The unfinished Dandolo is in every respect its counterpart. The four line of battle cruisers already afloat are from 250 to 265 feet long, and though lightly armored are heavily armed, two of them carrying one 23-ton and six 18-ton guns, the other two carrying six 18 ton guns and two 12-ton guns. There are besides one monitor ram, four floating batteries, and six broadside frigates, for coast defense and station service. The unarmored fleet numbers ten fast cruisers, of which three are second-class corvettes, four gun boats, and three torpedo vessels. By the decree of 1877 it was determined to have completed by 1888 sixteen ships of war of the first class; ten of second class for local defense, for cruisings, and for foreign stations; and twenty vessels of third class; twelve transports, and twelve small ships for local service, a programme which is rapidly being carried out, as already shown.

Two years ago the Russian Navy included thirty-one armored ships and a couple of hundred other vessels. The armored ships were: frigates, 6; battery ships, 3; turret ships, 5; Popoffkas, 2; double turret monitors, 3; single turret monitors, 12. The more powerful of the Russian war ships have been launched since 1874. The double turret ship, Peter the Great, is 330 feet long, is of 9,510 tons displacement, carries four 40-ton guns, and has made 13 knots. The Knatz Minin is another powerful ship, 389 feet long, 5,800 tons displacement, and carries four 28 ton guns, mounted in pairs *en barbette*. The two Popoffkas are floating citadels of circular form, designed for service in shallow water. The latest novelty is the turbot-shaped Livadia, ostensibly a yacht for the Czar, but doubtless intended, in case of need, to be heavily armored and armed for naval uses. During the past five or six years Russia has also been expending large sums on unarmored fast cruising ships, this arm of the navy having already become formidable.

The armored fleet of Austria contains but three or four vessels older than 1870. It comprises three redoubt frigates, 276 to 302 feet in length, 5,940 to 7,390 tons displacement, armed with 10 and 11 inch Krupp guns (18 to 28 tons), and able to make from 13 to 14 knots; five casemate frigates, 222 to 275 feet in length; three broadside frigates, of 197 and 253 feet length; two monitors, and one citadel ship. The smaller frigates are armed with 7 and 8 inch guns, and make from 11 to 13 knots. The last mentioned vessel carries two 17 inch Armstrong guns. The unarmored fleet contains a considerable number of recent cruisers of fair speed and efficiency.

The navy of Holland is chiefly strong for defensive purposes, and comprises but two sea going armored ships. The armored ships of Spain are few and of small importance compared with those of other European powers. The list includes 138 vessels of all kinds, but there are no modern sea-going armor-clads and no cruisers of the rapid type. Denmark has launched two iron-clads since 1873, the frigate Odin, carrying four 18-ton guns; and the broadside, casemated, central battery ship Helgoland, launched in 1878. The half dozen other armored vessels are old. The Swedish navy is designed chiefly for coast defense. This arm comprises four armored monitors, ten armored gunboats, and about a hundred other vessels of all sorts. The navy proper comprises 38 unarmored vessels. Portugal has one armored ship, ten screw corvettes, nine gunboats, and half a dozen sailing vessels, transports, etc. Norway has four monitors, one frigate, four corvettes, and about a hundred gunboats and other small vessels. Greece has fifteen vessels, including two ironclads. Turkey has vessels enough to rank among the naval powers, but lacks money and officers to make them effective. Fifteen of her ships are large and fairly armed.

The chief lesson taught by the costly naval experiments of European powers during the past decade—a lesson which the United States can profit by—seems to be the inexpediency of building huge floating fortresses at enormous cost. The power of guns can be increased more rapidly than the ability of ships to withstand them; and the greater the target the greater the chance of being hit, and the greater the loss of life and property when a crushing blow has been struck.

For defense against the largest class of ironclads we need properly placed stationary coast defenders, the armor of which can be increased as the power of the guns to be resisted is increased. The superior accuracy of fire possible in a land battery will make one heavy gun, so placed and guarded, more formidable than many guns of equal weight on shipboard. For naval purposes a large number of small vessels of great speed, each carrying one heavy gun, will be more efficient than a few large armor clads of equal aggregate cost.

The Scientific American.

While the newspaper press of the day is, for the most part, inculcating more of error than of truth in the public mind in regard to medical topics, cultivating the vulgar superstitions by circulating every sensational story about mad-stones and blood stones and the like, and gloating over every report of the desecration of graves for anatomical purposes, it is refreshing to turn to the pages of the periodical above named, and to observe that whenever medical topics are introduced, it is with the design of imparting the truth and inculcating correct ideas. Many years of growth have raised the SCIENTIFIC AMERICAN to the front rank, so that there is not in any country a publication superior to it in its sphere.—*Pacific Medical and Surgical Journal.*

Photographic Emulsions.

BY H. W. VOGEL, BERLIN.

The essence of the invention consists in combining gelatine and bromide of silver with pyroxiline by the use of a new solvent, which insures the homogeneous mixture of the two. The solvent may be one of the inferior members of the fatty acids, such as formic, acetic, propionic acid, etc., or mixtures of the same alone or with alcohol, etc. Four various methods of producing the combination are described, of which the first is as follows: Ordinary gelatine is dried and dissolved warm in one of the above-mentioned acids, and one per cent of pyroxiline dissolved in a similar acid is added.

Machinery and Civilization.

Mr. Charles C. Coffin has been giving a series of lectures in the Lowell (Mass.) Institute on our manufacturing industries and the relation of invention to civilization. From the Boston *Advertiser* we make the following extracts from one of these lectures:

The first need of men in this world is for something to eat; the second is for something to wear. The earliest historical allusion to the manufacture of textile fabrics is the simile in the oldest poem extant—the Book of Job—the comparison of the swiftness of time to the weaver's shuttle. The weaver's shuttle of the East and the loom of the Orient through all the centuries have not changed. Throughout Asia, and even in some sections of Italy and Spain, the spindle of to-day is like that which Penelope deftly twirled when preparing garments for her absent lord. The use of machinery in the manufacture of clothing has been a powerful agency in modern civilization. Out of the multitudinous machines of the present century I select those for spinning and weaving to represent the progress of mechanic art. It is noteworthy that the first movement in free intellectual thought in antagonism to the dogmatism of the Middle Ages and the first mechanism to relieve woman from unceasing toil were coincident. During those years in which Martin Luther, Melancthon, and their compeers were awaking the world to a new intellectual and religious life, a German carpenter constructed the spinning wheel, which made its appearance about 1530. The knitting machine was the second invention—the device of a young curate of Nottingham, the Rev. William Lee; and during those months when the Mayflower was crossing the Atlantic, the first stockings knit by the machine were placed on the market.

The lecturer commented upon the fact that the century following Lee's invention rolled away without any invention. Men were giving their attention to other things. The spirit of the age was against invention. The learned were lost in abstractions, were regardless of human needs, utterly ignorant of the resources of nature to alleviate human woe or to lift men to a higher plane of life. Another reason why inventions did not come earlier was that all christendom, through the Middle Ages and down to the beginning of the present century, was engaged in war. The conditions were all adverse to scientific research. In 1781, just one hundred years ago, came Watt's first working engine, with a condenser and the steam applied to propel the piston in both directions.

Aside from the very few wind and water mills, the human race at the beginning of the present century was living by its own muscular energy, digging and delving, spinning and weaving, with rude instruments and mechanisms.

The world is more enlightened now, but there are still many people who cannot see how the introduction of a machine which will do the work of many men can be promotive of the well being of the community. Imagine yourselves as standing on the bank of the Merrimac in 1821, with Nathan Appleton, William Appleton, Patrick T. Jackson, Kirk Boott, John W. Boott, Paul Moody, and Nathaniel Bowditch. No sound breaks the stillness, save the rushing of the water over the rock. It is the energy of nature running to waste, and these gentlemen determined to set it to work for their individual welfare. They purchased the surrounding farms and the old canal which other men had constructed for the passage of rafts, set themselves to enlarging it, and in building a dam, not working with their own hands, but summoning the farmers, who came with their oxen to haul rocks. Stonemasons are wanted, and the blacksmith to sharpen their tools. Young men come down from Vermont and New Hampshire to dig the canal. The gentlemen who are pushing the enterprise need bricks. Another class of laborers is called for. Lumber is needed, and sawmills are set to humming. Masons, hodcarriers, mixers of mortar, lime burners, are set to work, with still more oxen, more teamsters and cartmen, besides coopers to make the casks for the lime. An architect plans the manufactory; the carpenters frame it, and a corps of joiners finish it. A millwright calculates the power, sets another corps of men at work constructing the great wheel. The manufacturers of the spinning and carding and weaving machines have regiments hammering and filing brass, steel, and iron. They in turn have set the founders, puddlers, and smelters to work. Furnaces send up their lurid flames; vessels are sailing on the ocean to fetch and carry the materials. The miners far down in the earth, the sailor climbing the shrouds in mid-ocean, the millwright lost in thought, as he calculates the power of nature's energy, the brickmaker moulding the plastic clay, the joiner plying his plane, the teamster urging his cattle; all have been called from former vocations to aid in building the mills. Why have they come? Because these gentlemen offer them more remunerative wages than they have been receiving.

Let us follow on. The mills are erected, the machines are in place, but human hands are still needed. The gentlemen summon the farmers' sons and daughters by the inducement of better wages. Have the gentlemen thrown any one out of employment? They have changed labor; they have made the spinning wheel and loom of the household useless lumber, not throwing the old-time spinners and weavers out of employment, but transferring them to one in which they can do more for themselves and their fellowmen. You ask, perhaps, what the masons joiners, and carpenters who built the mill are to do when the mill is completed? Are they not out of employment? The mill is only the beginning. Dwelling houses are needed, stores, shops for the grocer, butcher, baker, joiner, mason, blacksmith—the whole fraternity of trades and occupations. The first mill erected at Lowell was the beginning of a city to-day numbering between 50,000 and 60,000 inhabitants. It will be instructive in this connection to see what labor and capital together will accomplish through the use of the energy of nature, in giving value to raw materials.

The Southern farmer plows his lands, casts in the cotton seed. He sells his crop at 12 cents per pound, obtaining a livelihood by agricultural labor. The operative in Lowell, by manufacturing it into muslin, may make it worth 80 cents, by more delicate manipulation into lace worth $1. But before the process could be undertaken by the machinist, the iron manufacturers were called upon to construct the machinery. The ore which the miner dug from the ground, and which he sold for 75 cents, the iron smelter sold for $5. The machinist makes it worth $100. If instead of putting it into spindles and wheels, it had been sold to the manufacturer of fine needles, he would have made it worth $6,800. The manufacturer of watch springs would have made it worth $200,000; or if he were to use it for pallet arbors it would be worth $2,577,595. Past earnings and present labor together give this increased value to the 75 cents' worth of ore.

Invention renders old things obsolete and so is destructive; but there is a force more destructive than invention, a force that not only drives men from occupation, but upon the instant consigns their costly machines to destruction—a force wielded almost wholly by the female sex—the force of fashion, a power stronger than the combined strength of inventors, manufacturers, and operatives. Not long ago every woman in this audience quite likely regarded a hoop-skirt as necessary to make her wardrobe complete. Probably not less than 25,000,000 were manufactured per annum, requiring an outlay of many millions of dollars for complicated machinery, furnaces, and rolling mills for the foundation of steel, manufactures for the weaving of tape, employing many thousand operatives; but suddenly the idea gained possession of the female mind that dress would be more graceful and pleasing to the eye without them, and they were upon the instant discarded, bringing about quick destruction to the manufactures and loss of occupation to the operatives.

Invention is an educator. It begins with thought. The more thought put into his machine by the inventor the higher the intelligence to operate it. Mechanics has become a distinct profession, requiring high mathematics, physics, and the power of abstract thought. Trade and commerce recognize the new profession by offering it their highest pecuniary rewards. It is the master mechanic, receiving his salary of $15,000 per annum, who is the cheapest employe of some corporations in this country. Fifty years ago, in 1830, the spindles of the world were as follows: United States, 1,000,000; Europe, 2,000,000; Great Britain, 8,000,000. To-day the United States has 11,000,000; Europe, 20,000,000; Great Britain, 40,000,000. In cotton manufacture it is estimated that one man to day is able to do the work of 1,000 hand laborers, and that the cotton, silk, and woolen industries of to-day would require the labor of every human being if prepared by hand labor.

One hundred years ago, when thread numbered 150 by the standard set up by spinners was considered the utmost degree of fineness possible by English spinners, a pound of cotton spun to such fineness would give a thread 74 miles in length, sufficient to reach from Boston to Concord, N. H. The machinery of to-day spins for useful purposes thread numbered 600—from one pound a thread 196 miles in length. And machinery has been constructed so delicate that a pound of cotton has given a thread reaching 1,061 miles—farther than from Boston to Chicago! The weaver of my boyhood could throw the shuttle perhaps twenty-five times a minute, but not at that rate through the day. Human muscle would break down under such rapid action. In 1850 Compton's loom threw the shuttle fifty times a minute, whereas so great has been the advance of invention, that the loom of to day is considered a slow moving mechanism if the shuttle does not fly 240 times a minute! "No man can afford to take as a gift to-day a cotton manufactory equipped with the machinery of 1860," was the remark of the late superintendent of the Amoskeag Mills. "We are breaking up the machinery of those days for old iron."

In some departments of cotton manufacture a man with the present machines will do eight times the amount of work which he could accomplish in 1860. In the manufacture of coarse cloth an operative with ten machines does twice the work which he could accomplish with thirteen machines before the war. There never was a period so fruitful in discovery, so fertile in invention as the present, and the reason is manifest. The first discoverers and inventors groped in the dark. They were ignorant of nature's laws. They did not know what force was. They had a limited comprehension of what the simple mechanical powers were. There was little accumulated wealth of research.

In contrast, the mechanic of to-day has all the discoveries, the experiments, the ascertained facts, mathematics of machinery, the laws of force at his command. He inherits the scientific wealth of all the past and makes it his capital. Instead of gazing, as it were, upon old mines worked out, he beholds mountain ranges filled with golden ore, and engages in his work with the stimulus of the needs of the human race, and the ever increasing wants of an advancing civilization.

Repairing Steamers Out of Dry Dock.

Some weeks ago the steamship Queen, of the National Line, had her bow stove in by collision on the bay. To save the heavy cost of occupying the dry dock while the plates were being made for repairing the breach, the Queen was towed to the Erie Basin, where the manager of the line, Mr. Hurst, had the work done by means of a cofferdam, which was built on the dock. The dam was about 25 feet square, and was simply a huge box without a cover. In one side of this box an aperture was cut into which the bow of the vessel exactly fitted. Then the box was sunk beneath the steamship and raised under her bow so that it fitted snugly to her hull and the edges were calked. After the water had been pumped out the workmen descended into the box or cofferdam and rebuilt her bow. This method of repairing, which is an old but much neglected one, saved the company, Mr. Hurst is reported to say, just $26,000.

More recently the method has been applied to the iron steamship Holland, of the same line. Mr. Hurst says: "In the November gales she was all torn to pieces about the stern. She is 450 feet long and is registered at 4,000 tons burden. No dry dock in America could lift her. She is at our dock at Houston street, North River. I had a coffer dam built in Jersey City and towed to the Holland. The dam is 36 feet long, 26 feet wide, and 22 feet deep. I sent a carpenter into the hold of the Holland, and he took measurements every 2 feet from keel to deck. He then went on the dock and built a flat pattern the exact shape of the vessel about 10 feet from her stern. The shape of the pattern was cut from one side of the coffer dam. Then the coffer dam was towed to the vessel, heavy chains were thrown into her until she sank, the chains were then withdrawn, and the dam rose to the hull of the steamship. The stern fitted perfectly into the aperture, and all was made snug." The repairs will take till February 15. By that time the charge for dockage would have amounted to over $30,000, which is saved by the use of the coffer dam.

A Large Iron Steamboat.

The Fall River Steamboat Company announce that a contract has been signed with John Roach & Son for the construction for them of an iron steamboat, to be the largest ever built for the Long Island Sound trade, between New York and Fall River. Her length over all, on deck, will be 395 feet; length of hull, 380 feet; extreme breadth of beam across the guards, 87 feet; breadth of beam of hull, 50 feet, and 17 feet depth of hold. She will be built upon the cellular system, that is, with two hulls—the most recent type of shipbuilding insuring safety—the cellular spaces at the sides being two feet deep, and along the bottom three feet deep, between the hulls. The spaces between the two hulls will be divided into ninety-six watertight compartments, and, in addition, there will be six water-tight bulkheads from the inner hull to the main deck. The new boat will be provided with a steam steering apparatus, and an independent or safety-steering quadrant aft, in case of accident to the steam gear. The means for extinguishing fire, for closing one compartment from another, and other provisions for safety, will be on the latest improved methods. The engine will be on the "walking beam" principle, with 110 inches diameter of cylinder and fourteen feet stroke. There will be four main boilers, their construction being such as to warrant carrying a pressure of steam fifty pounds to the square inch, although the working pressure will be about twenty-five pounds to the square inch. The paddle shaft will be twenty-six inches in diameter, and with the piston rod, connecting rods, and rock shafts, will be made of the best wrought iron. The machinery will be inclosed in a compartment of longitudinal and athwartship bulkheads, carried up to the hurricane deck. The passenger accommodations are intended to be superior to those of any steamboat now afloat. The boat is to be completed by May, 1882.

AGRICULTURAL INVENTIONS.

Messrs. Anthony W. Byers and James C. Dorser, of Sherman, Texas, have patented a cotton planter so constructed that it can be adjusted to plant less or more seed, as required. There is an ingenious arrangement of spikes or prongs attached to the rim of the feed wheel, which take hold of the cotton seeds and draw them out between curved steel springs fixed in the slot in the bottom of the feed board or bottom of hopper, and at the sides and forward end of this slot are attached springs which are curved downward and outward in such a manner that their bends may meet, or nearly meet, within the slot, so as to prevent the seeds from passing out except when pushed out by the prongs of the feed wheel and thus prevent the seeds from being dropped in bunches. The outward curve of the ends of the springs allows the seeds to drop from them freely, and allows the prongs of the feed wheel to pass up between the springs should the said feed wheel be turned backward.

Mr. Julius Holekamp, of Comfort, Texas, has patented a seed planter whereby corn, sorghum, beans, rice, cotton, etc., may be planted in hills or drills, and so constructed that the seed may be planted in any desired quantity, and at any desired distance apart, and with the rows at any distance apart.

Mr. Christian E. Gardner, of Orangeburg, S C., has patented a seed planter and fertilizer-distributer, which has two hoppers and dropping devices whereby different materials may be carried and distributed by the same machine and at the same time. Adjustments are provided whereby the machine may be used either as a single or double planter.