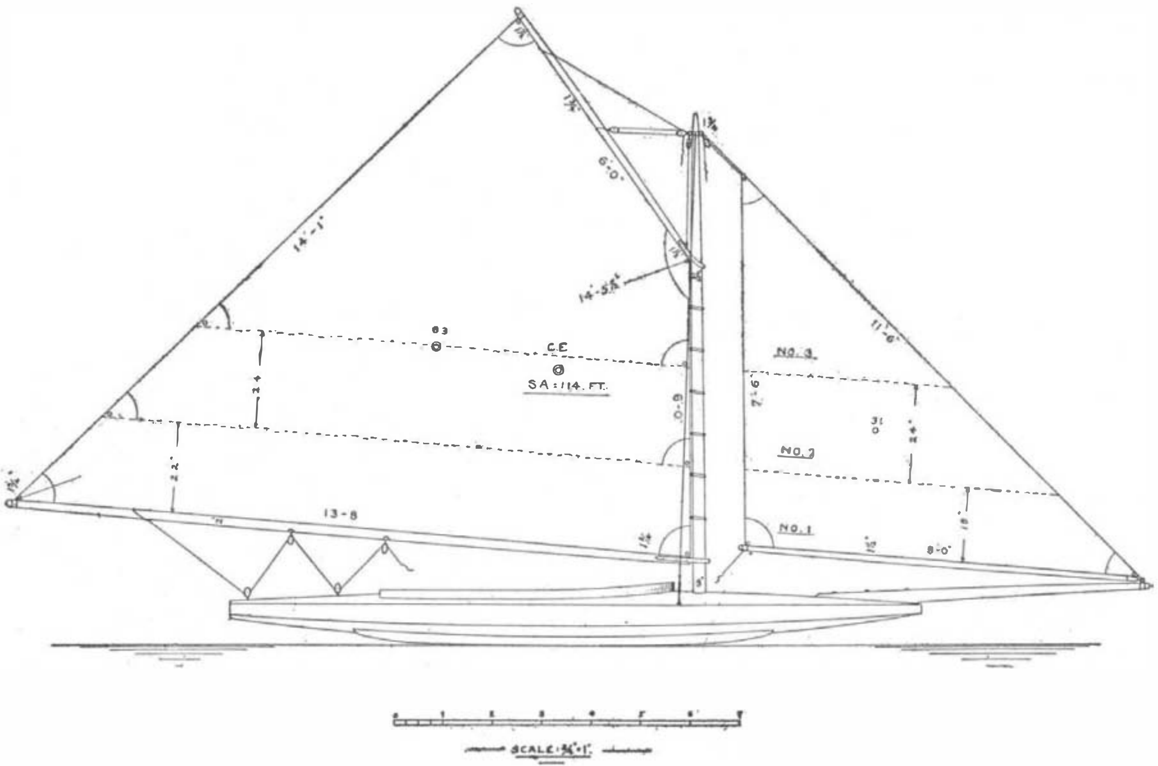
## HOW TO BUILD A SCOOTER.

BY FREDERICK K. LORD.

The rudderless amphibious ice yacht called the "scooter" is a product of the sailors of the Great South Bay, Long Island. In former years, when the bay would freeze over solid, the regular ice yacht was a very familiar sight. Recently, however, the mild winters produced so little ice fit or safe for sailing that the sport almost died out. The conditions caused by these winters have been met successfully in that new and ingenious type of ice boat, the scooter. Roughly, the scooter is a Barnegat "sneak box" mounted on runners.

This craft will sail in the water as well as on ice, consequently the sailor does not fear soft ice or air-holes, but sails merrily along taking ice or water, whichever happens to be in his course. They are sailed without a rudder by simply trimming the sails and shifting position in the boat so that the point of contact of the rockered runner upon the ice is just under the center of effort of the sails. A single occupant sailing the boat sits about amidships, and holding the jib sheet in his hand pulls in or slacks out until the boat heads just as desired. When two are in the boat they spread their weight about an equal distance from the center; one shifts as required, while the other tends the sails.

A pole with a spike and a hoe is carried, a slight scratch of the former being sufficient to get the boat on her course, while the latter is used to pull the boat out of the water in case the wind dies out. An oar is also carried to steer while in the water, but this is not necessary when crossing an air-hole less than forty or fifty feet, as the speed of the scooter, with a good wind, is sufficient to carry her across and out on the ice again in jig time. This ability to pop in and out of the water constitutes a novel sensation and makes scootering a very fascinating sport.



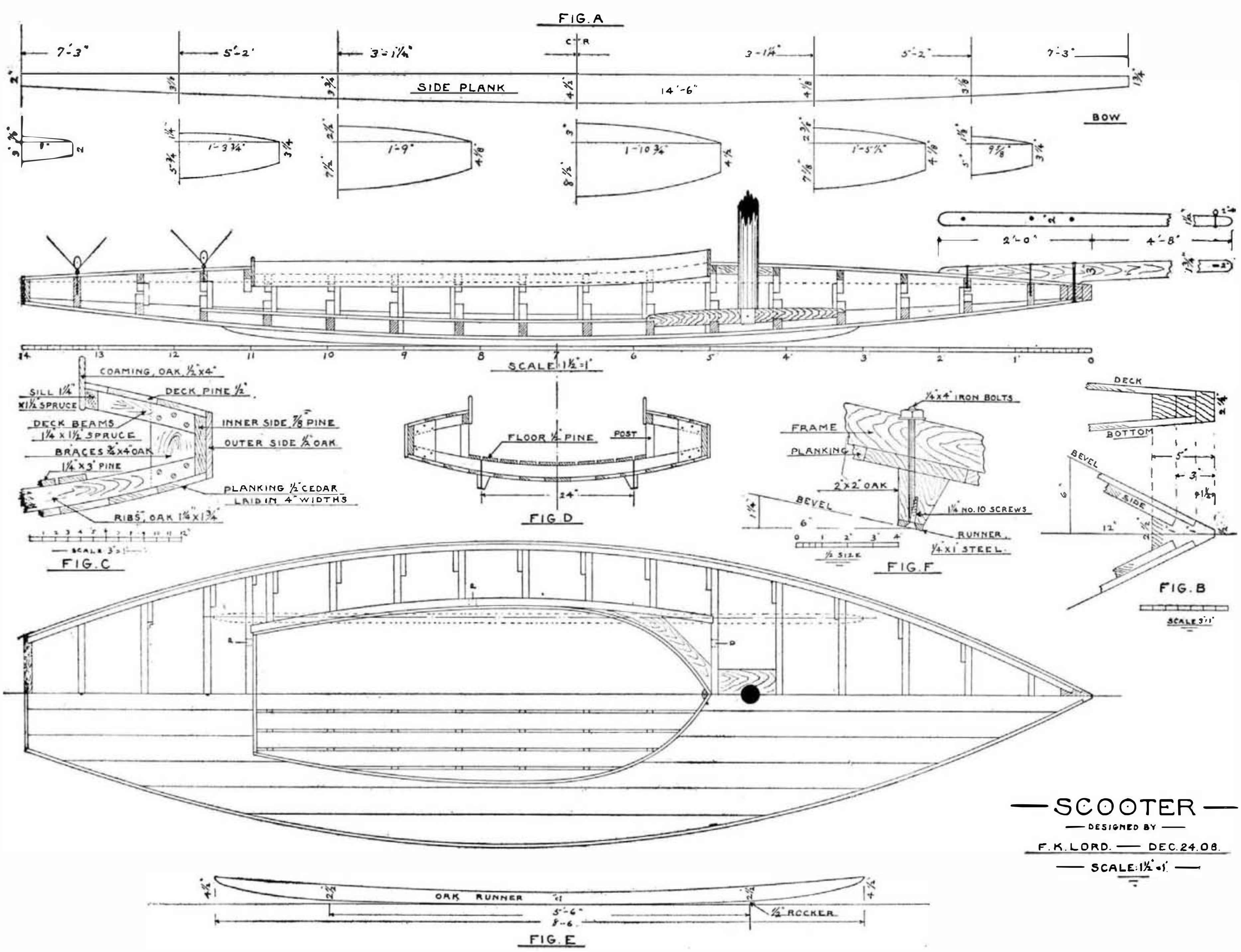

SAIL PLAN OF THE SCOOTER.

Notwithstanding appearances to the contrary, they are a very speedy little craft and can make 30 miles an hour in a good steady breeze, running up to over 50 in a heavy puff.

The cost of a scooter is between $100 and $125, but they could be built at home by an amateur for about $50.

The scooter shown in the accompanying plans is 14 feet in length and 4 feet beam. The sail area may be from 80 to 130 square feet, according to speed required and local weather conditions. The sail area in the plan is 114 feet and should make a good average rig. The construction is fairly heavy, making a serviceable boat. For pure racing it could be lightened considerably. Study the plans carefully before beginning work.

The first step in constructing the boat is getting out the side planks and springing them around "molds," which are simply temporary forms, to hold the elemental construction in place until it can stand alone and keep the boat in shape. The inner side planks are of ⅞-inch white pine and of the dimensions shown in Fig. *A*. The molds are next made, of ⅞-inch pine, and dimensioned according to Fig. *A*. The curves are arcs of circles and care should be taken to get the sides perfectly plumb, or else they will throw a twist in the side planks, and the upper edges will not lie in the same plane. The transom is ⅞-inch oak and the stem of oak, size as shown in Fig. *B*. It has a double rabbet. The inner is for inside plank and the other for the outer or covering plank. Screw the side planks to the stem and spring them around the molds and screw to transom. The molds are spaced 2, 4, 7, 10, and 12 feet from the stem head. This gives the rough form. Put the boat upside down on three saw horses and spring on the oak keel, which is 4 inches wide and ⅝ inch thick. This makes a fair line for the frames, which are next put in. Make them of oak 1¼ inch thick and 1½ inch deep, increased to about 2 inches along the center line of bottom in cockpit. They are spaced 10 inches on cen-




CONSTRUCTION PLAN OF THE SCOOTER.

ters. Beginning, start the spacing 5 feet from the bow and 3 feet from the stern in order to come right for the cockpit opening. Then turn the boat over and put in the deck beams by the same method. They are 1¼ x 1½-inch spruce spaced 10 inches and fastened to the side and ribs by oak braces ¾ x 4 inches, securely screwed together. Fig. *C* shows this clearly. A sill or stringer of 1¼ x 1½-inch spruce is run along cockpit side and a backing piece at the forward end is put in to take the curve of cockpit coaming. Posts are put in at the places marked *P*, to bind the deck and bottom together. The mast step is now put in. It is of oak, 2 inches deep and 5 inches wide, jogged over and ½ inch into four frames and securely fastened thereto. A backing piece of oak 1¼ x 8 inches wide is also put in between two deck beams to take the strain of the mast. Now turn the boat bottom up and proceed to plank her. The planking is of white cedar ½ inch thick laid in straight strips 4 inches wide. It is fastened to the frames with either brass screws or 1½-inch galvanized nails countersunk and puttied. The bottom is then carefully planed and sandpapered smooth, the seams calked with two threads of candle wicking and the whole given three coats of good lead paint. The runners are next put on, and with these be very careful. See that they are absolutely parallel and of the correct rocker and bevel. The distance between centers of runners should be 2 feet. They are of oak and shaped as shown in Figs. *E* and *F*. The runner commences 3 feet from the bow and runs aft 8½ feet. It is 2 inches deep amidships and reaches up at the ends. The middle 6 feet of the runner should have a rocker which is the arc of a circle with ½-inch curve in 6 feet. Referring to Fig. *F*, the outer edge of the oak stands plumb and is 2 inches wide at planking, tapering to 1 inch at face. The runner plank is fastened on with ¼ x 4-inch iron bolts set up on top of every frame. Carefully face up the runners by laying a straight edge across them both and fitting a bevel board. The bevel of the runners is 1¼ inch in 6 inches or about 11½ deg. Put on the shoes, which are of ¼ x 1-inch steel and 7 feet long. Bend them at ends so there will be no undue strain upon the screws, which are 1¼ inch, No. 10 size. The screws should be countersunk until they are flush with runners, and their slots lie fore and aft. The steel shoe should be very smooth, with sharp, square edges.

Now turn the boat right side up and start finishing up the deck and cockpit. An oak partner piece ½ x 5 inches is laid on center line of deck. A 3-inch hole is bored for the mast 4½ feet from the bow. The bowsprit is next put in. This is of spruce; of the dimensions shown, and fastened with three bolts as indicated in the plan.

The deck is now laid. This is of ½-inch white pine or cedar laid in about 4-inch strips fastened and treated same as the bottom. Next the cockpit coaming is sprung in. It is of oak scant ½ inch thick, 4 inches wide, and stands 2 inches above deck. Fasten to stringer with 1½-inch No. 10 brass screws countersunk and plugged with oak plugs. Lay a light flooring of pine in the cockpit in 2½-inch strips ½ inch apart.

Now plane up the edges of the bottom and deck flush with the inner side plank and then put on the outer side plank. This is of ½-inch oak and comes flush with the deck and bottom. It is also carried around the transom, thus covering up the raw edges of the ends.

Now for the rig. All spars should be of straight-grained spruce. Mast 10½ feet from step to truck, 9 feet 8 inches above deck, and 9 feet 3 inches from deck to center of band at top. To be 1¾-inch at head, 2½ inches at gaff, and 3 inches at deck. Make all the spars with a swell or barrel taper. Boom 14 feet, 1¾ inch at ends, 2 inches along middle. Gaff 6 feet 2 inches, 1½ inch at ends, 1¾ inch in center. Jibboom 8 feet 2 inches, and about 1½ inch tapering to 1¼ inch at ends. Fit wooden jaws to gaff and boom and use six mast hoops. A sliding rig is neater but would cost a little more. Use a single ¼-inch wire shroud with turnbuckles, the chain plate of steel ¼ x 1 x 7 inches long, to be fastened with rivets through the side planks. Eight small ⅝-inch bronze yacht blocks are needed and can be obtained from a yacht chandler. Rigging to be of ⅜-inch rope. The sails should be of about No. 4 yacht duck. The mainsail to be fitted for two reefs, the first taking off 22 inches and the second 24 inches. Have a permanent forestay and put the jib on with snap hooks. For reefing, get two extra jibs as shown in sail plan and set them with a small sprit, if necessary.

The boat may be finished all over with three coats of spar varnish or painted white with buff-colored decks and varnished cockpit and coaming, which makes a very good finish.

### A CEMENT GRINDSTONE.

A grindstone made from one-half best Portland cement and one-half silica sand may be used in grinding glass to take the place of the wheel caster. The materials must be thoroughly mixed and evenly tamped. The advantage of this stone is that when properly made there will be no hard and soft spots, and it will grind glass without scratching. The cost is about ten per cent of that of the common grindstone. The Onward Manufacturing Company, of Menasha, Wis., to whom we are indebted for this information, has been using cement grindstones successfully for a year.

### FURTHER DETAILS OF THE HOME-MADE VACUUM CLEANER.

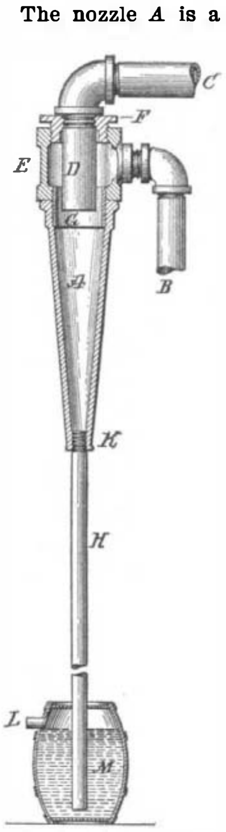
BY W. J. C.

The following particulars regarding the construction of the vacuum cleaner described in the issue of November 7 will answer some of the questions received regarding the apparatus:

The pressure of water in the pipe *B* has no effect on the amount of vacuum obtainable. This depends on the column of water in the pipe *H*, which, as stated, must be at least 34 feet from *K* to *L*. This distance corresponds to the height of the barometer, or in other words, to the weight of the atmosphere. The best and most economical method of controlling the water supply is to place a tank, similar to the ordinary bathroom tank, above the apparatus and control the amount of water through a valve. The tank would get its supply from the house mains through a float-operated valve.

The apparatus described in the previous issue was meant to supply a small private dwelling where not more than one or two openings would be in use simultaneously, and if required for a larger installation must be increased in size.

The nozzle *A* is a standard size nozzle and can be used if desired for larger installations by changing the bushing *F* to correspond to the increased size of the pipe *C* and using the proper opening at *B*. The pipe *H* when increased must be attached to the nozzle by means of a coupling which in turn is screwed on the outside of the nozzle, the latter being turned and threaded to suit. The nozzle described has a ¾-inch hole at this point and can stand being bored to 1 inch, as the metal is pretty heavy.




THE HOME-MADE VACUUM CLEANER.

The reservoir mentioned is not absolutely necessary. Most of the dust is carried over and goes down with the water and only the larger particles will drop in the reservoir. If the latter is omitted, an opening must be left in the lowest part of the pipe *C* through which this dust is removed.

The efficiency of the apparatus depends in the first place on the joints in all pipes being absolutely airtight. If pipe with good threads, fitting tightly, is used and made up with red lead in a proper manner, airtight joints may be expected. If it is necessary to make a bend in the pipe *H* at a point 10 feet below *K*, 45-degree ells should be used to make it as gradual as possible. In figuring out the size of the pipe necessary for any size machine the starting point must be the sum of the areas of openings in use. This will give the area of the pipe *C*. The seal pot *M* can if desired be dispensed with if the pipe *H* is connected to the waste water connection. The dimensions of all pipes are inside. This holds good in all cases up to 14 inches when outside diameter is usually given.

The quantity of water will depend of course on the size of the machine. The following formula will be found accurate enough for all purposes:

$$g = 28 \sqrt{d^5}$$

$g$ = gallons of water per minute and $d$ = diameter of pipe *H* in inches. The amount of vacuum necessary for ordinary cleaning purposes should not be less than 15 inches, but for light work such as walls, hardwood floors, etc., satisfactory results can be obtained with 8 to 10 inches. The higher figures are necessary where heavy rugs, carpets, and similar articles are to be cleaned.

The cleaning implements are far too numerous in design to describe and can be procured on the market much cheaper than they can be made at home.

As regards mechanical efficiency this apparatus will create sufficient vacuum to do all necessary cleaning, but it has a fixed volume, therefore its volumetric efficiency is less. The apparatus is intended not to supply a cleaning system for hotels, clubs, churches, and buildings of such a character, but is thoroughly capable of cleaning private dwellings. In a pump plant, for instance, its cleaning power can be increased by running the pump at a greater speed and thereby taking care of a larger number of openings, of course up to a certain point. In the water system nothing is gained by increasing the flow of water in the pipe *B*. Therefore if the capacity of this apparatus is to be increased the only method of doing so is to increase the size of the pipe *C* and all other fittings accordingly. For large installations this would mean a considerable increase and therefore render the apparatus impracticable.

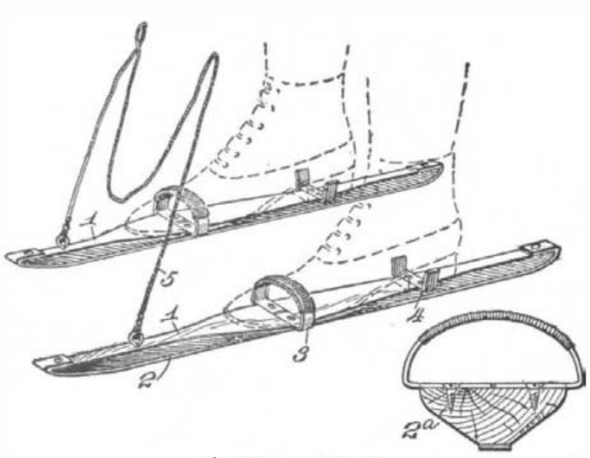
### COASTING SKATES.

BY L. GESSFORD HANDY.

There are more ways than one of enjoying an icy hill. The accompanying illustrations show a pair of coasting skates. These skates can be well made by any amateur at little or no expense.

The base 1 is of hard wood and is 20 inches long. It is 3 inches wide at the middle, and tapers to 1 inch at either end. It is 1¼ inch thick and dressed off on the under side, as clearly shown at 2*a*, leaving a flat section ⅝ inch wide along the center line. The front end is curved upward, and a strap of iron or thin steel 2 is fitted to the flat section and serves as a runner. The ends of the runner are turned over upon the top of the base and held by screws. No screws are necessary in the bottom. In use the ball of the foot rests at a point approximately midway in the length of the skate. A stiff strap, 3, preferably of metal and designed to fit over the toe of the shoe, is screwed or otherwise secured to the base at this point. This strap may be wrapped with padding if desired, but if properly shaped the padding is not necessary. A U-shaped iron as 4 is fixed to the base as shown, so as to prevent sidewise movement of the heel.

It will be appreciated that these skates may be



COASTING SKATES.

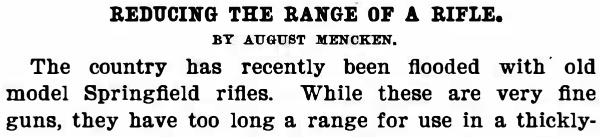
readily removed from the feet after a coast down hill, and as readily readjusted at the top of the hill. To facilitate the use of the skates, a guide rope 5 is used. The opposite ends of this rope are secured to eyes, one in each of the skates at the forward end. When coasting, the rope is grasped in one or both hands, and held taut from the eyes.

### REDUCING THE RANGE OF A RIFLE.

BY AUGUST MENCKEN.

The country has recently been flooded with old model Springfield rifles. While these are very fine guns, they have too long a range for use in a thickly-populated region. As the writer could not use a rifle that carried over two hundred yards, he reduced the range by the following method:

Taking an empty regulation shell, 0.45 caliber, the




REDUCING THE RANGE OF A RIFLE.

head was bored out so that a 0.44 caliber revolver cartridge would fit snug. Then the head of the regulation shell was turned out, so that the head of the revolver cartridge would be flush, as shown in accompanying sketch. The writer is using these cartridges up to a hundred yards with good results.

### THE NEXT ISSUE OF HANDY MAN'S WORKSHOP.

A special automobile number of the SCIENTIFIC AMERICAN will be published next week and will contain a large Handy Man's Workshop Department.

How to convert a buggy into an automobile and how to build a portable automobile house will be explained in detail. In addition to this there will be many valuable hints on emergency repairs.

We have not been able to find room, in the present number, for the promised article on the hand-operated motor sled, but expect to publish it in the first issue of Handy Man's Workshop following the automobile number.