### THE ITALIA.

(*Continued from first page.*)

The estimated weights of the hull, armor, etc., were given approximately as follows:

| | Tons. |
|---|---|
| Hull | 5,000 |
| Armor of armored deck | 1,200 |
| Armor of citadel | 900 |
| Armor of ammunition shaft | 246 |
| Armor of chimneys | 552 |
| Total weight of armor | 2,898 |
| Teak backing | 114 |
| The total weight of the machinery is about | 2,200 |

The armament consists of four 43 cm. (110 ton) R. L. R. guns supplied by Armstrongs. There are eight 15 cm. (6 in.) Armstrong breechloaders. Six of these are carried on the upper deck, two being respectively bow and stern chasers. There are six smaller quick-firing guns of 57 mm. caliber.

There are machine guns, comprising twenty-two Hotchkiss and quick-firing guns for the boats and landing parties. There will also be a number of Maxim guns.

There are four torpedo ports arranged on the broadside, two ahead and two astern.

The two sets of engines for driving each of the Italia's twin screws have each three cylinders of equal size arranged in line on the shafting. At full speed they all take steam direct from the boiler, but in ordinary working the foremost cylinder of each set alone takes steam from the boiler, and exhausts into the other two cylinders. There are thus six cylinders to each propeller. The engines are placed amidships, the boilers being placed fourteen before and twelve abaft them. The shafting runs under the after boilers. It is this unusual arrangement of the boilers which gives the vessel the somewhat peculiar appearance due to the position of the six chimneys, which it will be seen by our engraving are placed in two groups of three each before and abaft the barbettes. The latter are placed *en echelon*, and each one carries two of the monster 100-ton guns. The barbettes are contained] in an armored casemate, which is supported by the unarmored structure of the ship, a point in design that has raised many adverse comments from naval critics in this country. The space thus inclosed is entered from below through an armored shaft, which leads below water to the space between the forward and after sets of engines. This armored tube serves as an ammunition shaft. The bases of the chimneys in each group are also protected by armored belts. The plated deck completes the armored protection of the ship. This deck extends from stem to stern, the armor being of steel, and 3 in. thick. The body plan of the ship shows this deck in a uniform curve extending from side to side. Where it springs from the skin of the vessel it is about 5 ft. 6 in. below water line, and at its highest part it is about 1 ft. 6 in. below the level of the water. These figures are those which were allowed for in the design, but we believe, as a matter of practice, the Italia, like so many other war ships, has accumulated weight during construction, so that the deck is more submerged still. It is this under-water arrangement of the armored deck that has been so unfavorably criticised, and it may be noted that in the succeeding ships, Re Umberto, Sicilia, and Sardegna, the crown of the deck has been raised considerably above the water level, so as to conform more nearly to the arrangement followed in our own smaller protected ships of the Mersey type.

Steel is largely used in the construction of this vessel, and when we remember that she was commenced ten years ago, we feel we have another reason to admire the courage and prescience of her designer. The bottom is sheathed with wood. The double bottom has 3 ft. 3 in. between the two skins in the midship part. There are two longitudinal water tight bulkheads, extending fore and aft for 254 ft. Altogether the hull is divided into 53 vertical divisions, these being split up again horizontally by the four decks. Cork stuffing is extensively used in the side compartments. Six feet above the water line is a deck of ordinary plating covered with wood; and above this is the battery deck, having a height of 14 ft. above the water line. Again, 7 ft. 9 in. above this is the upper deck, which supports the casemate containing the big guns mounted *en barbette*. The great height at which the Italia carries her guns is a very strong point in favor of her design, such an element being to a war ship of the present day, when armored decks form so important an element of defense, very much what length of reach is to a boxer. High speed is another and perhaps the most important advantage that was aimed at as a counterbalancing advantage in dispensing with side armor. The under-water shape of the Italia is very beautiful, and in looking at her model one is forcibly reminded of a remark of our present director of naval construction, Mr. W. H. White, that however unsightly modern war ships are to view afloat, some of the most beautiful forms ever produced by the naval architect were hidden from sight below the water line of the ungainly superstructures. It was hoped that the Italia would steam 18 knots, and this was all but got on her trial, the speed we believe that was registered being as stated 17·8 knots. The power developed by the engines was considerably short of the contract. It was expected to get 18,000 indicated horse power, but there was a very large falling off from this. There was, it is said, a difficulty in getting air down to the furnaces, and the necessary amount of coal could not be burnt. Alterations and improvements are now in course of consideration, and no doubt will lead to an increase in the power developed.

### To Builders and All Who Contemplate Building.



### A New Life Boat.

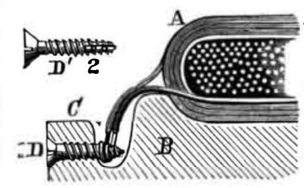
Some interesting experiments were made recently at St. George's dock, Liverpool, with a new life boat, the invention of Messrs. Gray and Hughes, and built by Mr. R. R. Gray, at his works at the Queen's dock. The boat is 16 feet in length, with a beam of 5 feet 6 inches, and 2 feet 6 inches in depth. She is built of galvanized steel sheets, and is in 20 watertight compartments. When not in use, she can be transformed into a deck seat. When in this form, directly she is lowered, or in any way touches the water, she folds together, and is kept in position by a clip at each end of the boat, which is at once screwed up. The boat will hold from twenty-five to thirty passengers, and has life lines outside her bulwarks, which will assist as many more in keeping afloat. She will carry over four tons dead weight. The watertight compartments are so built that they can be used for storing food, etc. The life boat can also be fitted with two masts, and has eight life buoys, which can be instantly detached and thrown overboard. Experiments were made to illustrate the *modus operandi* of putting her into the water, in this case by means of a crane, which lowered the boat into the water. Immediately on touching the water, the boat was transformed from a deck seat into a life boat fully equipped for a voyage. Several people then got in, and were rowed about the dock, after which she was hoisted up and resumed her position as a deck seat. It is stated that the boat can be put into the water in any position, but will always right herself.—*Iron.*

## Correspondence.

### Improvement on Simple Electric Motor.

*To the Editor of the Scientific American:*

Referring to your article on "How to Make a Simple Motor," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, the method of joining the ends of the armature coils to the screws forming the commutator can, I think, be improved in this way. See Figs. 1 and 2.



1.

The wood, B, being turned away so that the inner ends of the screws, D, are clear, then by a file or hack saw a slit could be cut in the screws, which would admit the ends of the armature wires. Now, both wires and screws being well tinned, if placed in position a drop of solder and a hot iron will complete the connection. As the screws will wear and burn, they will have to be replaced, and by a hot iron this can be readily accomplished without injury to the wires, as they do not have to be bent or scraped in any way. J. T. WHITNEY,

*Assistant in Physics, Ohio State University.*

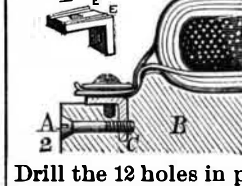
Columbus, O., April 24, 1888.

[The improvement suggested is undoubtedly practical, and may be adopted to advantage by those desiring to make a motor of the kind referred to; but it involves the use of a hack saw and soldering iron in addition to the tools required in the construction of the motor as originally described. The motor was designed to be made with common tools, such as may be found in almost every dwelling house. If one has an engine lathe and a full complement of metal and wood-working tools, the construction of an electric motor becomes an entirely different matter. In such a case a motor might be made in the regular way more readily, perhaps, than in the manner suggested. It is our purpose to publish a full description of a "regularly made" electric motor in the near future.—EDS.]

### A Commutator for the Simple Electric Motor.

*To the Editor of the Scientific American:*

As I am interested in making the simple electric motor described in No. 11 of the SCIENTIFIC AMERICAN, I will describe my method for making the commutator. The parts are few and easily made by all those who have small screw-cutting tools, and will afford a more certain means of connection than to place the armature wires in the wood and trust to a sure contact between the wires and the wood screws. From a piece of ¼ in. sheet brass, or any other suitable material, cut 12 L-shaped pieces, 7-16 in. each way (Fig. 1). Next fit each piece into the wooden hub in place of the holes for the armature wires, taking care that each piece is embedded almost entire in the wood (Fig. 2).




Drill the 12 holes in place of the wood screws, through the piece of brass, from the end of the hub, and pass a lap through.

Procure 12 brass rivets, A (with washers), of sufficient length to reach from end of hub to L, cut threads on each one and fit into the hub, passing through the L (Fig. 2).

Drill and tap each L on its upper surface for a machine screw and washer, D, cutting a small groove, E, at the edge of each for the wires from the coils. Place the armature wires under the washer and fasten with the screw in the order described in the description of the motor. GRANT J. THOMAS.

[The remarks in connection with the letter of Prof. Whitney will apply in this case.—EDS.]

### The Age of the Stars.

A very interesting address delivered at the annual public session of the five academies of France, October 25, 1887, by M. Jannsen, the director of the observatory at Meudon, France, is published in the December numbers of *Ciel et Terre* and the January and February numbers of *L'Astronomie.* The principal thought is that the idea of evolution may be applied to the stars as well as to terrestrial things. The stars are not fixed and eternal, but are subject to change and time. They have a beginning, a period of activity, a decline, and an end. By recent advances in the study of celestial physics, especially with the spectroscope, we are enabled to know something of the actual condition and relative age of some of the stars. We may assume that the age of stars, other things being equal, will depend upon their temperature, and that their temperatures are higher in proportion as their spectra are richer in violet rays. The majority of the stars which are visible to the naked eye are white or bluish, and therefore at a high temperature; but many are yellow or orange, like our sun, showing that they have passed their youth, while others are from dark orange to dark red, showing that their sidereal evolution is far advanced. —*Sidereal Messenger.*

**Engine Foundations.**

There is not a detail in engine construction and operation that merits greater consideration, or is of greater importance to the successful working of an engine, than the foundation upon which it stands, and too much care cannot be accorded it, that it shall have ample spread, stiffness, unity, and adaptability to the movements and operation of the parts which it supports. It should be so bonded and tied that unequal settlement shall not take place, and the height, weight, and base should be of such proportion that when the engine is in full operation there shall be no swaying or twisting of the parts, no heating of the journals, no springing or tremor of the bed arising from an unsuccessful transmission of the strains. The higher the speed and revolution, the stiffer and more solid should be the foundation, and the greater the base contact with the supporting earth. A good foundation will often decrease the defects of a poor bed, provided, of course, that such engine bed be properly and thoroughly bolted to its foundation. When properly constructed, and tied together, the engine bed and its foundation should be portions of one complete whole, inseparable and undisturbed in their relationship by the movements of the engine parts while at their hardest work.

A good bottom of concrete of smooth upper surface laid upon a rock or solid earth bottom, upon which the main structure of brick is laid close and jointed with first quality of cement, and the whole capped with one or more large blocks of stone jointed and placed to suit the engine bed, and to distribute the weight over as great an area as possible, constitutes the best foundation. Where bricks are scarce the foundation above the concrete bottom may be all of stone, and the larger the stones the better.

Ordinary rubble work is not to be relied upon, the only capacity for retaining and uniting the structure as a whole being contained in the cement. The irregular shape of the stones forming the rubble masonry present, through their lack of contact with each other, rather a precarious and unreliable bond, and the cement is too thinly laid to fix them permanently in their position, in spite of the thrust and twist of engine operation. It is far better to mould a complete foundation of concrete, capping it, if possible, with the thick solid blocks already mentioned in connection with the brick foundations. The foundation completed and thoroughly set, the engine frame or bed may be placed in position and lined up, and the joints filled and packed with melted sulphur.

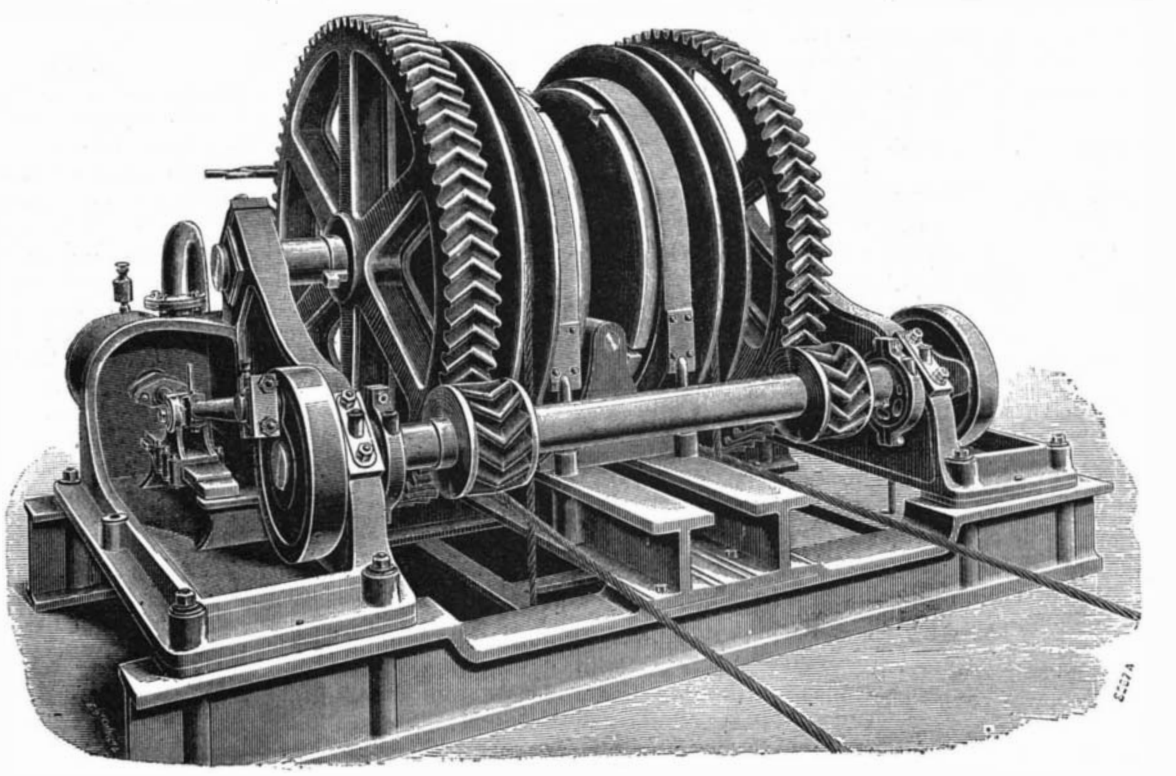
The actual nature of the soil or bottom upon which the engine and foundation is to rest, whether it be wet, soft, and elastic, whether it be dry, sandy, and solid, or whether it be a rock bottom, to which the bed might be immediately fastened with a mere leveling foundation between, determines the nature, extent and scope of the foundation, while the size, weight, and power of the engine determines its weight and bulk to prevent vibration or tremor.—*The American Engineer.*

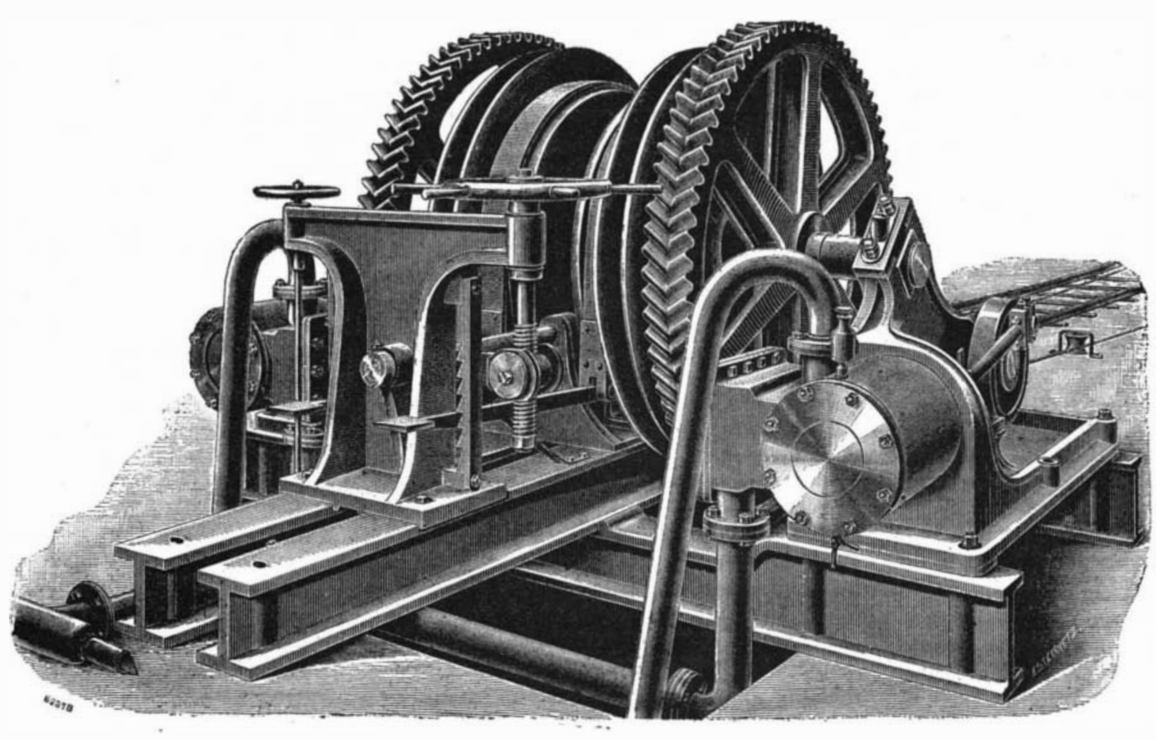
**Clean up the Cellars.**

The spring months, truthfully says a contemporary, are apt to be sickly in country places, partly because of confinement of people during the winter in ill-ventilated rooms over damp cellars filled with vegetables. Malarial fevers attack older people, while diphtheria is the scourge of the young, especially those kept mostly in the house. The common city plan of heating the house from the cellar by furnaces and registers avoids this evil by giving better ventilation from the cellar to the garret. It also precludes storing many vegetables in the cellar, as in a warmed air they will not keep. Confinement in bad air and drinking impure water result in poisoning the blood, thus aggravating nearly every form of disease. Where the water is suspected of being impure, boiling it destroys its poisonous elements. Western people have by long practice in fighting them learned much about malarial diseases. They consider coffee thoroughly browned a specific against malaria.

**ENDLESS ROPE HAULING MACHINE.**

Our engravings represent a front and back elevation of a hauling engine made by the Lowca Engineering Company. The cylinders are 10 in. in diameter, with a 12 in. stroke. The engine is compact, self-contained, and requires no foundation. The duplicate helical gearing is in the ratio of five to one. There are two driving drums 4 ft. in diameter, with a friction clutch between them, which can be thrown in and out of gear when the engines are running at full speed. Each drum is provided with a strap brake, which throws itself out of gear on releasing the brake lever. The drums are designed for endless rope haulage, and around these the rope is wound two or three times to obtain the requisite driving adhesion. The rope is kept taut by passing round a terminal tension pulley.—*Engineering.*





IMPROVED ENDLESS ROPE HAULING ENGINES.

**The Philadelphia System for Underground Electric Wires.**

The town council have control of all electrical work, and some time ago they determined that all overhead wires should be undergrounded, which has been done. The engineer to the council, Mr. D. R. Walker, has just sent in his annual report to the mayor, describing the behavior of these underground cables, which are used for telephonic, telegraphic, and electric light service. There are four companies in Philadelphia now using Waring underground cables, viz., the Brush Company, the Keystone Company, the United States Company, and the Underground Electric Light and Power Company. The Brush Company are using sixty arc lamps in one of their circuits, which is five miles long, and is worked at a pressure of 2,800 volts, or about 45 volts per lamp. The lamps are generally placed at intersections of streets, and at a distance of about 500 feet apart. The cable for the Brush lamps consists of a seven strand 14 B. W. G., with insulation of from one sixteenth inch to three thirty-seconds inch, and protected with a lead covering one eighth inch thick. The same cable is used by the Keystone Company in a fifteen mile circuit at 2,000 volts, and no difficulty has been found in working it. Along Chestnut Street the electric light cables are laid side by side with telephone and telegraph cables in a cast iron duct 20 inches by 30 inches. In Broad Street the cables are laid in a wooden trough covered with a plank and close under the pavement. According to the report, nine tenths of the difficulties experienced with underground work were not in the cables themselves, but in the connections with the overhead portions. Mr. Walker also mentions an interesting case where lightning struck an overhead connection on an underground circuit, ran through three miles of cable, and burned the dynamo. The cable itself, however, was not injured.

**The Black Hole of Calcutta.**

The Iowa State Board of Health, in its April bulletin, concludes that few who have heard of the "Black Hole of Calcutta" know the terrible facts that have rendered the place famous and made it the synonym of all that is to be dreaded from foul air and overcrowding.

At eight o'clock on the evening of June 20, 1756, one hundred and forty-six prisoners, officers and men, black and white, and of different nationalities, were thrust into a room eighteen feet square—with two windows on one of the four sides heavily barred with iron—giving to each inmate forty cubic feet of space. In ten hours one hundred and twenty-three were found dead—only twenty-three being alive!

Another instance is where, in 1742, the High Constable of Westminster, London, committed twenty-eight persons to prison, where they were thrust by the keeper into a hole six feet square and five feet ten inches high—the windows being close shut. In a very short time four of the inmates were suffocated!

These facts show the poisonous effects of the human breath—or of respired air. Prof. Brown-Sequard has recently made some experiments that are not only highly interesting, but show why the expired air of man and animals is so deadly. From the condensed vapor of the expired air he produced a liquid so poisonous that when injected beneath the skin of rabbits it produced almost instant death. This poison he found to be not a microbe, but an alkaloid. His conclusions are that the expired air of all animals contains a poison more fatal than carbonic acid.

It is well for the people to understand these facts. They cry aloud for better ventilation and purer air—for less crowding in home and church and hall and school room.

GREAT are the wonders of the telephone. A physician reports to *Gaillard's Medical Journal* that he was saved a two mile ride through a driving storm the other night by having the patient, a child, brought to the instrument and held there until it coughed. He diagnosed false croup, prescribed two grains of turpeth mineral, and turned in for an undisturbed sleep during the remainder of the night. He found the patient in the morning doing nicely—under the care of another doctor.