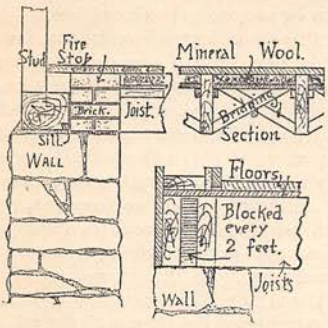
wished under the floor and through the walls by means of air-bricks, the floor may be laid on the regular beams away from the ground surface, and ought to be "deafened" with "mineral wool," which, from its antiseptic and non-inflammable qualities, is



BRICK AND "UNDER-FLOOR" FIRE-STOPS.

a most valuable and at the same time an inexpensive adjunct to good building. Mineral wool is prepared by passing superheated steam through ordinary iron slag, the resulting product being a white, almost weightless, woolly substance which is death to insects or vermin that enter it. Also, it is a non-conductor of heat, cold, and sound, is perfectly fire-proof, and costs only a few cents a square foot about one inch thick. The beams are prepared for the wool by nailing fillets, from one to one and a quarter inches thick, say two inches below their upper surfaces. These fillets support a thin board bottom, on which the mineral wool is laid in a moderately compact mass until it is level with the top of the beams. If packed too tight, it loses many of its valuable properties; however, it should not be merely scattered between the beams. The trifling expense incurred will be repaid a hundred-fold by the comfort and security resulting from its use. As a fire-stop, the value of this material is only beginning to be known. If placed in partitions, behind furring, between floors and under roofs, many fires unaccountable in origin and difficult to get at, would be prevented.

Such, in brief, are some of the points which require attention in constructing a good foundation. With different conditions and novel requirements, special and novel means will be employed by a skillful architect to accomplish the desired ends. These hints are not given in order that the reader may become the architect of his own house, but in the hope that they will enable him to examine intelligently and to appreciate properly prepared plans and specifications for new structures, and in the hope that they may suggest simple means of improving dwellings already constructed.

GEORGE MARTIN HUSS.

THE WORLD'S WORK.

New Steam-boat and Engines.

IN a new steam-boat now building upon the Hudson, an attempt is being made to produce a boat that shall be self-righting, that shall be very fast, and that cannot sink unless entirely torn to pieces. The boat is comparatively small, as it is intended only for an experimental or model boat. If successful, it is intended to build ocean steam-ships upon the same principle. It appears that the inventor's aim is to make a self-righting boat by carrying the sides over the deck in the form of a dome. The side frames are made continuous and meet over the center of the hull, or, in other words, the frames begin at one side of the keel, rise directly at an angle of about forty-five degrees to the water-line, and then curve inward over the deck and back on the same lines to the keel. A section of the hull taken in the center is thus of a wedge shape, with a sharp edge below and rounded top above. This wedge form is preserved through the entire length of the hull. There are no hollow lines in the boat, and the sharp, overhanging bow is intended to part the water near the surface and to form a long, tapering wedge. The widest part of the hull is exactly at the middle, both ends being precisely alike. This is quite different from the flat bottom and straight sides, with comparatively bluff or rounded bows, of the ordinary ocean steam-ship. The boat is intended to be much deeper aft than forward, and the deck will be much higher above water at the bows than at the stern. There will be no houses or raised constructions of any kind on the deck, except the dome-shaped pilot-house, the ventilators, and the smoke-stacks. There will be an open railing around the center of the deck, so that it can be used as a promenade in pleasant weather or whenever the seas do not break over the boat. The object of this unbroken dome-shaped deck is to enable the boat to throw off all waves that break over the bows or sides in rough weather. It is thought that, instead of shipping tons of water and retaining it on deck till it can be drained off, the boat will shed or throw off the water from the long, sharp bows and open deck, and will at once relieve herself of the weight of the water. Waves striking the rounded deck will have no hold on the boat, and their force will thus be spent harmlessly. The sharp wedge-shape and rounded top of the hull, and the fact that even when fully loaded the center of gravity will be below the water-line, makes the model self-righting. From experiments with a small model, this claim of the inventor seems to be clearly proved. In laying out the boat, only the spar deck will be used for passengers, the main deck and all below being intended for cargo, coal, and engines. The state-rooms will be arranged along the outside, each room having a port in the side of the boat, while the ceiling will be formed of the curved deck above. The saloons will be the whole width of the ship, and on the spar deck. For lighting the saloons there will be sky-lights in the center, and as these in rough weather may be

covered by the seas that sweep over the deck, they will be very strong, and will be air-tight. To secure ventilation there will be steam-fans, kept in motion at all times, and maintaining a good circulation of air through every part of the boat. For this purpose the fresh air will be taken through wind-sails on the deck, and the exhaust air from the rooms will be turned into the blast used in forcing the boiler fires. No boats are to be carried on deck; the life rafts and boats will be kept in an apartment under the domed deck at the stern, and when they are to be launched, doors will be opened in the deck and the boats launched in the usual way from davits through these doors. The pilot-house will be at the bows, and will be entirely inclosed. It will not rise much above the deck, and will be entered from below.

There will be no masts or sails, as it is intended to depend wholly on the engines for propulsion. In constructing the hull, to secure great strength, three heavy trusses, or "hog frames," are to be placed on the keel, each one rising to the spar deck and securely fastened to the side frames of the boat. The ceiling will be double, and placed diagonally on the frames. In the larger steam-ships, the absence of sailing power will be compensated for by two extra engines and two supplementary screws, that can be employed in case the larger screw is lost or the main engines break down. For this purpose the three shafts will be placed one over the other. The two smaller shafts will be placed above and below the larger or main shaft, and each will have an engine. There will be a two-bladed screw on each shaft, and they will move above and below the main shaft. Behind those two small screws will be a second stern-post supporting the main screw-shaft, and to this will be fastened the large screw generally used in moving the ship. There will be behind this screw a third stern-post, carrying the rudder. On the second stern-post will be two extra rudders, one on each side, and when the smaller screws are not in use these two rudders will be turned forward and shut close against the main stern-post, and will be bolted from the deck above in this position. By this arrangement, the two small screws may be completely shut in out of sight and out of reach. The water will flow past the two rudders to the larger screw, precisely as if the second stern-post formed the real end of the hull. If the larger screw and rudder are broken or lost, or if the engine fails, these supplementary rudders may be unlocked, turned back, and used to steer the steamer, while the two small screws, exposed to the water by the opening of the rudders, may be brought into use to propel the ship. The supplementary engines can be used to handle the cargo, or do other work, when not employed in turning the screws.

The engines and boilers for the main engine are to be of a novel type. The engines will be double compound, that is, there will be two compound engines, each having two cylinders, the high-pressure cylinder being placed within the low-pressure cylinder. The piston of the larger cylinder will be annular shaped, and will have two piston-rods. The action of this style of engine will be easily understood. The steam will be admitted, say, at the top of the high-pressure cylinder, and driving the piston downward. The exhaust steam will escape below, directly into the bottom of the larger cylinder that surrounds the first cylinder, and its expansion will drive the piston upward. In external appearance the engine will resemble a single engine having three piston-rods.

The boilers will be upright, with vertical water-tubes hanging down into the combustion chamber, somewhat like some forms of steam fire-engine boilers. All these tubes will be joined at intervals by horizontal tubes. The steam will be gathered in a larger tube in the center, where the steam will be disengaged from the water and will rise to the upper part, which will make a steam dome in the center of the boiler, and just under the throat of the stack. The boilers are to be very strong, as the engines are to be used under very high pressure and at high speeds. Further details of the construction and behavior of the model boat will be given as soon as she is launched.

Electrical Steering Apparatus.

EXPERIMENTS have been recently made in the use of electricity in steering or guiding steam-ships upon the open sea, and in controlling a light in such a way that the position of the light shall indicate the steamer's course. After the ship's course has been set, the helmsman's duty is simply to watch the compass and to move the wheel whenever the ship in her progress turns to the right or left from the course laid down. To enable the compass to steer the ship automatically, an index or pointer is fixed to the card of the compass in such a way that it may be fastened in any position on the card that may be desired—east, south-east, south, etc. When the course has been decided upon, and the index placed in the right position, the end of the index rests between two metal pins, each of which is part of an electrical circuit. When the movement of the ship out of her course, to the right or left, affects the compass, the card brings the pointer in connection with one of the pins. This closes one circuit, and the current, by the aid of suitable mechanism, controls one cylinder of the steam steering-engine, and this in turn controls the rudder. The ship, obeying the rudder, changes its course, and this in turn affects the position of the compass-card and the index is moved away from the pin, and the circuit is closed and the engine stopped. While such an arrangement of electrical and mechanical apparatus is quite possible, and while experiments with it have been successfully carried out upon at least one steamer, the invention cannot be regarded as one that will enable any ship to dispense with a helmsman or pilot. It might be suggested that, in place of employing the electric current to move the steam steering apparatus, it could be used to strike a gong. The sound of the bell would be a signal that the ship had left her course and required attention. By making the closing of the right-hand or left-hand circuit cause a bell of a different tone to ring, the deviation of the ship to the right or left could be clearly indicated. The circuits could also be extended to the captain's room, so that the ringing of the bells would inform him of the change in the ship's course. If the steering is made entirely automatic, there is danger that too much reliance might be placed on it by the pilot, and he might become careless or negligent at a critical moment, and place the ship in peril. By mak-

ing the apparatus merely ring a bell instead of controlling the steering engine, a watch would be set on the pilot at all times. The ringing of a bell should be the limit of this application of electricity to the compass. If not already patented, this suggestion will be free, and by its announcement here, all persons are debarred from taking an American patent on this application of electricity to a ship's compass. Another invention of somewhat the same character has been recently announced, that seeks, by means of a signal light, to give an indication in the night of a ship's course. A powerful light of some kind—an electric light being preferred by the inventor—is arranged near the bows in such a manner as to throw a beam of light directly ahead. Upon the ship's wheel are placed two electrical contacts, in such a position that while the ship is steered directly ahead no connection is made with either contact, precisely as the index on the compass-card is used in the first invention described. When the wheel is moved and the course changed, connection is made by the wheel with one of these points, and the current causes a reflector behind the lamp to move and deflect the beam of light to the right or left. This movement of the beam of light seen by approaching vessels indicates the change in the ship's course and the direction of the change. After the course has been changed and the vessel has fairly started in the new direction, the movement of the wheel opens the circuit and the reflector automatically returns to its first position of straight ahead. Approaching vessels see both the intended or changing course of the approaching ship by the movement of the beam of light, and are at the same time informed if the new course is maintained. A device resembling the one already suggested also rings a bell in the captain's room each time the reflector of the lamp is turned. A shutter, or shade, is also provided for preventing deceptive reflections on the water whenever an electric light is used with this apparatus. The movement of the reflector in the lamp, as first designed by the inventor, was to be performed by hand independently of the wheel, but the electrical arrangement is evidently better. This invention will not be patented, and is hereby given freely to the public.

White Slates.

SCHOOL slates are now being made of white card-board, covered with a film formed by the action of sulphuric acid on tissue paper. This covering is probably a modification of celluloid. The slates can be used with a lead-pencil or with ink, and, to remove the marks, the slate is washed with cold water. A special ink is also prepared for use with the white slates. It is composed of harmless mineral coloring matter mixed with dextrine, and is aptly called "children's ink." It can be removed from the slate with a wet sponge. Another form of slate is made by coating the white card-board with water-glass. It may be used with lead-pencils or colored crayons. When the surface becomes soiled the water-glass may be rubbed off with sand-paper, and a new film may be put on with a sponge or brush dipped in water-glass. The ordinary black slate and white pencil is well enough for mere writing and outlines, but for pictures requiring shading it misleads the child by presenting the picture with the lights reversed, or in a negative position. A white slate and black pencil is, therefore, better, as following nature in the matter of shading and giving pictures that are positives. The new slates have not yet been introduced in this country, but it would seem that they might prove of value in our schools. Perhaps a celluloid slate, if properly made, would be equally good, and might be sold at a low price.

New Tripod.

A NOVEL form of portable tripod for holding field cameras has been introduced which presents some features that may make the invention of value in a number of ways. It consists of three wooden legs, each eighty centimeters long, and hinged at the top to a small brass plate. This hinge is formed by a brass pin that passes through the top of the wooden rod or leg and gives it a free motion in two directions, while the frame of the hinge prevents any lateral motion of the rod. The screw for holding the camera on top of the tripod is fixed in the brass plate, and the camera is screwed down upon it by turning it round. This device saves the trouble of carrying a separate screw for this purpose. On the outer side of each rod is a T-shaped channel, cut in the wood the whole length of the rod. Three more rods of the same length are arranged with a projection on one side that will fit into the T-slots on the rods. These six pieces, when put together, one rod sliding on another, make a tripod that may be extended to a full length of one hundred and sixty centimeters (five feet three inches), or may be shut up to half the length. Brass rings hold the two parts of each leg together, and set-screws are used to keep each leg extended in any position desired. This arrangement enables the operator to adjust the tripod to any convenient height and to any uneven surface quickly and securely. When shut up, the tripod makes a small, light bundle, easily carried in the hand or trunk. By fixing a table to the top of the tripod, it may be used as a drawing-table for sketching out-of-doors, or for a dressing or dining table in camping out. It may also be used, by placing wooden leaves at the top, as a rack for holding sheet-music for bands. A larger tripod of wood or metal might also be used as a portable frame-work for a small field-tent, by covering the tripod with canvas or tarpaulin.

Improvement in Stoves.

THE tendency in the manufacture of all kinds of apparatus for burning fuel, whether it is merely to obtain heat for warming a room or in making steam, is toward a greatly increased radiating surface. The aim is to increase the radiating pipes, flues, or other parts of the stoves, so that as much heat as possible may be absorbed and given off to the air or water, instead of being thrown away up the chimney. The latest experiments in this direction have been made with a stove that was suggested by the ordinary surface condenser for steam. In this familiar apparatus, the exhaust steam from the engine is made to enter a chamber filled with a great number of small pipes. Through these pipes flows cold water, and the steam meets a large surface of the cold pipes and is condensed quickly, hence the name "surface condenser." In the