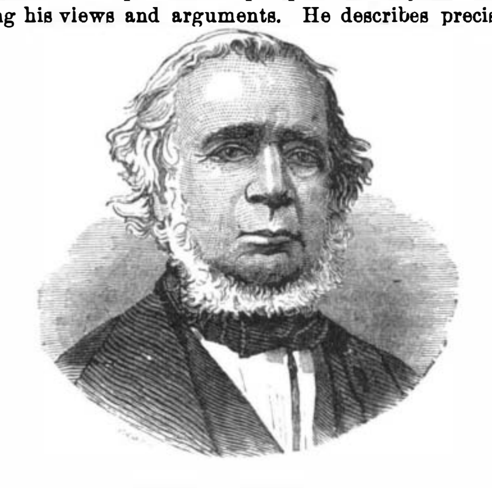
THE MESSRS. STEVENS OF HOBOKEN, AND THEIR IRONCLADS.

One of the greatest engineers living at the commencement of the present century was Colonel John Stevens, of Hoboken, N. J. He was born in this city in 1749, but early became a resident of New Jersey, of which State he was a prominent and public-spirited citizen. In 1787, while driving on the bank of the Delaware, he saw the steamboat of John Fitch on one of its trial trips; and its partial success induced him to attempt the solution of the same problem, and he was assisted, until 1801-2, by Chancellor Livingston, who then went to France and there met Fulton. In 1789, Stevens asked of the Legislature of New York an exclusive right to steam navigation of the Hudson, stating that he had perfected the plans of his vessel, that they were entirely new, and that they did not interfere with any then existing inventions. In 1803 he built, and in 1804 actually had in use, a steamboat embodying ideas a half century or more ahead of his time. Steam was furnished under 50 lbs. pressure by what we to-day call a "safety" tubular or sectional boiler. The engine was quite similar to that built many years later for the French steamer *Etoile*. The propelling apparatus consisted of a pair of twin screws. His boiler was forty years ahead of his age; the engine was copied thirty years later; the screw came into use only when Ericsson and his rivals brought it forward, thirty years after Stevens, and twin screws are hardly yet recognized as standard practice under proper conditions. The machinery of this vessel is still preserved in good condition at the Stevens Institute of Technology. An engraving of it has been published in the SCIENTIFIC AMERICAN and in the SCIENCE RECORD. The British patent on the boiler is still to be seen at the Stevens Institute.

The success of this little craft was such that he built another in 1806, 50 feet long, 12 feet wide, and 7 feet deep, with a single screw. What remains of this screw—the hub and one blade—is to be seen at the Stevens Institute of Technology. The success of this latter and larger boat encouraged him to construct quite a large steamboat, the Phœnix, which was brought out and which very closely contested the claim of Fulton for the monopoly of steam navigation on the Hudson River. Beaten by, it is stated, a quarter of an hour in time of completion and trial, Stevens sent his boat, in June, 1808, in charge of his son, Robert L. Stevens, around into the Delaware, and the latter thus had the honor of being the first to make a sea voyage in a steam vessel. Stevens' boats were successful on the Delaware and on the Connecticut for many years, and, after the expiration of Fulton's monopoly, became the most successful on the Hudson.

In 1812, Colonel John Stevens proposed to construct an ironclad floating battery, which was identical in all its leading features with the circular battery, proposed sixty years later by the late John Elder, of Glasgow, and which has recently been illustrated in foreign engineering periodicals. This odd craft was intended for harbor defence. It was to be a saucer-shaped vessel with a bombproof deck, and armed with a number of the heaviest guns. It was anchored by a swivel at its center, about which it was to be rapidly turned by a set of submerged screws driven by a steam engine. As each gun during its revolution came into the line of fire, it was discharged and was reloaded before the completion of another revolution brought it into line again. The plan evidently resembled somewhat the "monitor" in principle. This was probably the first ironclad of which plans were ever prepared. In 1812 Colonel Stevens proposed and urged upon the New York State Legislature the construction of a railroad to connect the waters of the Hudson with those of the great lakes, and insisted that economy of first cost, and of maintenance, as well as convenience and speed of transportation, dictated the adoption of his plan rather than the construction of the canal proposed by De Witt Clinton, Gouverneur Morris, and other distinguished men of that time. He published a pamphlet in May, 1812, embodying his views and arguments. He describes precisely



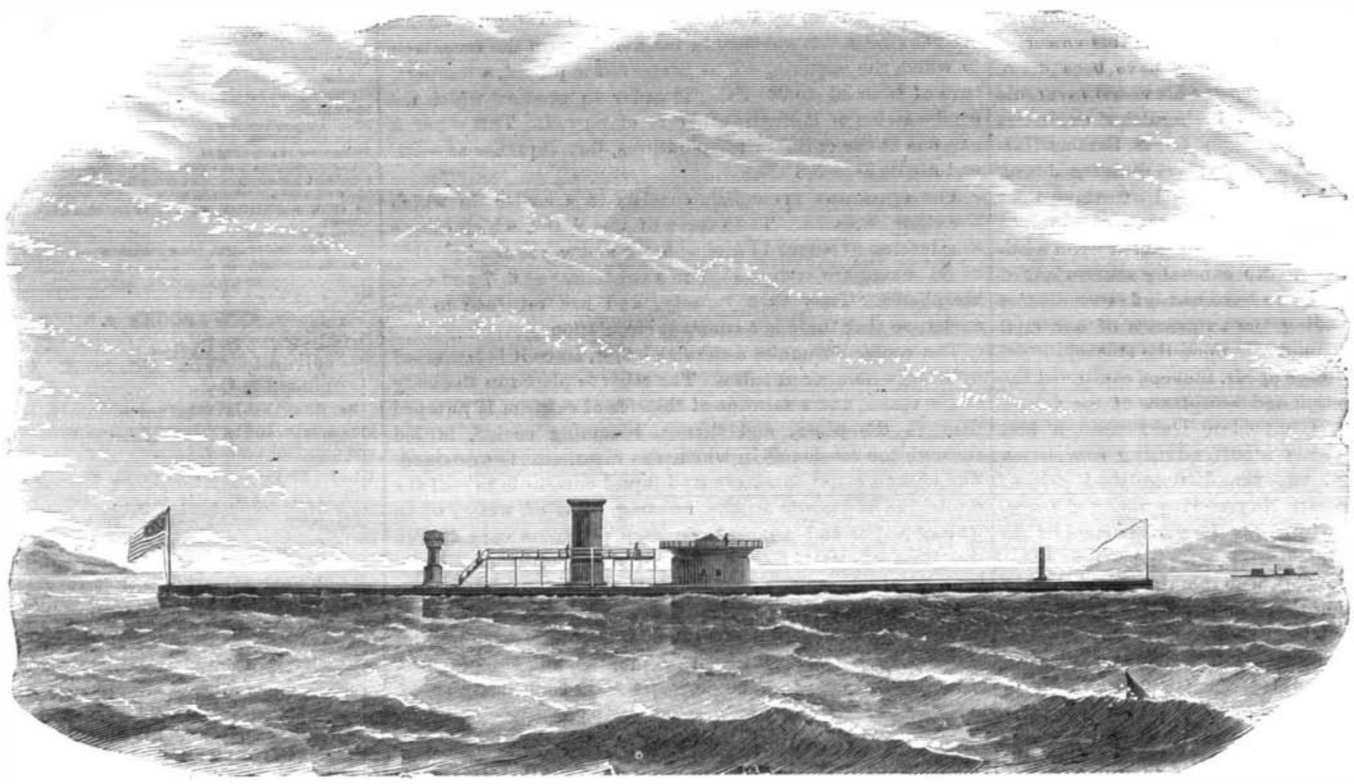
EDWIN A. STEVENS.

the modern railroad and even the non-condensing locomotive engine, with wheels fast on the axle, with flanges and every modern detail. He states, with wonderfully prophetic judgment, that the probable practical average speed may be expected to be twenty or thirty miles per hour, and that he can "see nothing to hinder a steam carriage moving on these ways with a velocity of one hundred miles an hour." And all this was before the British engineer, George Stephenson, had begun even the rude Killingworth machine which drew its little train with so much velocity.

A little later this great man had an experimental locomotive in operation on his own premises, and subsequently, with his sons, he was the prime agent in setting in operation, in 1831, the first New Jersey railroads. In all of his engineering operations, Colonel Stevens was aided by his sons, who inherited much of their father's peculiar talent and engineering skill, and who had also the necessary energy and enterprize to carry out their great schemes. Robert L. Stevens seems to have been the most persistent worker in the field in which his father had first labored. In 1814 he started the Philadelphia, and attained the then wonderful speed of thirteen and a half miles an hour. This was the first boat of the first day line to Albany. He subsequently added a false bow to this vessel and, by thus fining her lines, increased her speed considerably. Fulton introduced steam ferry boats, and, in 1822, Robert L. Stevens built the Hoboken, the first ferryboat of the now standard form in the United States.

The locomotives used on the Camden and Amboy Railroad were built from the plans of R. L. Stevens, either at his own shops in Hoboken or in England, where among his correspondents was Robert Stephenson. An autograph letter from the latter to the former, dated 1833, descriptive of his "large" locomotive, which weighed nine tuns and could draw a hundred tuns at the velocity of "sixteen or eighteen miles an hour on a level," is preserved in the "Relic Corner" of Professor Thurston's lecture room at the Stevens Institute of Technology.

This ingenious man invented the now almost universally used wrought iron T rail; and when the great Dowlais Works of South Wales were unable to find a man to roll the new form, Mr. Stevens himself went abroad and accomplished the self-set task successfully. He had already made many valuable improvements and inventions. In 1808 he had induced his father to introduce hollow water lines in the Phoenix; and in the succeeding year he invented the feathering paddle wheel, now so generally used in Great Britain, and the A frame and guard beam which is now always used on our own side wheel steamers. In 1813 or 1814, during the war with Great Britain, he invented elongated shot and shell to be fired from smooth bored guns, and the shell were fitted with a percussion fuse so arranged that only the tremendous shock of striking the object fired at would explode them, and were thus safe against explosion by any percussion produced by ordinary accidents. Being hermetically sealed, they could not deteriorate with age.

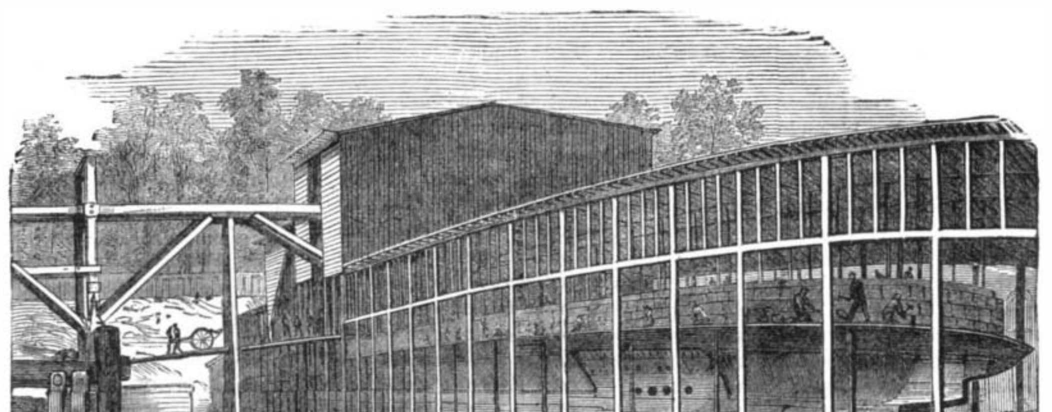


THE STEVENS IRONCLAD BATTERY.

In the Philadelphia, in 1813, he used steam expansively; in 1818 he used coal in the cupola furnace, and a little later in the steam boilers of the Passaic. He invented the now universally known American skeleton walking beam, with its cast iron center and forged strap, and used it on the Hoboken in 1822. He placed the boilers of the Trenton on the guards, in 1824, a custom now universal here; he used blowers, for the first time, on the North America in 1827; and, in the same vessel, he applied the hog frame to stiffen the long, slender hull. He brought out the New Philadelphia, in 1832, with spring bearings under the shafts, which, it is worth knowing, were of cast iron and are still running. In this boat, also, he used the first double puppet balance valve. He built an ice boat in 1832 for the Philadelphia and Camden ferry. At that time he built fire tubular boilers, a form which had hitherto only been used on locomotives, and gave them the shape now known as "marine." He used steam packed pistons in 1840, in the Trenton.

With Mr. Francis B. Stevens, his nephew and still the well known superintendent of the Camden and Amboy repair shops at Hoboken, he invented, in 1841, the Stevens cut-off valve gear, which is still used on the larger number of marine beam engines. He built, at about the same time, locomotives with cut-off valves, brought out eight wheeled engines, and used anthracite coal in their furnaces. In 1848 he used anthracite successfully in passenger locomotives; and at various times he made numerous minor inventions which cannot be even named here.

When a very young man, Robert L. Stevens commenced experimenting on the shot-resisting power of



THE STEVENS BATTERY IN THE DRY DOCK, HOBOKEN, N. J.

iron plates. As a practical result of his investigations, his brothers, James C. and Edwin A. Stevens, addressed a letter, August 13, 1841, to the Navy Department, proposing, as the idea of Robert L. Stevens, an ironclad vessel of great speed, with machinery entirely below the water line, driving the screw. The armament was to be the heaviest breechloading rifled ordnance, with elongated projectiles, both shot and shell. The usual delays deferred the decision of the government, and the preparation of plans and preliminaries occupied several years; but finally, in 1843, a contract was made, and, in 1854; the keel of the ironclad was laid, and the work progressed intermittently, as changes of plan and of naval administration interrupted it, until Mr. Stevens' death. The vessel as first proposed was to have been 250 feet long, 40 feet beam, 28 feet deep, of 900 indicated horse power, and protected by armor 4½ inches thick. At Mr. Stevens' death he had made a far more formidable vessel. The dimensions, when General McClellan was engaged to rebuild and complete the ship, were: length, 415 feet; beam, 45 feet; depth 22½ feet; and thickness of armor proposed, 6¾ inches. The power of the machinery was estimated at 8,624 horse power, and her twin screws were to drive the vessel twenty miles an hour. The vessel was in this form at the commencement of the late war, but without armor or armament. The Navy Department appointed a board to examine the vessel, the majority of which board after, as claimed by Mr. Stevens, a cursory inspection, reported against completing the vessel, except on terms unsatisfactory to Mr. Stevens. Professor Henry, in a minority report, urged prompt completion and her employment against the enemy. It is difficult to imagine what good work might not have been done had this powerful vessel been placed in our fleet, as might have been done, early in 1861. Mr. Stevens obtained for his vessel favorable professional opinions from the most distinguished engineers and shipbuilders in the country. R. L. Loper, Samuel Harlan, Jacob G. Neafie, Theodore Birely, Washington Jones, Erastus W. Smith, and Meirs Coryell, all of whom were acknowledged as the best authorities in the country, endorsed Mr. Stevens' plan; but the vessel was still looked upon without favor by the government. No generally acknowledged authority on the subject seems to have had influence against the ship; yet, notwithstanding the exigencies of our civil war, she was allowed to remain idle upon the stocks.

After his death, the brothers of Mr. Stevens continued the effort to obtain the completion and acceptance of the vessel, with no greater success. Commodore Goldsborough presented a somewhat ambiguous report, advising completion and trial before purchase, and the distinguished present Chief of the Bureau of Steam Engineering reported favorably as to the machinery, which was the vital portion of the plan.

Finally, Mr. Edwin A. Stevens, who inherited the property of his brother, died, leaving the vessel to the State of New Jersey, and appropriating a million of dollars to complete her. The executors, in accordance with the known desire of the testator, appointed General McClellan as engineer to carry out the provisions of the will.

Under the direction of General McClellan and his assistant, Mr. Isaac Newton, the ship was completely rebuilt and new machinery constructed; and the vessel was converted into a monitor. The funds, however, proved insufficient to complete the vessel on the new and elaborate scale proposed, and, at last, work was stopped. A question arose as to ownership, and the State Legislature directed that the vessel be sold as she stands, and the proceeds paid into court.

The commission appointed to effect the sale, Governor Parker, Vice-Chancellor Dodd, and Mr. Stevens' executors, have now employed Professor Thurston as their consulting engineer, and have issued a pamphlet containing his report, in which the vessel and machinery are minutely described, and the calculations of strength, of speed, and of other important particulars are given at considerable length. The pamphlet is beautifully gotten up and is illustrated by drawings of the vessel and machinery, and views of the premises where the ship now lies. From this book we learn that the vessel is intended to be made a turreted ironclad, as here illustrated. She has a greater displacement than has any vessel in our navy—over 6,000 tuns. She has four main engines, is 6 feet in diameter of cylinders, and of over 6,000 horse power. The details are shown to have great strength, and the journals to have ample bearing surface. The drawings show the lines of the vessel, and the engines are shown in plan and in side and end elevation. The boilers are of immense size, having 876 square feet of grate and 28,000 square feet of heating surface. Air is supplied by several large blowers which force it into the airtight fire room. The sides are to be protected by armor 10 inches thick, while the turret, 16 or 18 inches thick, can protect the heaviest ordnance in the world. The speed is estimated, on the basis of ordinary everyday performance, at 16½ knots as a maximum. Could the apparently unusually favorable conditions of the case be relied upon with certainty, Professor Thurston informs us, the speed would become not far from 20 miles an hour. The estimates of speed are made in several different ways, that usually considered most reliable—Professor Rankine's method—giving highest results. The slip of the screws, in consequence of their great area, is calculated at but 9 per cent, and this will effect considerable economy of power. At 16 knots the vessel will steam 109 hours, on 800 tuns of coal, making a run of 1,744 nautical miles. At 6 knots, she will steam 30 days and 5,256 miles. As a merchant steamer, carrying 1,600 tuns of coal, she would go from New York to Liverpool in 8 days, or to Queenstown in 7½ days, with favoring winds and smooth sea. As a steam ram, she would strike a blow of 60,000 foot tuns energy, which is equal to the concentrated impact of eight or nine British 600 pounder rifles, of six 20 inch Rodman shot, or of four of the 81 tun rifles recently designed for the British navy.

We give overleaf a view of the vessel as she lies in dry dock at Hoboken, not far from the Stevens Institute of Technology. Our advertising columns contain Professor Thurston's advertisement, which gives the main dimensions. We are indebted to that gentleman for many of the interesting particulars which have been given above.

The vessel is to be sold either as an entirety or in detached parcels, in November next, and the public, as well as naval men and engineers, will await the result with interest. It would certainly be sad if a splendid ironclad vessel, upon which millions of dollars and a vast amount of the finest engineering talent ever known had been expended, should go into the scrap heap because of the indifference of our own Navy Department, or in consequence of the reluctance of officers to trust their own judgment when the value of the vessel is so plainly shown them. It would be even more unfortunate if the superior intelligence or enterprise of some foreign government should add the fastest ironclad in the world to a foreign navy, where it may at some time act against what miserable remnant of a navy we may then still retain. Should it seem probable that such may be the case, it is to be hoped that some public spirited citizen may buy her and present her to our impecunious Navy Department.

A New Refrigerating Process.

A new process of refrigeration, adapted to the preserving of food, has recently been devised by M. Tellier, a French civil engineer. It consists in maintaining, in the receptacle in which the material to be preserved is placed, a temperature of from 30° to 32° Fah., in order to produce which the condensation of methylic ether is employed. This ether is gaseous at the ordinary temperatures, but liquefies at —22° and distils at +5·8° Fah.

The apparatus principally consists in a cooler, in which the ether is placed. The vapors of the latter, which escape at a tension of about 1½ atmospheres and at the temperature of 58° Fah., are compressed in a condenser at 6, 7 and 8 atmospheres. They then liquefy, and are returned to the cooler, so that there is a constant circulation.

The cooler resembles a tubular boiler, since it is traversed by a large number of tubes. The ether is placed in the body of the vessel, and a solution of chloride of calcium is pumped through the pipes, and thence, becoming cooled, is led through the receptacle in which the meat, etc., is contained. The effect of the intensely cold liquid current is to cool the air in the chambers to the freezing point of water, when watery vapor and atmospheric germs become deposited in the form of hoar frost. The solution is then conducted back to a reservoir, and thence through the cooler pipes again. A committee from the French Academy of Sciences, deputed to examine this invention, speak of it very highly, and state that meat thus kept for months, and subsequently cooked, was found to be in perfectly fresh condition.

Compressed Gun Cotton.

A series of experiments is in progress at the Royal Arsenal, Woolwich, Eng., with a view of further elucidating some of the various attributes and characteristics pertaining to compressed gun cotton. Interesting facts as to the extraordinary rapidity of detonation of gun cotton were brought to light about a year ago. It was ascertained that this was unprecedented, the swiftness of the action being marvelous; indeed, with the exception of light and electricity, the detonation of gun cotton traveled with greater rapidity than anything we are cognisant of. Thus, detonation would take place along a line of compressed gun cotton disks, placed so near as to touch each other, with a velocity only inferior to that of electricity or light, igniting a charge or conveying a signal, if desired, almost instantaneously; 20,000 feet, or nearly three miles per second, was calculated to be the rate of transit, according to Noble's electro-chronoscope. A powder quick match of the most delicate construction ignites so leisurely that the process can almost be observed with the eye. Now, comparing the velocity of detonation of gun cotton with some other speeds, we find that it is eighteen times greater than that of sound, fifteen times greater than that of a rifle bullet and actually one hundred and eighty times superior to that of the swiftest express train. One important characteristic in the detonation of compressed gun cotton is its power of self-transmission, unimpaired in violence and vigor of action, through a continuous train of disks. It is carried on from one disk to another, each in its turn being acted on by its neighbor behind, and setting up a similar action on its neighbor in front.

The present experiments are to determine the relative effects of the detonation of various classes of gun cotton, nitrated and common, when performed in the open air. A "crusher gage" has been employed. It consists of a cast iron body with an orifice at the top, into which a socket is screwed. Within this a piston works up and down, which is recessed around for packing. Pellets of copper are placed upon an anvil beneath the piston, and they are kept in position by a little india rubber washer placed around them. The crusher gage is then securely screwed to a large wrought iron plate at its three corners. The pellets employed are cylinders of copper ½ inch high, diameter 2·306 inches, and area, $\frac{1}{12}$ inch. The means adopted for determining the amount of pressure exerted upon the piston by the shock of an adjacent explosion are by measuring, with a delicate micrometer, the extent to which the pellets are compressed. Several 5 lbs. charges of compressed gun cotton were detonated, each at about a foot's distance from the crusher gage, and in the open air. In some instances the compression of the copper pellets was equal to 3½ tuns per square inch.

The concussion given to the air, then, by the detonation of a large mass of gun cotton must be simply prodigious. But we were prepared to find that it was extreme from observations taken during experiments recently instituted at the Arsenal with disks of gun cotton detonated upon wrought iron slabs, 1½ inches, 1½ inches, and 1½ inches thick. Although loosely placed upon the slabs, with only a light tamping of sand over them to keep the detonating fuze in position, and not in any way confined, upon firing the charges, consisting of ½ lb. compressed gun cotton, the slabs of iron were split into fragments. Moreover, a band of disks placed around the trunk of a large tree at Upnor, and detonated, severed it instantaneously as though felled by a single blow from an ax.—*The Engineer.*

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

PATENT BRACELET.—BARCLAY AND KNAPP *vs.* THAYER AND CUSHMAN.

Blatchford, Judge.

This suit is brought on reissued letters patent granted to John Barclay, December 6, 1870, for an "Improvement in the manufacture of plated metal bracelets," the original patent having been granted to him as inventor August 24, 1869.

This patent bracelet is constructed by turning over the two edges of the under plate until they rest on the base metal, and form a bead on each side, and then fastening by solder between the beads the edges of a single outer plate, so bent that a section of it is the form of an inverted U. Held by the court (Judge Blatchford) that this is the subject of a valid patent, although a previous patent covered a bracelet with its under plate of a similar form, but which was completed by sliding bits of metal with projecting lips under the beads.

[*J. Van Santvoord*, for the plaintiffs.
Carroll D. Wright, for the defendants.]

United States Circuit Court.---District of Massachusetts.

PATENT ALPHABET BLOCKS.—SAMUEL L. HILL *vs.* J. T. HOUGHTON.

[In equity.—Before Clifford and Lowell, Judges.—Decided May 30, 1874.]

Lowell, Judge.

Placing the letters of the alphabet upon cubical blocks of wood, or spelling blocks, having been practiced many years, and also placing two such letters upon some of the blocks, it is not patentable to place two or more upon each block, even if they are placed more systematically, and with the design of rendering the blocks more useful.

Letter blocks with pictures upon some of their faces do not infringe upon a patent for such blocks with figures upon some of their faces, by which they can be selected in accordance with a key accompanying them, so as to spell particular words, such blocks with pictures having been long known.

Bill dismissed.

[*J. Van Santvoord*, for complainant.
A. A. Ranney, for defendant.]

NEW BOOKS AND PUBLICATIONS.

IMPROVEMENTS IN STEAM ENGINES. By John Houpt, Pennsylvania. With Diagrams. Philadelphia: J. B. Lippincott & Co.

Mr. Houpt has invented and patented a long list of improved steam engine details, and he here reprints, in pocket book form, the specifications and drawings thereof.

EL ATENEO. $6 a year, 50 cents a number. Office, 31 Park Row, New York city.

This is the title of a new and beautiful monthly periodical, in the Spanish language, the first number of which is before us. Its contents include literature, the arts and sciences, each department being copiously illustrated with plates or engravings, while the general typography is most excellent. Taken altogether, it is a very beautiful publication, full of interesting and valuable information. We trust it may have a very wide circulation.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From June 19 to July 26, 1874, inclusive.

BARBER'S CHAIR.—W. M. Golden (of Brooklyn, N. Y.), London, England.
BEARING, JOURNAL BOX, ETC.—W. W. Crane, Auburn, N.Y.
BUTTON AND FASTENING.—D. Heaton, Providence, R. I.
CARD FASTENER.—J. H. Small, Buffalo, N. Y., *et al.*
CHANGING COSTUMES.—J. Morris (of New York city), London, England.
GAS BURNER.—A. T. Welch, Brooklyn, N. Y.
GAS ENGINE.—G. B. Brayton, Boston, Mass.
GAS MANUFACTURE.—W. Harkness, Providence, R. I.
GUANO BAG, ETC.—B. R. Croasdale (of Philadelphia, Pa.), London, Eng.
HOLDING AND PUNCHING TICKETS, ETC.—J. H. Small, Buffalo, N. Y.
INKSTAND.—B. Brower, New York city.
LAWN MOWER.—D. Williams, New York city.
LUBRICATING COMPOUND.—B. French, Rochester, N. Y.
MAKING FISH NETS.—B. Arnold, East Greenwich, R. I.
METALLURGICAL FURNACE —S. P. M. Tasker, Philadelphia, Pa.
PULLEY HUB.—W. W. Crane, Auburn, N. Y.
REAPER AND MOWER.—W. N. Whitely, Springfield, O.
REFRIGERATOR.—J. J. Bate, Brooklyn, N. Y.
SOLDERING PIPES, ETC.—W. A. Shaw, New York city.
SURFACING TEXTILE FABRICS —W. Bell, New York city.
WHARLE TUBE FOR WOOL SPINNING MACHINES.—J. C. Wellens, Phila., Pa.

Recent American and Foreign Patents.

Improved Screw Driver.

James A. Wakefield, Minneapolis, Minn.—This consists of a combination of a screwdriver and one or more countersinks or other similar tools. When the screw driver is in use, the countersinks are drawn back toward the brace, with the backs in contact with the screw driver. When a countersink is required, it is turned on a pivot pin, as on a hinge, to the proper position. A small slit in the back of the head of each countersink receives the end of the screwdriver. The faces of the countersink are fitted to the sides of the screw driver, and the screw driver turns the countersink as it would turn a wood screw.

Improved Combined Wheat Scourer and Cockle Extractor.

Lourens Arentsen, Gibbsville, Wis.—In using this machine the wheat flows from the hopper into a cylinder, where it is cleaned from dust and other substances that may adhere to it. If the wheat is free from cocklel a sleeve is adjusted to uncover the hole through a partition and allow th wheat to pass through a tu e or spout to the wheat spout, where the dus is withdrawn through the spout by the air blast. If the wheat contains cockle seed the sleeve is adjusted to close the hole in the partition, and open other holes, allowing the wheat to pass into the space between a screen and cone. As the wheat passes down through the said spaces, the cockle seeds enter the recesses in the screen, where they are held by the pressure of the air, which passes in with the wheat and through the openings in a ring plate. As the cockle seeds come opposite openings between the parts of double threads between cylinder and screen, they are forced through said openings by the current of air passing through the holes in the screen, and through the said openings between the parts of the threads as it makes its way through the spout to the fan. The cockle seeds drop through the interior of the cone to the air spout, whence they escape through the valve door.

Improved Plow.

William Warinner, Creelsborough, Ky.—This is an improved plow for loosening the subsoil around small plants, and at the same time throwing soil around them, which may be readily adjusted to throw less or more soil around the plants, as may be desired. The essential features are the adjustment of the wings for the last mentioned purpose and the arrangements for strengthening and supporting handles and beam.