ing. The purpose of this will be evident, as by reason of the rivet-ends undersetting in the hole, the possibility of the rivet working out is almost nil. The drill should by preference be a diamond, mounted up as in Fig. 2, or in a somewhat similar manner. The diamond being soldered into a metal tube, slightly coned in shape, as at D. The top part A is a flexible spring, fitted with a drilled collar. The screw B is free to move, when acted upon by socket C, by moving which up and down, the part B is revolved, together with the drill. A common form of drill is represented in Fig. 3. This, I think, is known by the name "Archimedean." It is not so useful a form of drill as the other, because both hands are needed to work it, unless the handle is held against the breast. With the other form of drill one hand is at liberty to guide the drill and hold the article. In drilling, a finger should be placed at the spot operated upon, for the purpose of feeling when the drill-point is nearly through. Its approach will be known by a perceptible warmth and vibration (If I may so term it). It should not be allowed to come through or even to chip the enamel. Although a diamond drill is almost a necessity for this kind of work, it may be done by a properly shaped and tempered steel drill, when assisted by a little spirit of turps as a lubricant. The cutting edges of the drill should slope in opposite directions, two facets only, as in Fig. 4, representing two sized drills. In starting the holes the drill may be guided by the fingers, or a piece of metal with a hole in may be held down in position as a guide for it. The wire used for riveting should be of brass or copper, well tempered and accurately shaped and fitted. The rivets should have a little spring, so as to catch under the holes on the inner sides, as at B, Figs. 1 and 5. The rivet faces should be filed flat, so as to set close. For cement, use a little white lead or well made putty, and force it firmly into the cavity, after the rivet is set in its place.

It will be found of great advantage in repairing a compound breakage and materially add to its strength if a little transparent cement, made of acetic acid and isinglass, is applied to the edges of the china before the final job of riveting; or, if time will allow, the broken parts should be firmly attached to each other an hour or two previously. The parts should all be perfectly clean, and be slightly warmed before applying the cement. If they are not heated, the cement gets cooled, and, instead of adhering, forms a hard, loose skin-like substance, which prevents a close fit, and is perfectly useless in its place.

The parts can be effectually and safely heated by immersing them in hot water, and wiping dry on the removal. The job should be done quickly, and the parts brought together immediately the hot cement has been applied, as it sets quickly. All that exudes can be removed when cold. Fig. 6 shows an article much broken which has been strongly mended and made thoroughly useful again, with a comparatively small number of rivets. Fig. 7 shows a very handy form of bow drill, the handle of which contains the drills not in use, the end of it unscrewing. The socket of the drill is keyed into the handle, and revolves with the bow and wheel. For very large articles this form is exceedingly useful, as it can be held in any position. Glass goods are mended in a precisely similar way to china, extra care only being needed on account of the brittleness and thinness of the articles generally. Stems of wine glasses may easily be joined together by melting the broken ends in a clear gas or other flame, and pressing together when perfectly plastic. The blowpipe will assist in getting the heat up. Glass is such a slow conductor of heat that no fear of burning the fingers need be entertained, unless the worker is an immoderate time at the job, so that the parts can be held by the fingers without danger to them. When mending glass goods in this way, the surrounding air should be kept perfectly still, and all possibility of a sudden draught of cold air falling upon the heated glass guarded against. A draught of cold air upon the junction would prove fatal to it. The stem can be set upright while the glass is soft. Let all cool gradually.—*Eng. Mechanic.*

IMPROVED BOAT-LOWERING APPARATUS.

The necessity of an efficient boat-lowering apparatus must have been impressed upon any one who has from time to time read of marine disasters, in which the loss of life has been doubled by the imperfection or disarrangement of the boat lowering apparatus. In fact, it may be said that too frequently the sole cause of loss in such cases is the lack of proper appliances of this character.

We give below an engraving of a new apparatus for lowering and raising boats, recently patented in this country, also in Canada, England, France and Germany, by Mr. R. H. Earle, of St. Johns, Newfoundland. In the engraving Fig. 1 shows the boats being lowered. Fig. 2 shows the davit in use as a life ladder resting against the ship's side. Fig. 3 shows the davit with the cradle detached, containing a man who is in the act of picking up a child. The davit is shown lifting a boat full of people in Fig. 4. Fig. 5 shows the davit acting as a spar keeping the boat from the ship's side, and taking persons on board during a storm; and Fig. 6 shows the appliance in use as an ordinary davit.

This apparatus, while very simple in its construction and easily operated, performing all the functions of the ordinary davits, is at the same time efficient in so many other ways as to place it at the head of devices of its class.

It is a very much needed invention, and its adoption will undoubtedly be the means of saving thousands of lives not only at sea but wherever boats are used. The inventor informs us that expert sea captains who have examined this appliance assert that every boat on a ship fitted with this device could be filled with passengers and lowered within from one to two minutes from the time of the occurrence of the accident.

This apparatus is not only wonderfully rapid in its operation, but it guarantees absolute safety to the passengers. After launching the ordinary ship's boat the life rafts may be lowered, or if the ship is so fortunate as to be equipped with the well known collapsible boats invented by E. L. Berthon, M.A., of England, these boats could be readily placed in the cradle, filled with passengers, and quickly launched, thereby saving many lives that would otherwise be lost.

The preparations necessary to lower the boat with this apparatus are exceedingly simple. When an accident occurs the covering attached to the boat is thrown off, when the passengers take their seat, and all is ready. Then the levers which hold the boat and the lowering appliance rigidly to the deck are instantly unloosed, and the boat is immediately lowered to the water. Clearing the decks thus quickly quells excitement and gives assurance of safety to passengers, enabling the officers of the ship to maintain order and discipline, a thing of rare occurrence when the ordinary and tardy means of boat lowering are employed.

The dashing of the boats against the ship's side, lowering one end of the boat before the other, jumping into boats, the cutting of the boat's ropes by sailors and rowing away without passengers, are all impossible where this improved appliance is employed.

In this improved system of boat lowering a great saving in labor is effected. With the ordinary plan it requires ten to fifteen persons to lower and attend to each life-boat; in the new apparatus no lifting is required, and four or five persons are sufficient to the task. This is extremely important, especially in the case of steamers, where comparatively few men are employed.

For military transport, where rapidity, safety, and secrecy are indispensable, this invention will prove of great value. And in times of collision the swinging davits will be of inestimable value.

Further information in regard to this invention may be obtained by addressing R. H. Earle, 216 Water street, St. Johns, Newfoundland, or Earle, P. O. box 1177, New York city.—*Scientific American.*

A Small Ice Machine.—An ice machine suitable for private houses, especially in India and the Colonies, or for steamers, ambulances, and so on, has been devised by M. Raoul Pictet on the principle of his larger machine. It is capable of producing 2 lbs of ice in 15 minutes, or about 10 lbs. per hour, with an expenditure of less than a horse-power of energy. It consists of a compression pump actuated by the motor employed to yield the power; a freezer surrounding the cylinder of the pump; and another in which are placed the vessels containing the water to be frozen. These parts are all grouped into a machine standing about 4 feet high and 18 inches square. The process is as follows:—Sulphuric anhydride is placed in the feeezer around the cylinder, and on working the pump the evaporation absorbs a large quantity of heat from a well of glycerine constituting the freezer by which the water to be frozen is surrounded. The sulphuric anhydride is carried by the pump into a condenser where it is liquified, and in the act yields up a certain quantity of heat. The condenser is kept cool by the circulation of water.—*Engineering.*