

have no doubt the enemy thought so too when the terrific shower of exploding shells fell upon them, knocking their guns about in the wildest confusion. Instead of anchoring his fleet and blazing away at the works, he kept his ships in motion, thus securing the use of both his broadsides, which kept the guns from heating by the alternate fire, and enabled the men to work to greater advantage in their quarters. A fort on shore is a large stationary object, and may be hit anywhere, while a ship is comparatively a small mark, and by keeping it moving the enemy's gunners were prevented from getting an accurate range, thus disappointing Gen. Ripley, who ordered the artillerymen just how to fire, and where the shot would do most execution.

The report says that the enemy felt confident that he could annihilate the fleet in case it should attempt to pass the forts into the harbor. When Commodore Dupont's fleet had described the arc of a circle about the forts three times, keeping up a terrific cannonade, and was about to pass the fourth time, without showing signs of exhaustion or defeat, the Confederates thought it about time to leave, and they did so in a most precipitate manner.

Dupont's plan of the engagement was laid down after a careful reconnoissance of the enemy's works and position. It combined all the points which great commanders have endeavored to secure, viz., security and superior destructive opportunities for their own forces, with surprise, derangement of plans and inferior destructive opportunities to the enemy.

This attack and its successful results is one of the most brilliant victories ever achieved by our navy, and must tend to elevate it in the eyes of all nations.

#### SUBJECTS FOR INVENTION.

For the convenience of our inventive readers, we subjoin a catalogue of subjects or problems that may, we think, be advantageously conned over with a view to further discovery or improvement. We propose to publish this catalogue quite frequently, by way of reminder to our ingenious friends, and we shall also from time to time make additions to the list. We shall always be glad to receive suggestions of new subjects to be added to the column from any of our readers.

Patents for improvements connected with the subjects here indicated would no doubt prove of value.

**A SMALL LOCOMOTIVE FOR FAMILY USE**—suited to run on common level roads, to be light, safe, neat, convenient, easily managed by any person and not expensive to run. Great speed not essential.

**AN INSTRUMENT TO INDICATE THE COMPARATIVE PURITY OF THE ATMOSPHERE**—We already possess the thermometer which shows the temperature; and the hygrometer which tells us the comparative dryness or moisture of the air. We now need a simple instrument that will indicate to the eye whether the air in our rooms is pure or impure.

**A POROUS SUBSTITUTE FOR LEATHER**—Many excellent substitutes have been invented, but most of them involve the use of gum, paint or some water-proof substance, so that the article produced is unfit for the feet, and for other purposes to which leather is applicable.

**A PULSE INDICATOR**—A small instrument for the sick room, capable of application to the wrist of the patient, to show and record the number of pulse beats.

**A CHEAP METHOD OF PREPARING THE METAL MAGNESIUM**—This metal possesses the remarkable property of burning with a most brilliant light when held in the flame of any common lamp or candle. The light thus produced far excels that of gas or coal oil; but the great expense of producing the metal is the obstacle which stands in the way of its employment. It is believed by many persons that if some cheap method of producing the metal can be invented, the magnesium light will come into general use. Here is a fine problem for amateur chemists.

**SUBSTITUTE FOR BREAD YEAST**—A family instrument or machine for impregnating bread dough with carbonic acid gas, and thus avoid the necessity of using yeast.

**A MUSICAL INSTRUMENT**—An improvement in musical instruments, so made that by passing a sheet of paper or other object through the instrument, the desired tone will be produced. The object of this improvement would be to enable every family to en-

joy the latest and best music, or such selections as might be desired, without the requirement of educated manipulation of the instrument. The sheet or object by which the changes of sound are effected must be cheap and easily produced.

**A CLOTHES DRYER**—A drying frame for clothes capable of being projected from the windows of dwelling houses.

**AN ARMOR-CLAD WAR VESSEL**—Light of draft, cheap and quick of construction. As the iron-plated ships have been thus far constructed, Sir Edward Belcher thought that even a well-constructed wooden ship, striking one fair across the bows, would cause such a shock as to sink the armor-plated vessel. And he declared that if he were hard-pressed, he should have no objection to try it. Indeed, he seemed to think that "compressed brown paper was one of the most powerful repellants of shot, and might be advantageously tried." Something better is needed in this line than has yet been brought out either in Europe or this country.

**A POCKET TELEGRAPH INSTRUMENT**—To be operated without connecting wires; capable of being carried in the pocket like a watch, and to be in sympathetic relation to another similar instrument possessed by a distant friend or correspondent.

**AN ARMOR DRESS**—Of little weight, capable of being worn under the ordinary garments, and of sufficient strength to resist musket and pistol balls.—Something better in this line than has yet been invented would sell at this time very readily.

**AN ATTACHMENT TO GUNS TO CUT THE ENDS OF CARTRIDGES**—At present the soldiers tear the cartridges with their teeth, but the niter and sulphur contained in the powder occasions diseases in the mouth and loss of teeth, besides causing the most acute thirst to the soldier during battle.

**SUBMARINE MACHINES**—A very important field for ingenuity is the discovery of an efficient method of preventing the entrance of vessels into harbors by submarine machines or explosives.

**WATER PIPES**—A material for making pipes for conducting water, not metallic, but pliable and capable of being bent in any direction.

**A TENT FOR ARMY PURPOSES**—Capable of being quickly converted into a substantial boat, for carrying troops across rivers.

**A SADDLE AMBULANCE**—For mules or horses, capable of ready adjustment so as to remove the wounded from the field of battle.

#### TRIAL TRIP OF THE STEAMER CONSTITUTION.

At 2:40 P. M., of the 16th ultimo, the steamship *Constitution*, belonging to the Pacific Mail Steamship Company, started for Boston upon a trial trip, with a select company of guests, professional and non-professional. The vessel is the largest built since the days of the *Grand Admiral* and *Adriatic*, and exceeds the former vessel in her proportions. She is intended for the Pacific trade, and has a beautiful hull, combined with great motive power. From these two specialties extraordinary results in speed were expected. The length of the *Constitution* is 364 feet, by 45 feet beam; her tonnage—carpenter's measurement—is 4,400 tons, with capacity for 3,000 troops and their necessary baggage. Three thousand souls, exclusive of the crew required to manage the vessel, are enough to be called a respectable town in any part of the world, and to feed, transport and care for such a body of men daily requires great forethought and experienced officers. These are as follows:—Captain A. T. Fletcher, three other officers, boatswain and 22 seamen. The ship is brig-rigged, and carries ordinarily 12 life boats—on this occasion she was provided with 6 additional ones. Wind sails and ventilators are distributed liberally throughout the vessel. The comforts and convenience of the passengers have been well provided for by the proprietors. The fittings are of a luxurious character, the furniture of comfortable and elegant design, and the state rooms are commodious and cheerful. If we add to this the comforts in the way of baths and barber shops, and the light afforded at night by the mechanical lamps which light the main saloon, one sees that an able mind has superintended the building of a ship embracing such various details. The machinery of the vessel is of the most massive and powerful description. A steam cylinder, of 105 inches diameter, by 12 feet stroke of piston, furnishes the motive power to the ship through

wheels 40 feet diameter by 10 feet face. There are in addition 6 auxiliary engines for various other purposes, such as pumping up water to the boilers, blowing the fires, &c. The boilers are 4 in number, and of the return-flue pattern. They contain 5 furnaces, and 3,500 feet of fire surface each. They consumed upon this trip 47 tons and 980 pounds of coal per day, with an average steam pressure of 15 pounds per square inch, and 11 revolutions of wheels per minute, with throttle valve half open. Average vacuum, 28 inches. The speed of the vessel with wind part of the time ahead and the rest abeam, was 12 knots per hour—knots meaning nautical miles. The chief engineer is Mr. Wm. Vanderbilt, an officer of great experience; his assistants are Messrs. Sparks, Reed and Reynolds, in the order of their rank, with 36 firemen, coal heavers, &c. The main engine is of the beam variety, and furnished with an enormous Sewall surface condenser, containing upward of 5,500 brass tubes, three-fourths of an inch in diameter. The public are familiar with the capacities of this apparatus, but it is not amiss to state that this particular one is able to distill 30,000 gallons of fresh water per day from sea water, or to pump out the vessel's weight in three hours, from her hold, using, of course, her two pumps—air and circulating—to accomplish that end. In the language of Captain Fletcher, "a hole in the vessel as big as a rice tierce would be of little inconvenience." Although the engine was entirely new, and just as it came from the Novelty Works, it was never stopped or slowed from the time of leaving New York until it reached Boston Light and the vessel anchored, which fact alone is creditable. Nothing could exceed the smoothness and regularity of its performance. Steam is worked expansively upon the *Constitution*, and an ingenious and simple apparatus, devised by the Novelty Iron Works, permits the valves to drop at any required point of the stroke. It consists merely of the ordinary rock shafts and their several toes for working the valves. The steam toes, however, have a slot in their ends which permits a sickle-shaped apparatus (also working on the rock shaft, but not fixed thereto,) to run through them. From the ends of these toes project steel catches, which pick up the steam valves—the catches being disengaged from the valves by the sickles aforesaid, they having one side peculiarly shaped, and which cannot be described, for that purpose. These sickle arms can be placed at all points where it is desirable to cut off the steam. The whole apparatus worked successfully, and without causing any anxiety to the engineers. Those who are prejudiced against a surface condenser, and opposed to improvements, should have seen the Sewall condenser perform its functions; never ceasing in its duty, it condensed the whole steam admitted to it, and maintained a most extraordinary vacuum, without leak or loss. It is difficult to conceive of any opposition to a machine which can be used either as an old-fashioned jet or as a surface condenser, doing twice the duty of the former. Mr. George C. Shelley is at the head of the culinary department of this ship, and has contrived an ingenious apparatus, which cooks the rations and makes the coffee, for the 3,000 troops for which the vessel is provided, in the same space of time that this is usually done for ten men. Incredible as this statement may appear, it is true, as any one can satisfy himself by examining the fixtures. We are indebted to this gentleman for many personal attentions. Dr. Normandy's condenser, for making aerated fresh water, is in use, and was highly successful in its operation, making the drinking water for the vessel.

Through all the brisk gale which prevailed during the entire passage, not a drop of water came upon deck, nor was the motion of the vessel extraordinary under the circumstances. The powerful engine performed its revolutions with as much regularity as on the smoothest sea. At every rise and fall of the cumbersome piston the requisite lead met it and imparted successive strokes, which urged the steamer on with strong and sturdy impulses. The sound of the exhausting steam, the monstrous beat and thump of the rubber valves, and the singing of the boilers seemed like the sigh of some pent-up monster. Long ago in the Arabian Tales some eastern writer depicted the fable of the genius imprisoned in the sealed box, who gave whatsoever was required. To-day the fiction becomes fact, and the genius is safely confined in the lever which moves the world. The whole running time of

the trip from New York to Boston, by the outside route, was 29 hours and 30 minutes, and those who are qualified to judge of the vessel pronounced her working admirable.

A meeting of the guests took place in the main saloon, after the trip, at which complimentary resolutions were adopted, and cheers given for Captain Fletcher. Among the guests were, W. H. Webb, Esq., Howard Potter, Esq., Wm. E. Everett, Esq., and Captain Ezra Nye. Mr. Sewall, the inventor of the condenser used, was also present. The cost of the vessel and machinery was not made public, but cannot be less than half a million of dollars. The guests will long have reason to remember the pleasant trip made by the *Constitution* and the bounteous hospitality of her proprietors.

**INDEX OF WAR AND NAVAL INVENTIONS.**

We are frequently asked to furnish descriptions of the various kinds of war implements which have been invented, and such as are now in practical use by the government. Nearly all the inventions which have been made and introduced into the War and Navy Departments have been published in the *SCIENTIFIC AMERICAN*, and for the convenience of inquirers we append herewith an accurately prepared list of subjects illustrated since the commencement of the present volume, (July 1st). In the former volume we illustrated a large number of war subjects, many of which have been introduced into the service.

Besides the illustrations presented, we have furnished a very extensive summary of useful information concerning the art of warfare, such as cannot be found in any other publication.

We have here a list of engravings comprising cannon, rifles, projectiles, war vessels, camp utensils and military equipments generally; in fact, all that is needed to prepare our soldiers and sailors to arm and equip in defence of our Union and the glorious flag.

This index does not include descriptions of many improvements which have been published in these columns, but only those which are accompanied with engravings to illustrate the inventions more fully.

- 1.—Privateer *Savannah*, in one figure, on page 4.
- 2.—Sigourney's Rifle Projectile, three figures, p. 5.
- 3.—Smith & Wesson's Breech-Loading Rifle, four figures, p. 8.
- 4.—Cochrane's Rifle Cannon Shell and Shot, two figures, p. 24.
- 5.—Bathe's Shields for Ships, two figures, p. 32.
- 6.—Hirchbuhl's Vent-Stopper for Cannon—Cannon and Gunner—one figure, p. 33.
- 7.—Rodman's Cannon Powder, one figure, p. 53.
- 8.—Gun Lock—Hillier's—with Pistol, two figures, p. 56.
- 9.—Electric Cartridges for blasting, six figures, p. 64.
- 10.—Parr's Camp Chest, showing table, dishes and tools, two figures, p. 65.
- 11.—Chinese Cannon—regular antique breech loader, one figure, p. 80.
- 12.—Map of Bull Run Battle-Field, one figure, p. 82.
- 13.—Chinese Jingall—small cannon—one figure, p. 87.
- 14.—Shrapnell Shell and Fuse, two figures, p. 88.
- 15.—Submarine Infernal Machine, found in the Potomac river, one figure—ship and machine, p. 101.
- 16.—Sawyer's Projectile, used at Fortress Monroe, two figures, p. 112.
- 17.—Machine for Rifling Cannon, showing the operation, in one figure, p. 113.
- 18.—Chariot Shield for Soldiers, with companies of soldiers marching behind the shield, two figures, p. 128.
- 19.—Stevens's Marine Battery and Iron-Clad Frigate, the parent of iron-clad war ships, three figures, p. 129.
- 20.—Target of a Crack Rifle Shooter, one figure, p. 132.
- 21.—Schubarth's Breech-Loading Rifle, showing cartridge lock, four figures, p. 136.
- 22.—Babcock's Spiral-Formed Cannon, five figures, p. 160.
- 23.—Spanish Rifled Cannon and Shot, in two figures p. 166.
- 24.—Slinging and Working Guns on Ships—Scott Russell's plan—in three figures, p. 168.

- 25.—Gault's Expanding Projectile, four blades expanded and "clear the way," three figures, p. 168.
- 26.—Russell's mode of building Iron War Ships, in eight figures, p. 176.
- 27.—Inside view of a new Gun Boat, one which has since done good service at Port Royal, one figure, p. 192.
- 28.—Army Spy Glass for measuring distances, two figures, p. 200.
- 29.—Jones's Angulated Iron War Ship, one figure, p. 225.
- 30.—Spear Projectile—Brown's—one figure, p. 225.
- 31.—Howe's Army Scale for weighing, two figures, p. 232.
- 32.—Canteen—Montgomery's—three figures, p. 240.
- 33.—Henry's British Prize Rifle, three figures, p. 244.
- 34.—Winslow's Semi-Steel Cannon, shot, shell and target, six figures, p. 273.
- 35.—Winslow's Bomb-Proof Armor for War Ships, four figures, p. 276 and 277.
- 36.—Rockwell's Combination Union Army Camp and Chest, tables, box, stove, &c., three figures, p. 280.
- 37.—Ball's Army Chest and Stove, Table and Box, three figures, p. 296.
- 38.—Ashold's Camp Stool, three figures, p. 296.
- 39.—War Steamer *Merrimac*, sunk at Norfolk, raised, and now covered with iron plates, and made into a Marine Ram, in one figure, full view, p. 304.
- 40.—Chinese Long Musket, one figure, p. 344.

**TO OUR EDITORIAL BROTHEREN.**

We send a copy of this week's issue of the *SCIENTIFIC AMERICAN* to every newspaper published in the United States accessible to us through the mail facilities of Uncle Sam, and we take this occasion to thank our brethren of the press for their uniform courtesy toward us ever since we commenced the publication of this journal. Your friendly aid, thus cordially extended, has aided us materially. We acknowledge it with gratitude, and still further appeal to you to speak a good word to your readers in our behalf. To all such journals as publish our prospectus in their columns we shall send the *SCIENTIFIC AMERICAN* one year without an exchange.

**Paging Account Books by Machinery.**

John McAdams, of this city, is the man who has made the paging of account books by machinery a practical art. Ten years ago he invented his first machine, and he has been engaged since in making improvements upon it. After eight years' use, he happened one night to think of the plan for carrying down the leaves as they are successively paged, by means of a little revolving finger; and this slight modification very largely increased the capacity of his machine. On another page will be found an illustration of his machine, embracing the latest improvements. It is a beautiful piece of mechanism. We have seen it in operation, and can say that it works in a rapid and perfectly successful manner, paging the books with the greatest neatness and regularity.

**COAL OIL, PAINTS, &c.**—Our readers will find in our advertising columns the advertisement of Messrs. Reynolds, Devoe & Pratt, who are extensive importers and dealers in paints, oils, varnishes, colors, &c. We take much pleasure in speaking of these gentlemen as being in every way reliable and upright merchants of long standing, and who are probably the most extensive dealers in their line of business in the United States. They have issued a comprehensive catalogue of their goods with prices attached, as far as it is practicable to do so.

**THE CALIFORNIA TELEGRAPH TARIFF.**—The rates fixed from St. Louis are as follows:

First 10 words.....	\$4 25
Next 90 words (each).....	36
Next 400 words (each).....	24
Next 500 words (each).....	18
After 1,000 (each).....	12

These rates are in conformity to the act of Congress. From New York, Boston, and other Eastern cities, the usual rates to St. Louis are added.

The second British great iron-clad frigate, *Black Prince*, lately made a trial trip, when she attained a speed of 17 knots per hour in smooth water.

**NOTES ON FOREIGN INVENTIONS.**

**Rolling Iron.**—J. G. N. Alleyne, England, has obtained a patent for applying two steam engines to operate the rolls in a rolling mill—the one set for operating the rolls in one direction, and the other for moving them in the contrary direction. In rolling iron into plates, or bars, or T and angle iron, it is necessary that the rolls should be moved with great rapidity to accomplish the work while the iron is hot. When the rolls are rotated in one direction, one engine is thrown off and the other thrown on for the reverse motion, so that each engine is alternately getting up speed and accumulating work in the fly wheel for the next rolling operation. The arrangement also obviates the necessity of toothed gearing for the rolls, an important advantage.

**Fixing Varnish on Glass.**—R. A. Brooman, of London, has applied for a patent to prevent lac and other varnish from cracking off when applied to glass, by simply applying paste made of rye flour to the glass first, then before it is quite dry laying on the varnish, which is afterward dried in a warm apartment.

**Reproducing and Varying Drawings.**—M. M. A. Huray and H. Leile, of Paris, have patented an instrument denominated a goniometroscope, by the aid of which patterns of flowers, lace and other small objects can be multiplied and reflected at any given angle, from a triangle upward. The instrument consists of wood, opening like a book. The two sides forming the case are hinged at the back, so that when required they will stand on end, the back being in a vertical position. The sides are each covered on the inside with a thin sheet of copper plated with silver, and burnished. These serve as reflectors, and the reflection is intended to be made in the very center of the pattern. A protractor—a half circle marked off in degrees—is secured at the top of one side of the case, at a short distance from the hinged back. By this the different angles can be readily found, the protractor being held firmly by a small holder, having a regulating screw on the other side of the case. Through each side of the case, near the opening part, there passes a vertical needle, having a head upon it. A screw is cut upon this needle, and it takes it into a thread in the hole of the case through which it passes. This needle is a little longer than the case, and by turning its head it can be made to enter the pattern and thus steady the instrument. When the angle is to be changed, or the instrument closed, the points of the needles are withdrawn into the case, by turning their heads. By placing a pattern or design to be copied for sewed muslin work, or for printing so as to enlarge it, the pattern is placed on the table between the leaves of this case, and it is reflected from its polished reflectors upon a piece of prepared paper set in proper relative position to receive it above. It is a convenient instrument for those engaged in enlarging intricate designs for manufacturing purposes.

**Opening and Closing Port Holes.**—C. Burn, London, has taken out a patent for opening and closing port holes of ships and forts in a rapid and easy manner, to prevent the entrance of missiles from an enemy and yet permit the quick firing of cannon from within. The port hole is covered with two doors, arranged like the upper and lower sash of a window, and then hung and balanced nearly in the same manner as a window sash, with a chain and weight. These two iron doors are set, the one to move in a recess in the ship's side (or in the wall of a fort), above the port hole, and the lower one into a like recess below the port hole. These doors are made of very thick iron, so thick that shot or shell can not penetrate it, and they are operated inside. Being balanced by counterweights, they can be opened and closed with ease and with great rapidity. Whenever a gun is discharged the port is at once closed, and when the gun is again loaded the port is at once opened and the gun discharged. The upper door is hung on chains, which pass over two pulleys on the lower door, to which they are fastened, and by this means the weight of one door balances the other, and they move simultaneously. The face of these port hole doors is angular, to deflect the shot.

**COLONEL GOWEN**, our enterprising countryman, has now succeeded in raising eight war steamers, one fifty-gun frigate, three corvettes, twelve gun brigs and several smaller craft, in the harbor of Sebastopol. All these have been raised entire and floated.