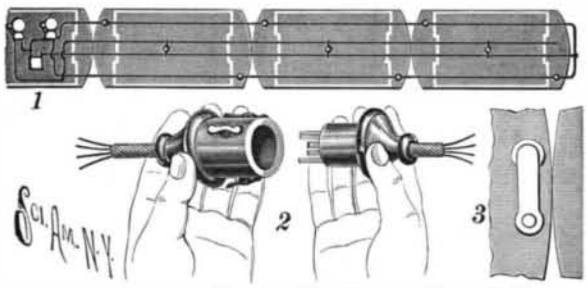
ELECTRIC TRAIN "STOPPING" AND "STARTING" SIGNAL.

The illustration represents a very simple system of signaling to the engineer from any part of a train, each conductor contributing his part to the closing of the circuit, and the signal being given the moment the last conductor completes the closing of the entire circuit. The improvement is represented as arranged especially for use on elevated railway trains, insuring promptness in leaving stations. A patent has been granted for this invention to Francis C. E. von Sternberg, of No. 933 Lafayette Avenue, Brooklyn, N. Y. In Fig. 1 are indicated three cars of a train and the

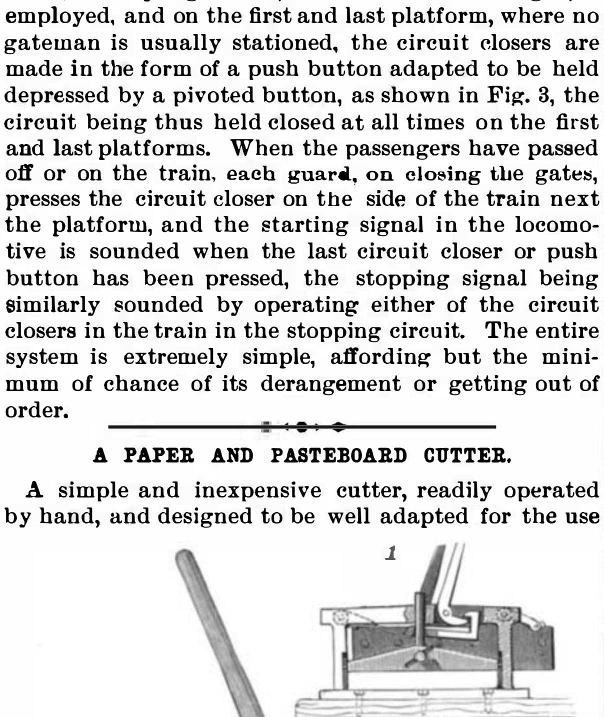


VON STERNBERG'S ELECTRIC TRAIN SIGNAL.

engine, there being in the cab two electric bells and a battery, connected up with the train wires to form "starting" and "stopping" circuits. The starting circuit includes two parallel conductors extending the length of the train at each side, each wire being provided with a circuit closer on each car to hold the circuit normally open, such circuit closers being at opposite sides of the platforms at opposite ends of the cars, and the ends of the conductors being connected with a central return conductor at the rear of the train, whereby each branch of the starting circuit is maintained normally open. The stopping circuit includes a central conductor extending along the train and having normally open connections with the return conductor on each car, there being in each car circuit closers to close the stopping circuit and operate the signal. To connect the sections of the several circuit wires, a coupling device, such as shown in Fig. 2, is employed, and on the first and last platform, where no gateman is usually stationed, the circuit closers are made in the form of a push button adapted to be held depressed by a pivoted button, as shown in Fig. 3, the circuit being thus held closed at all times on the first and last platforms. When the passengers have passed off or on the train, each guard, on closing the gates, presses the circuit closer on the side of the train next the platform, and the starting signal in the locomotive is sounded when the last circuit closer or push button has been pressed, the stopping signal being similarly sounded by operating either of the circuit closers in the train in the stopping circuit. The entire system is extremely simple, affording but the minimum of chance of its derangement or getting out of order.

A PAPER AND PASTEBOARD CUTTER.

A simple and inexpensive cutter, readily operated by hand, and designed to be well adapted for the use



BYRD'S PAPER AND PASTEBOARD CUTTER.

of country printers, is shown in the accompanying illustration, and has been patented by Charles A. Byrd, of Drain, Oregon. Fig. 1 is a side view of the machine, with the parts adjusted to receive the paper to be cut, Fig. 2 being a partly sectional view of the opposite side of the cutter, showing the paper-clamping device. The presser arm and block are engaged and operated by a lever having a cam-shaped end to firmly clamp any thickness of material, from a single sheet to the greatest thickness within the range of the device; and when the stock has been clamped the movement of the knife lever effects a drawing cut by the blade. As the main portions of the machine may be made of cast metal at a low cost, a cutter of this description can be afforded at a very moderate price.

The Carl Zeiss Optical Works.

The Carl Zeiss Optical Works at Jena are probably the most important of their kind in the world and are quite exceptional in their constitution. The firm was established some years ago by a skilled workman whose name it bears. He is no longer living, neither is any member of his family connected with the factory. Jena is a university city in Saxe-Weimar-Eisenach, one of the Thuringian states of the German Empire. When Zeiss began to make his way he found the necessity of the association of some scientific adviser, and was fortunate enough to obtain in that capacity the well known Professor Abbe. In consequence of the rule that only the very best possible work should leave the factory, the business grew with great rapidity.

This institution is now a public trust, with the Duke of Saxe-Weimar as chairman. By public trust it must not be supposed that a public company in the ordinary sense is meant, for the profits annually earned, which are large, do not benefit individuals in the sense of shareholders. The payment of wages to the ordinary staff is liberal, the scientific staff receiving no less a sum than $25,000 annually. In this division is still included Professor Abbe, with whom is associated Dr. Czapski, as advisers in the optical department, and Dr. Pulfrich in a like capacity on instruments for physical research, while Dr. Rudolph advises on photographic objectives; Mr. Fischer being general business manager. To return to the question of the profits, they are divided between old age pensions for the workmen and grants for the encouragement of scientific research. The University of Jena receives a portion of these latter grants and more than one Englishman has participated, if not actually in money, in the form of scientific instruments. The invested pension fund now exceeds $1,250,000.

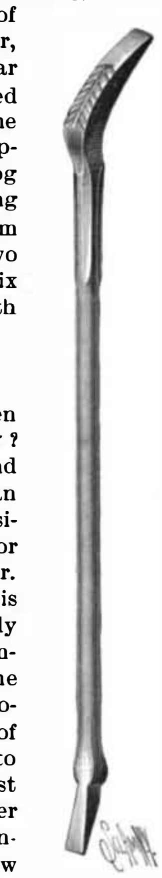
Some idea of the magnitude of the Carl Zeiss Works may be gathered from the fact that it requires three hours to pass through the various wings and departments, without leaving much leisure for inspection of details. Upward of 500 workpeople are employed, a curious feature being that there is no difficulty in obtaining skilled workers in metals, but the optical hands have to be trained within the works from boyhood. In consequence of the frequent addition of extra rooms to the factory difficulty in transmitting the power from a central steam engine was from time to time increasing, the loss of power being more than forty per cent. This difficulty has been overcome by making the steam engines drive large electric dynamos, which are connected to separate motors under each workman's bench. The loss has thus been reduced to eighteen per cent.—Science Gossip.

The Electrical Production of Carbon.

It has been recently shown, says the London Electrician, that at the highest temperature attainable in an electric furnace, all substances other than carbon are dissipated and removed, with the result that the ends of the electrodes are not only graphitic, but are also sensibly pure. It follows that a carbon plate or rod, of dense graphitic structure, good conductivity and unusual freedom from impurity, should be producible by exposing the ordinary moulded article to the temperature of the electric furnace. This is precisely the direction in which Messrs. Street and Girard have been working. They claim to have succeeded in producing a form of carbon the conductivity of which is fourfold that of the untreated material, while its resistance to chemical action is also much enhanced. Taking the density of an ordinary carbon before heating as 1·98, they find that after treatment it has attained a density of 2·6. Should this figure be corroborated, it must be considered remarkable, inasmuch as the density of graphite obtained by ordinary means is not higher than 2·3, while the same figure has been observed as a maximum for hard gas carbon. Analysis of the carbons thus made indicated that the percentage of carbon transformed into graphite was about 80 to 85 per cent. The method of analysis is, however, by no means beyond criticism, depending, as it does, on the conversion of the graphite into the highly indefinite body known on the lucus a non lucendo principle as graphitic acid, which in no way resembles graphite, or comports itself as an acid. This point, however, may safely be left for future settlement. The precise percentage of graphite is not of moment, provided a product has been obtained possessing many of the properties that would be exhibited by a sound coherent block of that form of carbon. When once criticism is allayed by the appearance, in a marketable form, of carbon which is nearly free from other elements than C and neither oxidizes easily nor irregularly, nor breaks up when used as an anode for aqueous or igneous electrolysis, an ample field of application will at once be open. To take one of the most pressing cases alone; it is notorious that next to the want of a good diaphragm, the most urgent need of those interested in commercial electrolysis has been a reliable, unattackable anode.

GATTI'S PRYING BAR FOR HANDLING LUMBER.

The illustration represents a tool more especially designed for the use of stevedores in loading vessels with lumber. It has been patented by Tony C. Gatti, of Scranton, Miss. It consists of a bar of steel having at one end a curved point and serrated back, to give a good hold on the lumber and prevent slipping, while at the other end is a stop in the form of a chisel point terminating in a collar, preventing the stop from passing too far into the lumber. The stop is employed to stop the timber passing through the port into the vessel, by placing the opposite point of the tool against one log and engaging with the stop the incoming log, the collar preventing the stop from entering the timber more than about two and a half inches, instead of five or six inches, as is frequently the case with stops without a collar.



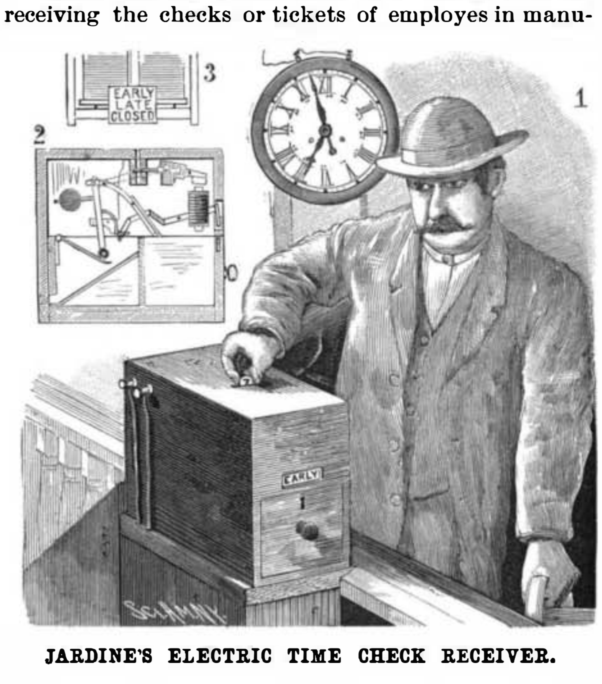
Man's Susceptibility to Weather.

Who has not felt the difference between a depressing and an exhilarating day? Sydney Smith wrote: "Very high and very low temperature establish all human sympathy and relations. It is impossible to feel affection above 78 degrees or below 20 degrees." Dr. Farr and Dr. Stark almost lead us to think morality is registered on the thermometer, so surely does it measure certain kinds of criminality. On suicides the effects of the weather are well known. Nearly all vocations are affected by weather. Men of science are often as much subject to weather as seamen. Some writers must have the weather fit the mood, character or scene. If one will read poetry attentively, he will be surprised to find how many weather marks are scattered through it. Diverse weather states may be one cause of so much diversity and even disagreement in thought processes usually regarded as scientific. Many experienced teachers think there should be modifications of school work and discipline to correspond with the weather.

The head of a factory employing three thousand workmen has said: "We reckon that a disagreeable day yields about ten per cent less work than a delightful day, and we thus have to count this as a factor in our profit and loss account." These are some of the ideas put forth in a preliminary statement by J. S. Lemon, who proposes to publish more at length upon the subject. "Laboratory investigation of the subject," he says, "meets at the outset the difficulty of distinguishing results of weather changes from similar states otherwise caused. This difficulty is no greater than in many other topics of research, and, we believe, will not invalidate our methods and results."—Popular Science Monthly.

AN ELECTRIC TIME CHECK RECEIVER.

The illustration represents an automatic device for receiving the checks or tickets of employes in manu-



JARDINE'S ELECTRIC TIME CHECK RECEIVER.

facturing establishments, offices, etc., for which a patent has been granted to Charles K. Jardine, of Achuaran, Lismore, Oban, Scotland. The lower part of a box, of which a transverse section is shown in Fig. 2, has a drawer divided by a partition into two compartments, one of which has an inclined chute leading to a slot in the lower part of the drawer at the rear. In the top of the box is a time-check-receiving slot, beneath which is pivoted a lever, there being a plate attached to the lower end of the lever, while to its rearwardly curved upper end is pivoted a bar, at whose lower end is a roller, there being also in the bar a rod on which is a counterweight. An electro-magnet is supported in the box, and its armature lever has rearwardly projecting lugs engaged by a bar connected with the curved upper portion of the lever beneath the check-receiving slot. Pivoted in the box is a lever carrying a plate with the words "early," "late," "closed," the extremity of the lever being slotted to receive a curved wire projecting from the bar carrying a counterweight. Fig. 3 shows the magnet and indicator. A conveniently located clock has a dial in which are holes to receive contact pins, which also pass into corresponding holes in an insulated ring at the back of the dial, one hole being opposite each hour mark and another fifteen minutes beyond the hour mark, and pins inserted through the holes into the ring being touched by the hour hand. The insulated ring and the clock movement are electrically connected with the magnet in the casing and a battery. When the pins are inserted in the dial, a check dropped in the slot before the hour for commencing work is passed from the chute to a receptacle outside the box, the indicator then exhibiting the word "early." When the hour hand arrives at the hour at which work begins, the curved lever beneath the slot is tilted to deflect the check into a compartment of the drawer, the indicator then showing the word "late;" but in fifteen minutes after the first contact, when the hour hand reaches the second contact, a check cannot be inserted, and the word "closed" is exhibited by the indicator, the apparatus remaining in this condition until it is reset.

An Old Horse's Memory.

Eleven years ago a horse was purchased for the fire engine Portland No. 2, on Munjoy Hill. This horse was called Old Tom, and it helped draw the engine for six years and was then disposed of. It has been drawing an ash cart of late years, and the other day went by the engine house. Engineer Loring, who knew the horse well, since they came to that engine in the same year and were there together for six years, fell into conversation with the driver and told him that he hadn't a doubt that if the old horse was put in his old stall, and the gong was sounded, he would rush for his place in front of the engine just as he used to do. The driver doubted this, and they agreed to try it. The old horse, now fifteen years old, was put in his old stall, where he had not been for five years. At the first sound of the gong he started for his old place under the harness in front of the engine. He tried to go quickly, but made only a sorry exhibition of nimbleness compared to his former habit.—Portland Daily Press.

THE AUTOMATIC LIFE SAVING APPARATUS OF DE ROPP.

M. De Ropp has utilized the liquefaction of gases in the manufacture of a life preserver. The apparatus gives the wearer entire liberty of movement until the moment arrives when the life preserver is required. It consists of a belt or sack of rubber which is normally flaccid and pliable, but which receives at the desired moment a quantity of liquid methyl chloride which, on expanding, is sufficient to completely inflate the sack. The liquefied gas is contained in a small flask terminating in a fine point which is introduced into the sack. A knife is held in place by a spring which is kept in position by a ring of filter paper which is destroyed on coming in contact with the water. The knife actuated by the spring, on being released by the band of paper, falls on a glass point, breaking it. The liquid then escapes into the sack, and, assuming the gaseous state, completely inflates it. The device can be disguised so as not to be noticeable. The inventor has also devised a signal for use by shipwrecked persons. The apparatus of M. De Ropp was experimented upon for the first time in the laboratory of M. Raoul Pictet. For our engravings we are indebted to La Nature.

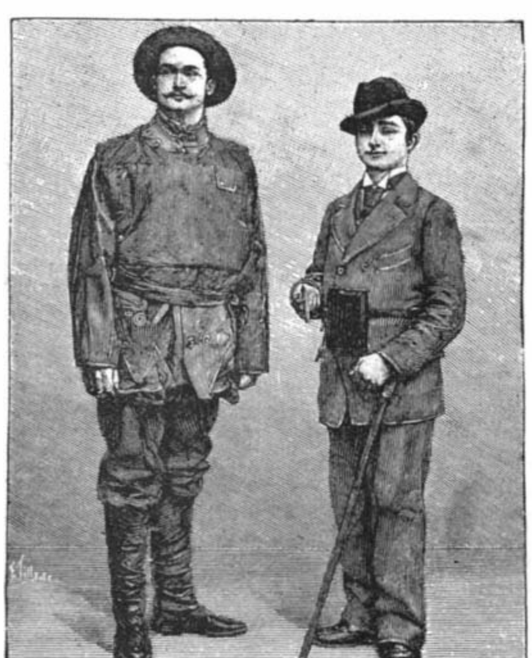


Fig. 1.—LIFE PRESERVER BEFORE INFLATING.

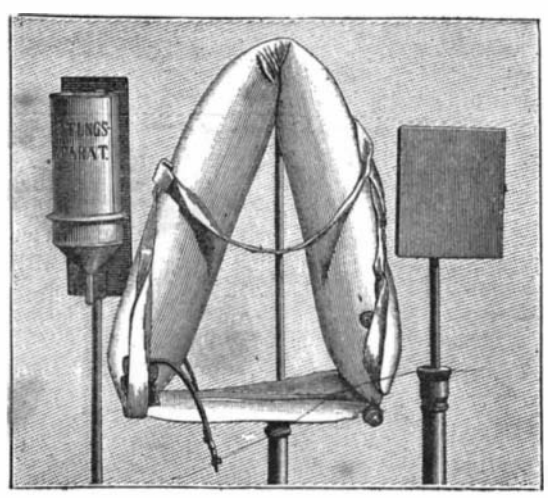


Fig. 3.—APPARATUS FOR TESTING THE LIFE PRESERVER.

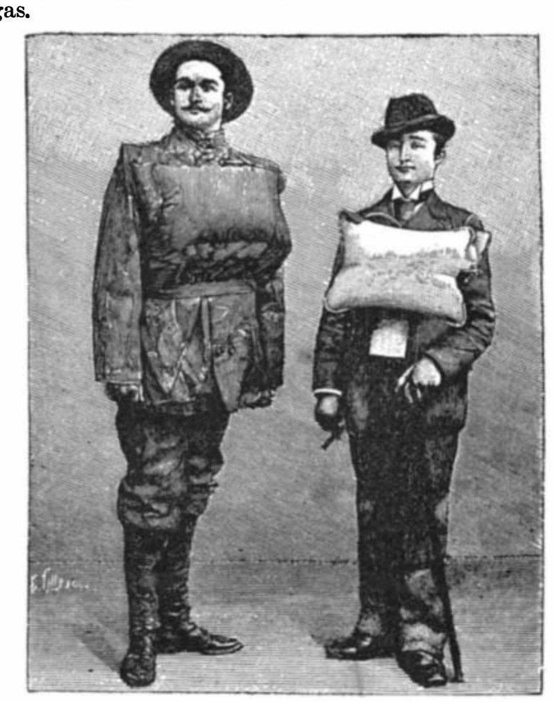


Fig. 2.—LIFE PRESERVER AFTER INFLATING.

Scientific Enthusiasts.

It is a common error to think of science as opposed to all the poetry of life and scientists as the most cold and matter of fact men. In reality the true scientist is almost always a poet at heart, and the greater he is the more certain is he to be a pure enthusiast and of a deeply reverent spirit. Kepler, exclaiming in the moment of his great discovery, "O God, I think thy thoughts after thee!" is a type of this.

Professor Farrar, who occupied the chair of natural philosophy at Harvard University two-thirds of a century ago, was a man possessed of this enthusiasm for his work, and was beloved by his pupils, whom he inspired with something of his own spirit.

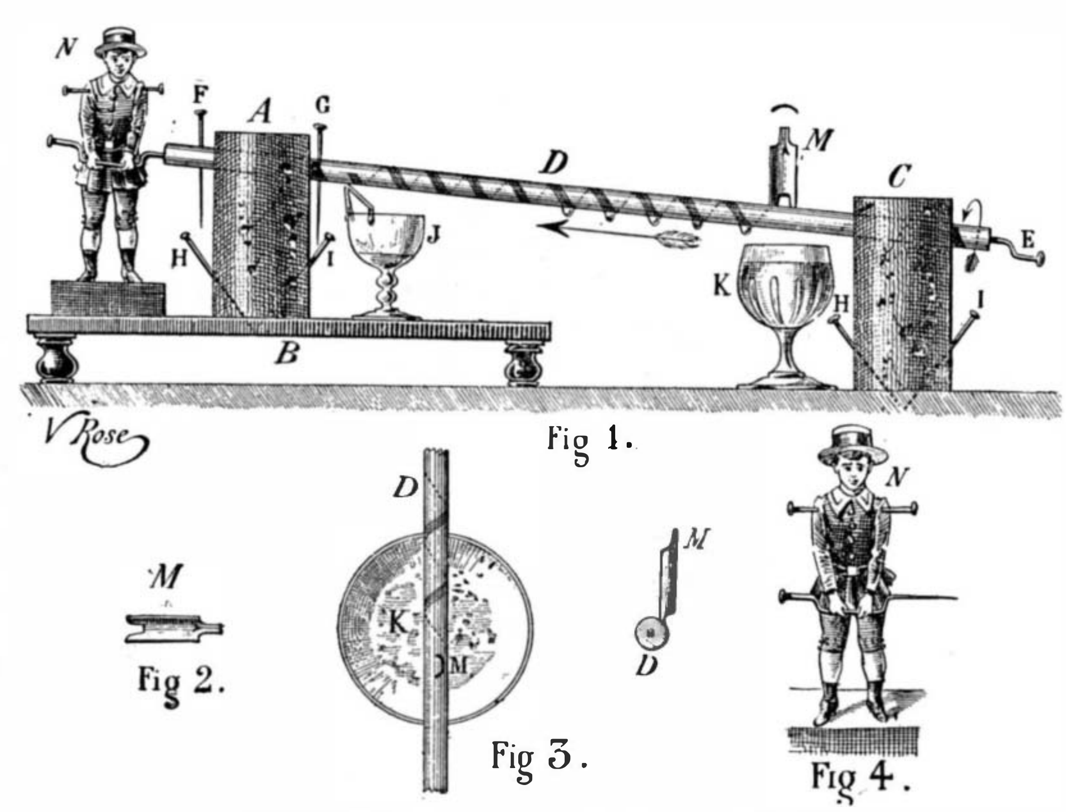
One day the class entered the lecture room and found the professor walking backward and forward with kindled eye and working face, holding a ball in his hand. Presently he stopped and confronted the class and exclaimed, suiting the action to the word:

"I toss this ball into the air; the earth rises up to meet it and the stars bow down to do it reverence!"

Probably no member of the class who heard these words ever forgot their absolutely accurate lesson—that action and reaction are equal; that the apple which falls to the earth at the same time draws the earth to itself in the exact ratio of their relative weight, and disturbs even the course of the planets and stars. Still less could they forget the grandeur and unity so vividly expressed in that brief imagery.—Youth's Companion.

AN ARCHIMEDEAN SCREW CONSTRUCTED FROM SIMPLE MATERIALS.

To perform this simple experiment take a long lead pencil, preferably an unvarnished one, and place it through two pierced corks, as shown in the engraving, one cork being placed higher than the other. The corks are adjusted so that the pencil turns freely. A bent pin, E, serves as a crank. The pencil is pierced by two other pins at F and G, which limit the motion of the pencil. Pins H and I hold the two corks firmly. A vessel of water, as a goblet, is placed at J, and another at K. The elevation of the glass, J, must be greater than that of the glass, K. On J is placed a bent match whose lower end is split to fasten it to the goblet. It is adjusted to almost touch the pencil. Then take a pen and cut it as shown in Fig. 2. This pen is forced into the pencil as shown in Figs. 1 and 3. Now fill the glass, K, with colored water so that the course of the water will be made more apparent. The colored water in K is now to be transferred to J, by the medium of the pencil, D, which acts as an Archimedean screw after the pencil has been scored spirally with a pair of pliers. The spiral begins at the pen, as shown in Fig. 3. Now turn the crank, E, in the direction shown by the curved arrow. The pen dips in the water and on rising carries a drop with it which is at last deposited at the beginning of the spiral. The drop is forced to follow the spiral until it strikes against the match. It then runs down into the glass, J. At each turn of the crank a drop is forced upward. If it is desired to render the experiment more comical, a paper or other kind of doll may be secured to the upper crank at N. For our engravings and description we are indebted to La Science en Famille.



ARCHIMEDEAN SCREW MADE FROM SIMPLE MATERIALS.

A Large Cargo Steamer.

The Hamburg-American Steamship Company has ordered from Messrs. Harland and Wolff, of Belfast, a twin-screw steamer of 20,000 tons burden, i. e., only 3,000 tons less than the Great Eastern. The vessel, when completed, will be the largest in the world. It is to be chiefly employed for freight, but will also be able to accommodate 200 cabin and 1,500 steerage passengers. The order has been given to a British yard, as its tender was more moderate than those of the German shipbuilders, and as the former contracted to deliver the vessel in 10 months, while the latter demanded to be allowed 19 months. The chief German dockyards are, it is stated in explanation, overwhelmed with work at the present moment.

OIL stoves and gas stoves should never be kept burning in a sleeping room, for they are burned in the open air of the room, and, having no connection with a chimney flue, they throw the poisonous carbonic oxide of combustion into the air of the apartment and make it unfit for respiration. Even an oil lamp is dangerous if left burning all night, but an oil stove is worse, because stoves generally feed more flame, consume more of the oxygen and give off more poisonous gas.