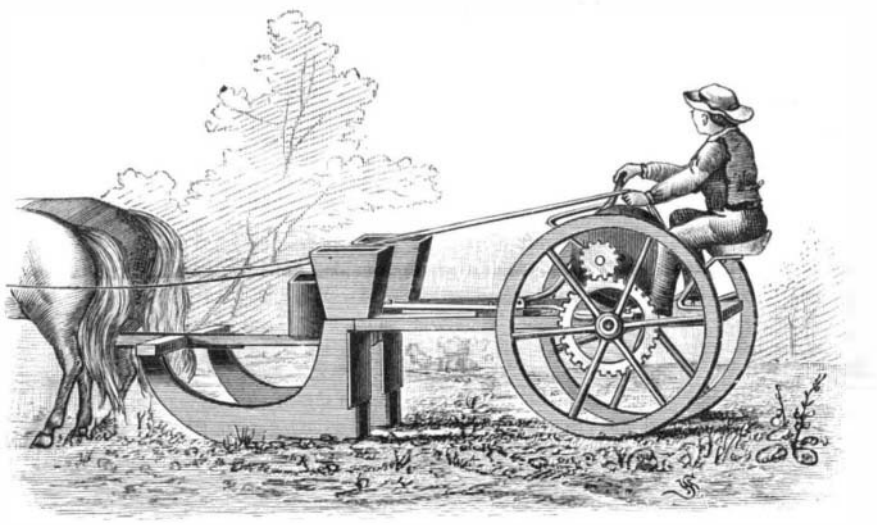
The Doorway of Furnaces.

The *Locomotive* concludes that probably every man who owns or bas run a boiler has experienced a vast deal of trouble with the cast iron mouth pieces around the furnace doors. These pieces invariably warp, crack, and burn out in a short time, and the firebrick lining falls down, the cast iron front becomes burned, and where the boilers are set with the flusb front setting the portion of the shell which projects beyond the front tube sheet gets overheated, which generally results in its fracture, and in many cases the longitudinal seam where the head is attached to the shell is so severely strained that it begins to leak, and sometimes this leakage is very difficult to stop, owing to the joint being permanently strained. This warping and burning away of these castings may be prevented by simply slitting them back from the edge for about one-half their depth. The slots sbould be from one-half to one-fourth of an inch in width, and may be from eight to twelve inches apart over the furnace door. This width is necessary, as tbey close up gradually under the influence of the intense furnace heat.

CHECK ROW CORN PLANTER.

To the wheels are secured gear wheels, with which mesh pinions placed upon the ends of a shaft revolving in bearings in supports attached to the frame. Upon the inner ends of the hubs of the pinions are formed annular grooves that receive the forked outer ends of two rods, whose inner ends are pivoted to a lever upon the opposite side of and equally distant from the pivoting point of the lever. This lever is pivoted to a support attached to the frame, and its rear end projects to such a position that it can be readily reached by the driver from his seat, and operated to throw the wheels into and out of gear.

To the middle of the shaft is attached a wide wheel, in the face of which is formed a cam groove to receive a pin attached to the end of a lever. The lever at its middle part is pivoted to a cross bar of the frame, and is pivoted at its forward end to the seed dropping slide, so that the slide will



BARRETT & FORSTER'S CHECK ROW CORN PLANTER.

be operated to drop the seed by the advance of the machine. To the center of the seed dropping slide is attached the rear end of an arm whose forward end enters a slot in a hopper, so that lime, plaster, sand, or other white substance may be dropped from the hopper to the ground. This hopper is attached to the center bars of the forward part of the frame, a little in front of the line of the seed hoppers, and in such a position that the white substance dropped from it will fall upon the ground midway between and in a line with the hills, so as to mark the cross rows and thus enable the driver to plant the corn in accurate check row. By means of a lever attached to a pawl engaging with a ratchet wheel on the pinion shaft, the driver is enabled to adjust the seed dropping mechanism when starting in at the side of the field and at any time when the cross rows get out of true.

This invention has been patented by Messrs. E. P. Barrett and J. A. Forster, of Holden, Mo.

The Clock in Trinity's Tower.

The clock in Trinity Church tower in this city is the heaviest in America. The frame stands nine feet long, five feet high, and three feet wide, The main wheels are thirty inches in diameter. There are three wheels in the time train, and three each in the strike and the chime. The winding wheels are formed of solid castings thirty inches in diameter and two inches thick, and are driven by a "pinion and arbor." On this arbor is placed a jack, or another wheel, pinion and crank, and it takes 850 turns of this crank to wind each weight up. It requires 700 feet of three inch rope for the three cords, and over an hour for two men to wind the clock. The pendulum is eighteen feet long, and oscillates twenty-five times per minute. The dials are eight feet in diameter, although they look little more than half that size from Broadway. The three weights are about eight hundred, twelve hundred, and fifteen hundred pounds respectively. A large box is placed at the bottom of the well that holds about a bale of cotton waste, so that if a cord should break the cotton would check the concussion.

THAT time-honored association, the Massachusetts Charitable Mechanics, holds its fifteenth exhibition this year, at Boston, beginning September 10. See advertisement.

Glass Bearings.

Bearings made of glass are now being experimented with in the rolling stock of railroads, in regard to their frictionless quality. This material is a hard, clear substance, and must wear down smooth and give a fine bearing surface for an axle to rest upon. It is a non-conductor of electricity, if not of heat, and the fine particles have as good a chance to work down the bearing of the axle to a running fit as in the grinding in of a valve seat for a brass valve, and much power is expected to be saved by converting the wearing of a journal into some other agency than by converting it into heat.

How a Salt Well is Worked.

The stratum of salt having been once pierced, a saturated solution of the saline matter frequently rises in the boring to within eighty feet of the surface. This, however, cannot always be depended upon—and here center the increased difficulty and expense. When a few dozen feet have been drilled, a 6 or an 8 inch iron pipe is inserted as a "casing." Inside of this a 2 inch pipe—also of iron—is placed. The "casing bead" has two openings—one for the entrance of pure water from a neighboring spring into the larger pipe, at the lower end of which it becomes saturated with saline matter; the other at the end of the smaller pipe, to allow tbe expulsion of the brine. Of course, the wells become foul or leaky at times, and then resort is had to torpedoes of nitro-glycerine, which are sent down to the bottom of the "casing," and after them is sent an iron weight which secures the explosion. The rusting of the "casing" is the great enemy of the salt worker; and, when his engine cannot lift the mass of rusted iron, a "knife" cuts the rusted metal, and the engine tears it away piecemeal. But the salt wells are exempt from any danger of taking fire; and it is never necessary, as in the case of oil wells, to shoot off the "casing head" with a cannon ball.

After the brine has once reached the surface it is forced into large reservoirs, whence it is drawn off through "string" after "string" of "covers," until solar evaporation has left the coarser grades of salt. The "covers" or vats are usually 16x18 feet, and the product to each one per year is estimated at 150 bushels; while the product at Syracuse is only about half that quantity. It is also claimed, adds *The Age of Steel*, that the slope of the valley at Warsaw is peculiarly adapted to rapid evaporation by the sun. When the finer grades of salt are wanted, the brine is led from the reservoirs to an evaporating pan, where a gentle heat is applied. Similar treatment in another pan completes the process, and the residuum of salt is raked upon a shelf at the side of the evaporator. After a slight draining it is taken to the bins, where a more thorough draining is allowed for a space of two or three weeks.

SLIDE TROMBONE VALVE FOR CORNETS, ETC.

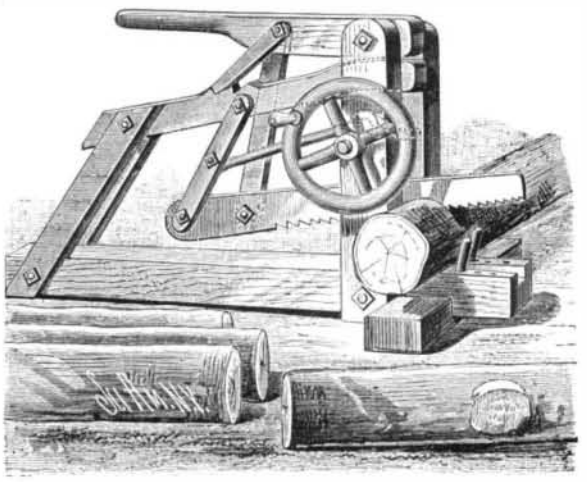
The body of the instrument between tbe mouth piece and bell is wholly severed once or more for the purpose of connecting with one or more extensions, in order that the tone may be changed by thus increasing the tubular length of the air passage. To make and break this connection at will a peculiar slide valve is interposed, in which one or more flanged and lipped plates, fixed to the body of the instrument, serve to guide one or more valve plates. Each plate carries two short tubes, one of which is telescoped at one end with the body of the instrument, and at its other end is secured in the plate, through which it communicates with the body when in its normal position; the second tube is wholly mounted on the sliding plate, and both ends open through the plate. Mounted on the fixed plate is an extension, both ends of which open through the plate. One end of the body opens through the fixed plate, and the other end may extend directly to the bell, or to the telescoping end of another slide valve. Each slide valve is provided with a poppet having a spring which raises the valve to its upper position, in which condition the air passage from the mouth piece to the bell is through the shortest tube connection. When a poppet is pressed down, the length of both the movable and fixed tubes is added to the air passage by a quick movement of the operator's finger. These interposed tubes may be of any suitable length, and any desired number of valves may be added to a single instrument.

Made after this plan there are three fixed parts, three sliding parts, and a telescoping joint, making eight pipe ends that are brought to connect in two different ways by pressing or releasing a single poppet. The telescoping joint prevents disturbing the vibrations in the instrument during the instant of sliding the valve. While only two very short and light tubes are carried by the slide valve, they serve to connect a tube of any desired length with the air passage, thereby preventing friction and requiring but a slight pressure of the finger to operate the valve.

This invention has been patented by Mr. G. W. L Schweich, of Richmond, Missouri.

DRAG SAW

On one end of the base are secured two standards in which is journaled a transverse shaft, upon one end of which is mounted a wheel provided with a crank handle. A top beam is held between the upper parts of these standards, and two inclined standards fastened to the rear end of the base. To the lower end of a connecting bar pivoted to the side of the top beam is pivoted the butt end of tbe saw that projects between the forward standards. This bar is connected by a rod with a crank on the shaft, so that by revolving the latter the saw will be reciprocated. Pivoted to the forward standards is a lever which is connected by a rod to tbe saw a short distance in front of tbe butt end. On the



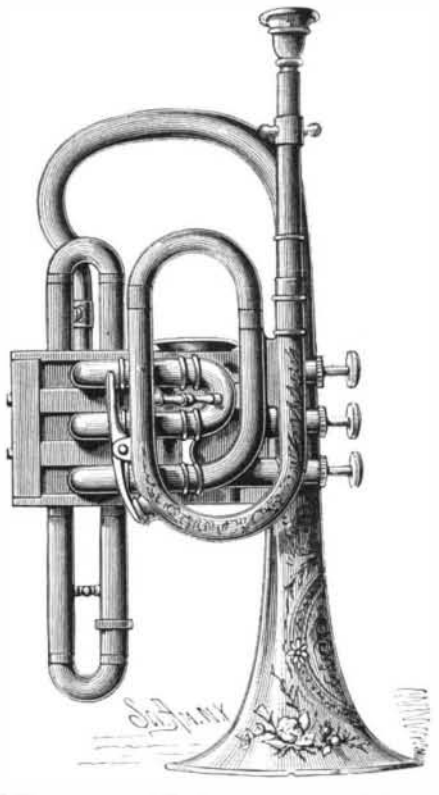
CRAWFORD'S DRAG SAW.

top edge of the top beam are formed teeth, against which rests the free end of a pawl pivoted to the lever. The front of the base is supported upon a transverse beam, and in the upper surface of this part of the base is a groove at the sides of which are apertures for receiving the pins for holding the log in place. The groove receives the edge of the saw after it has passed through the log. By means of the lever and pawl the saw can be raised and held in any desired position. By increasing the height of the rear standards so as to accommodate the lever, the saw can be reversed so as to project from the rear.

This invention has been patented by Mr. Edward F. Crawford, of Honey Bend, Ill.

About Bricks.

An average day's work for a brick layer is 1,500 bricks on outside and inside walls; on facings and angles, and finishing around wood or stone work, not more than half of this number can be laid. To find the number of bricks in a wall, first determine the number of square feet of surface, and then multiply by 7 for a 4 inch wall, by 14 for an 8 inch wall, by 21 for a 12 inch wall, and by 28 for a 16 inch wall. For staining bricks red, melt one ounce of glue in one gallon of water; add a piece of alum the size of an egg, then one-half pound of Venetian red and one pound of Spanish brown. Try the color on the bricks before using, and



SCHWEICH'S SLIDE TROMBONE VALVE FOR CORNETS, ETC.

change to light or dark with the red or brown, using a yellow mineral for buff. For coloring black, heat asphaltum to a fluid state, and moderately heat true surface bricks and dip them. Or, make a hot mixture of linseed oil and asphalt, heat the bricks, and dip them. Tar and asphalt are also used for the same purpose. It is important that the bricks be sufficiently hot, and be held in the mixture to absorb the color to the depth of one sixteenth of an inch.—*The California Architect.*

Germ-ane.

The *Phrenological Journal* has coined the above word to meet recent microscopical discoveries, and proceeds to describe some of them as follows: We are living in an ocean of infectious germs. So the microscopists tell us. With the recent improvement in lenses and methods of examination, a world of minute life has been revealed that should be most startling to every one who reads about the spores, bacteria, bacilli, micrococci, etc., etc., that render whatever we eat or drink tremulous with parasitic life. The atmosphere teems with an infinite detail of germs, each one ready to pounce upon our soft tissues for a contribution to its greedy maw.

Every breath takes in a countless host of these creatures to riot on our delicate "innards." What fastidious appetites the brutes must have! for some show a special preference for dainty protoplasmic bits of liver, or kidney, or heart; while others make imperative demands upon the choicest of our neurilemma, or are found at table in the most retired chambers of the brain. What are we to do about it? Must all our fair dreams of development, progress, civilization, be regarded as arrant delusions; and must all our hopes of health and longevity go down before the advancing hosts of invisible imps that Koch and Pasteur, Crudelli, and Schmidt and Grassi tell us are only the vanguard of zymosis and contagion?

One tells us that we must beware of flies; even that familiar little impertinent that has buzzed in our homes for centuries, has made himself welcome to everything nice on our dining table, is teeming with creatures whose names are witnesses to their terrible characters—as the *tricocephalus dispar, oxyuris vermicularis, tænia solium, oidium lactis*, and so on. Even our books and newspapers, freshly drawn from the vender's shelves, and apparently pure and bright, are loaded with infectious little scamps. A German, who squints through high angled objectives. points a new moral to the old apostolic warning of evil in many, by assuring us that the loose change we may jingle in our pockets is coated with animal life, very dangerous to health; and then, O oyster and clam eater! know that in the tissues of your favorite bivalve lurk those relentless foes of family peace, scarlatina, diphtheria, and other frightful things whose habitat is the human fauces!

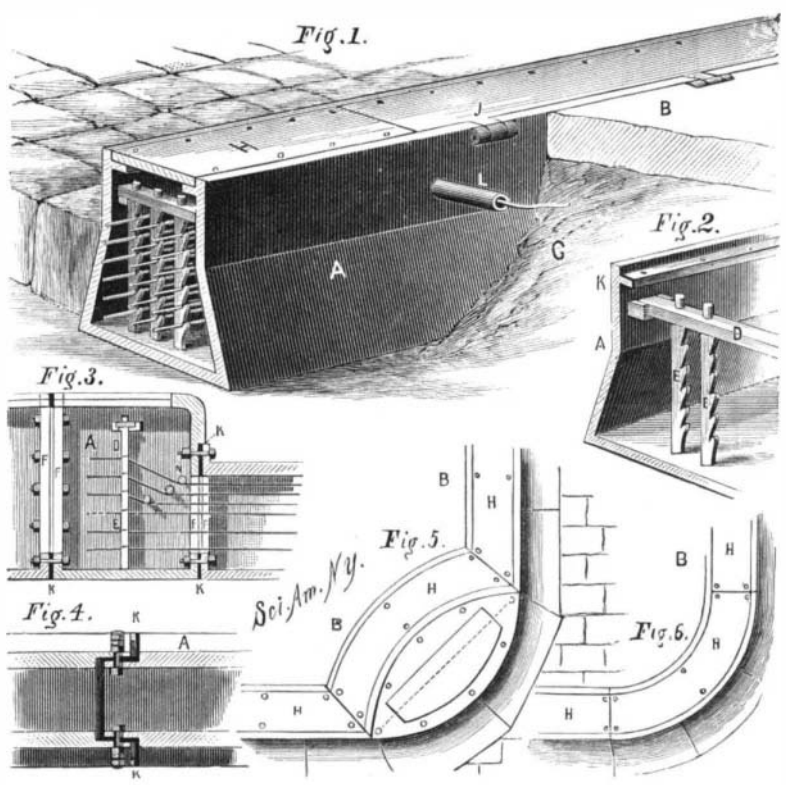
We tremble as we contemplate the situation. What are we going to do about it? Oh, let the manufactures of disinfectants be multiplied; let the disease-breeding atmosphere be made redolent with sulphur fumes, carbolic acid, chloride of lead, zinc, copperas! and let everything that is germicidal be thickly spread over our food and drink! Hurry, hurry, hurry, ye chemists, with your potent mixtures, and relieve us from being the unwilling habitations of lively bacteria and bacilli, of tænia and ascaride, who are sworn against our mortal comfort and physical integrity.

COMBINED CURBSTONE AND TELEGRAPH WIRE CONDUIT.

In the accompanying engraving, Fig. 1 is a perspective view of the combined curbstone and conduit, showing the wires in position; in the second figure the wires and cover are removed; Fig. 3 is a vertical section taken at a street corner; and Figs. 5 and 6 are plan views at street corners, the former being an inlet corner and the latter the usual rounded corner; Fig. 4 is a horizontal section illustrating the method of securing together the conduit sections in order to permit expansion and contraction. The hollow curb conduit sections, A, made of cast iron or other suitable material, are formed with vertical sides above the street pavement to form the curb, and those portions sunk in the ground have outwardly flaring sides to insure against displacement and provide ample space. The cover, J, is about flush with the sidewalk. Between the cover and the top of the ledges is placed a water tight packing. The wires are supported by a series of vertical racks, E, located at suitable intervals apart. The lower ends of the racks enter sockets in the bottom of the conduit, while their upper ends pass through holes in cross stays, D, whose extremities rest in brackets in the sides. The ends of the conduit sections are flanged and bolted together. packing being inserted between them.

When it it necessary to provide for longitudinal expansion and contraction of the several sections, they are made with overlapping ends, and are secured by bolts passing through slots in one of the flanges. Packing is placed between the joints. The wires are inserted from the open top of the conduit, and rest in the teeth of the racks; after they are in position the cover is bolted down. When it is desired to conduct one or more wires into a building small lateral pipes, L, are connected to the side of the conduit. With this construction the wires are always easily accessible, and the tearing up of the pavement in order to reach particular points is obviated. The two plan views show clearly the methods of rounding corners. When the conduit crosses the street where the curb ends, those wires which are above the line of the depressed part are directed downward (Fig. 3), and kept in place by means of transverse studs, *n*.

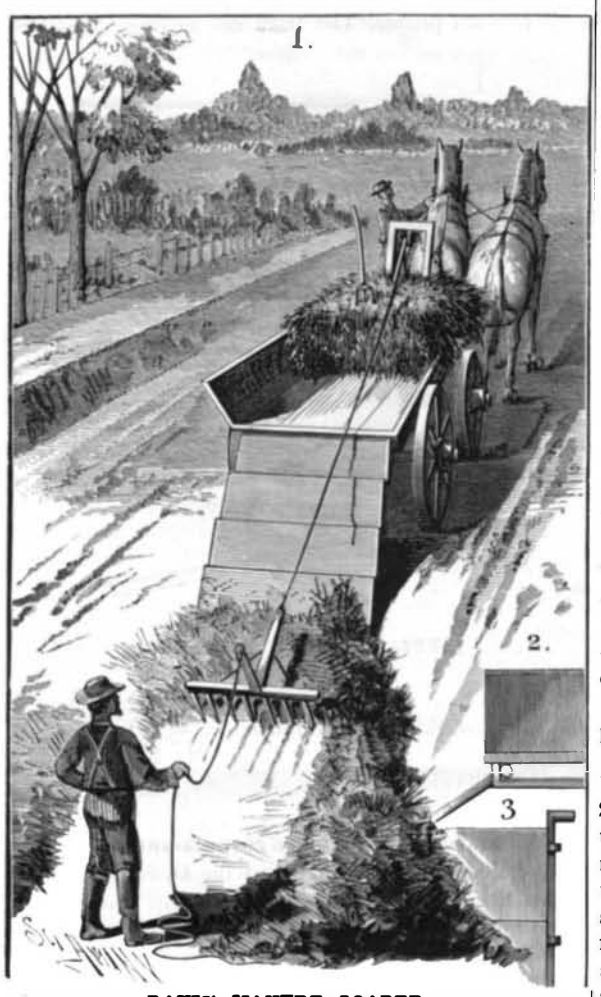
This invention has been patented by Mr. James S. Woodward, of 132 Chestnut Street, Philadelphia, Pa.



WOODWARD'S COMBINED CURBSTONE AND TELEGRAPH WIRE CONDUIT.

MANURE LOADER.

At the tail end of the wagon box is arranged an inclined apron, upon which the manure is hauled up into the box by a rake, to which is connected a rope extending over a guide pulley suspended over the front end of the box by an upright frame. Upon the other end of the rope are whiffletrees for hitching on a team. The rake is pulled back by means of a cord fastened to the head of the rake. The apron is so



DAVIS' MANURE LOADER.

arranged as to slide under the bottom of the wagon on guides, but it may be made detachable. The apron is preferably formed of sheet metal or other plates having hooks attached at the upper corners, which slide upon side bars having outwardly bent ends (Figs. 2 and 3). The upper ends of the plates are turned down and their lower ends turned up. The ends of the side rods slide on the guides beneath the wagon, while the plates slide under each other. By this plan a simple and efficient contrivance is obtained for loading manure into the wagon, and by its use manual labor is greatly economized. This invention has been patented by Mr. Henry C. Davis, of Willow Grove, Pa.

The Brazilian War Steamer Riachuelo.

An inspection has just taken place, says the London *Times*, of what has been publicly pronounced on high authority to be one of the most valuable additions to the armor-clad vessels of the world that can be imagined. This is the Riachuelo, Brazilian armor-clad turret ship, which may be taken as being the most perfect fighting ship afloat. The Riachuelo is a twin-screw ship of 6,000 tons displacement and 6,000 horse power, and she possesses in speed, coal endurance (or the capability of steaming without recoaling), and the arrangement and range of fire of her guns special advantages which we believe have not been previously attained in combination in any other ship. She is 305 feet long, 52 feet extreme beam on water line, and 30 feet extreme depth, her displacement tonnage being 5,700 tons at load line. Her draught of water at load line with 400 tons of coal in her bunkers is 19 feet 6 inches. Her estimated speed with 872 tons of dead weight on board is 15 knots an hour, but on her official trials she attained a speed of 16¼ knots with a natural draught, and 16⅜ knots with a forced draught. She is protected by armor 11 inches and 10 inches thick respectively, and her armament consists of four 9 inch 20 ton breechloading rifled guns in two revolving turrets. and six 6 inch breechloaders, besides fifteen Nordenfelt machine guns. She also carries Whitehead torpedoes.

Looking a little into the details of her construction, we may observe that her hull is built entirely of Siemens-Martin steel, and that her armor is compound or steel-faced, and consists of a belt 250 feet long and 11 inches thick amidships, where it protects engines, boilers, and magazines. It is then reduced to 10 inches thick, while for a depth of 4 feet below water line the armor is partly 10 inches and partly 7 inches thick. Beyond the 250 feet of side armor, at both ends inclined armor 3 inches thick is placed internally at an angle of fifteen degrees, and reaching from the top of the side armor to the stem and stern respectively. This 3 inch armor is so arranged that it measures and equals 10 inches of vertical armor if struck in a horizontal position. The inclined armor is useful for supporting and giving additional strength to the ram forward, while aft it protects the rudder head, tiller, and steering gear. A horizontal deck of 2 inch steel armor runs through the ship and joins the inclined armor at each end. On this are two oval breastworks built up of plates and angles, and protected by 10 inch armor plates and teak backing.

Within the breastworks are two revolving turrets similarly built up and protected, and in each of these are two of the 20 ton guns. A very important feature in connection with these breastworks is that they are *en echelon*, and are so carried out as to enable the guns in each turret to command an unbroken fire for 180 degrees on their own side of the vessel, and 50 degrees on the opposite side. Thus the whole four guns can be brought to bear ahead or astern, while an all-around fire can be always maintained with two guns, and all four of them can be used for broadside firing on either side of the ship. The guns are loaded by hydraulic machinery, and the turrets are revolved by similar means. The six 70 pounder guns are placed on the upper deck, while of the fifteen Nordenfelt machine guns, five are for use in the mast tops, and the remainder are placed on pedestals so as to keep off torpedo boats. The torpedo guns are arranged to fir from 5 ports, 4 broadside and 1 right aft.

The engines of the Riachuelo are of 6,000 horse power indicated, and of the vertical twin screw type. Each set of engines has one high pressure cylinder of 52 inches diameter placed between two low pressure cylinders, each 74 inches diameter, with a 3 foot stroke, and making from 80 to 90 revolutions per minute. Steam is supplied from ten boilers working at 90-pound pressure, and containing a total heating surface of 19,400 square feet. Although designed to give, when working at her full power of 6,000 horses, a speed of 15 knots an hour and to have at that speed a coal endurance for five days' working, she developed on her trials a 15 knot speed with only 4,500 horse power. Hence at that speed she can run a distance of 4,500 miles without recoaling. In other words, the coal supply of 800 tons is sufficient for 12 days' steaming at 15 knots an hour.

Diagrams of this ship and other particulars will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 438.

Steel Made and Reworked.

Some tests have been made of steel from the roll and from the hammer as compared with steel that is annealed and turned to size. It appears from these tests that the commercial steel, untouched by annealing heat, or by the turning tool, is better in its resistant qualities than the annealed and turned material. Unannealed steel is tougher—it resists torsion better—than annealed steel. This fact was constant through a large number of tests of the steel made by five of the most prominent and best known manufacturers. Further trials proved the fact that steel as it comes from the hammer is better for certain tools than the same steel annealed, turned, and after worked. A square bar of commercial steel centered and cut to thread made a better tap than the same bar annealed and turned round, and then four-scored and retempered. It is possible that for certain tools—lengthwise tools—as taps and reamers, steel might be forged in bars to size and shape, with advantage, not alone as to saving of lathe work, but as to value of the finished tool. If steel makers can be induced by sufficient orders, it is probable the experiment will be made on a scale large enough to establish the question of its value. The claim of those who have made the tests is that the "skin" of the steel as it comes from under the hammer is stronger than any after coating by the oxidizing of tempering.