The Editor of Handy Man's Workshop will be glad to receive any hints for this department and pay for them if available.

TWO WAYS OF IMPROVING A SLED.

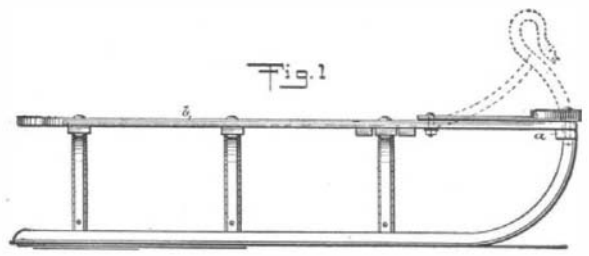
BY J. A. BERGSTROM.

The accompanying illustrations show how an ordinary sled may be converted into a dirigible sled, and how it may be combined with a boy's hand car to make a motor sled.

THE DIRIGIBLE SLED.

Unlike the ordinary sled, that is steered by digging in the heels, or dragging the feet in the snow, from one side to the other, thereby checking the speed of the sled, the sled here shown has flexible runners, which may be curved to one side or the other by a steering bar, causing the runners to follow smoothly in the curving tracks. The sled should be built low and narrow, and the runners should extend well forward and rearward, which will materially add to the speed of the sled when coasting down a hill.

Fig. 1 shows an ordinary girl's sled, which is made into a flexible or dirigible sled. The top part of the runners, shown in dotted lines, is cut off on a level with the seat and the ends are fastened together with a transverse bar *a*, made of iron or wood. From this bar, and fastened thereto, are bars *b*, one on each side of the seat and parallel therewith. These bars



A DIRIGIBLE SLED.

are fastened to all the standards of the sled. On the front bar is fastened a steering lever *c*, which is fulcrumed by the rearwardly-extending arms *d* to the front part of the seat of the sled. It is now evident that when the operator wishes to steer to the right, he presses the lever with the left foot, and *vice versa*. As the steering lever is thus moved, it will be noticed that it moves the transverse bar to one side or the other, thereby curving the runners in the same direction, which will then follow smoothly in the curved tracks.

It will be noticed from the plan view, Fig. 2, that the end standard is bolted to the seat of the sled, and that the other two standards are not, so as to allow a free movement of the runners when operated upon by the steering lever.

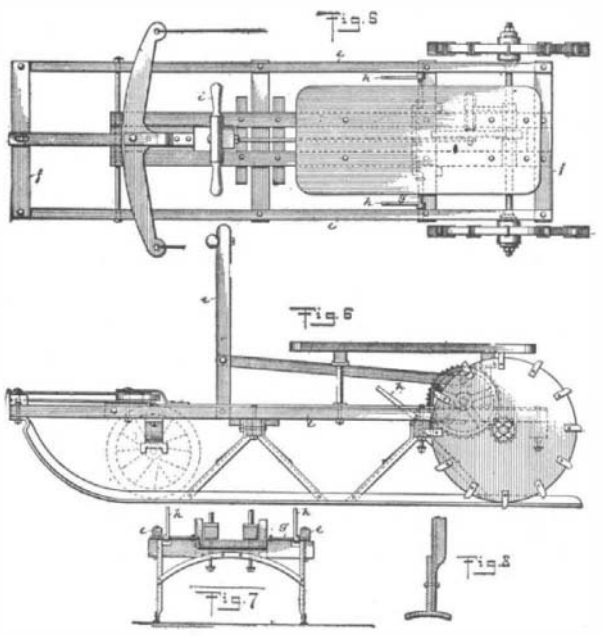
Two pieces of wood should be fastened under the seat, a short distance each side of the forward standard, to allow for side movement.

The old iron shoes on the wood runners should be taken off and curved or hollowed as shown in Fig. 4, or may be replaced by new ones. By referring to Fig. 12, it will be seen how this curving of the shoe may be accomplished. A shallow groove is made in a block of hard wood, over which the thin steel shoe is placed. A short piece of round iron is laid on the shoe top; the latter is then hammered into the groove, assuming the hollowed or concave form.

Rivet the shoe on the runner, which should be hollowed out a little to fit. The object of the concave form of runners is the same as that of hollow ground skates. The outside edges have a tendency to dig into the ice or snow, and keep the sled in its course, or in "the same rut"; but when thrown out of line with the steering lever, they seem to take hold of the snow and change the course of the sled.

THE HAND MOTOR SLED.

The motor sled, which should appeal to almost any boy, is made by combining a flexible sled with an ordinary hand car, such as sold by toy dealers. The rear wheels are taken off and substituted for a pair of traction wheels, which may be thrown in or out of com-



THE HAND-MOTOR SLED.

mission by a suitable lever, within the reach of the operator.

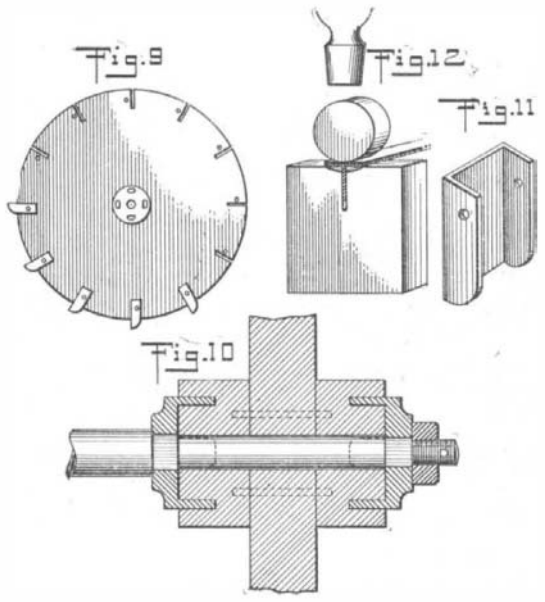
The sled may be of any steerable kind now on the market, or it can easily be built by almost any amateur, to suit the hand car to be used. The material may be bought from almost any hardware dealer. The runners are made for an ordinary size sled, from ½-inch by ⅝-inch T iron or steel, or they may be made from two angle irons riveted together. The base of the T should be bent or curved downward, so as to make it slightly dished out in the center. This can be done as before described. See Fig. 12.

The runners are now ready to be bent to suit the height of the sled. There may be two or more standards, according to the length of the sled. They can be made of angle iron, riveted to the runners, and fastened to transverse bars of wood at the top, and braced together if found necessary, so as to make them stiff.

To these standards are fastened, one on each side, and directly on top of each respective runner, wooden rails *e*. These rails are fastened together with transverse bars *f*, at the front and rear ends. Directly over the rear standard, and journaled into the outside rails *e*, is a crankshaft *g*, provided with suitable handles *h*. At the front end, and directly over the front axle, the steering lever is fulcrumed, and two extending arms fastened thereto, which are connected with the front bar *f* by a bolt passing through slots in the arms.

The sled is now ready to receive the hand car, which is placed in the center of same. The front end is fastened to the outside rails *e* with a long bolt, forming a hinge for the car.

Long bolts with nuts at their lower ends are now passed through the frame of the car into the rear transverse bar, also into the rear standard. Two pieces of wood may be nailed or screwed to the rear



DETAILS OF THE MOTOR SLED.

standard, forming a guide for the up-and-down movement of the car.

It will now be seen that by moving the handle *h* to the rear, the crank *g* will lift the rear end of the hand car relatively to the sled, thereby elevating the traction-wheels from contact with the ice or snow. It will also be seen that the handle *h* will rest on top of the standard, and that the crank *g* has passed the center of the shaft, and is consequently locked in this position.

The traction wheels are made of hard wood. First cut out a disk (see Fig. 9) about the same size as the wheels of the car. Then cut a number of radial slits in the periphery of same, into which are inserted small galvanized-iron buckets, shown in Fig. 11, and riveted thereto. Small round disks are now fastened to either side of the large disk, so as to make the proper length of the hub. Into these small disks are made four elongated recesses, to fit the four outward-extending prongs of the fixed collars on the shaft; and when screwed together with the nut on the outer end thereof, will keep the large disk fast on the shaft, and will rotate with same. See Fig. 10.

The sled may be propelled by operating the handle *h*, and steered by means of the foot-lever, like the sled described above.

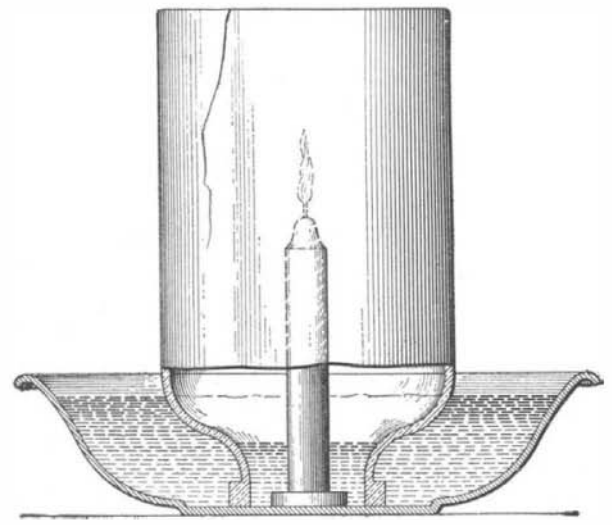
It will be possible to propel the sled up a hill, or go a round-about way to get there. Then by throwing the lever *h*, the traction wheels may be elevated above the runners, so they will not interfere with coasting down hill.

MENDING A CRACKED BOTTLE.

BY W. J. C.

A very neat way to mend a piece of cracked glassware with sodium silicate or water-glass came to my notice some weeks ago. A cut glass decanter which the owner valued very highly had a bad crack running irregularly around the bottom and partly up the side. In addition to preventing its use, it rendered it unsightly.

To remove all appearance of the crack, the decanter was warmed slowly and then sealed with its own ground stopper. The water-glass was then applied with a broad brush on the outside of the crack, and as the air cooled inside the external pressure forced it



MENDING A CRACKED BOTTLE.

into the crack, which completely disappeared and was rendered perfectly water tight to cold water at least.

Since seeing the above I have tried the same operation with success on a wide-mouthed jar, but obtained a much better vacuum and therefore better results without heating the jar.

I took a deep basin, and in the center arranged a candle as shown in cut. The basin was then filled with water and the cracked jar inverted over the lighted candle; as the air in the jar was consumed by the candle, it was slowly lowered into the water which effectively sealed it. The water-glass was then applied as in the previous operation and the whole left to harden. The water-glass takes six to eight hours to set and then the outside of the bottle or jar can be washed with a cloth dipped in hot water to remove all superfluous water glass.

A HYDRAULIC TEST FOR THE BOILER.

BY A. C. LAURENCE.

Some time ago my boiler engine was frozen up in a cold snap, and I wished to give my boiler a hydraulic test before steaming up again, to see if it was fit for business. I had no force pump or apparatus of any kind, yet I tested the boiler to the desired pressure, 100 pounds. I have had conversations with engineers since then, and not one of them could tell me how to make such a test without any apparatus, so I believe the idea may be useful for Handy Man's Workshop. I filled the boiler completely with water, leaving no air space whatever, then built a small fire under the boiler, and as the cold water warmed up and expanded, I watched the pressure gage rise until it reached the desired testing pressure, when I opened one of the try cocks, allowing a small quantity of water to escape and relieve the pressure. Having found things O. K., I drained water from the boiler to the proper level and proceeded to get up steam.