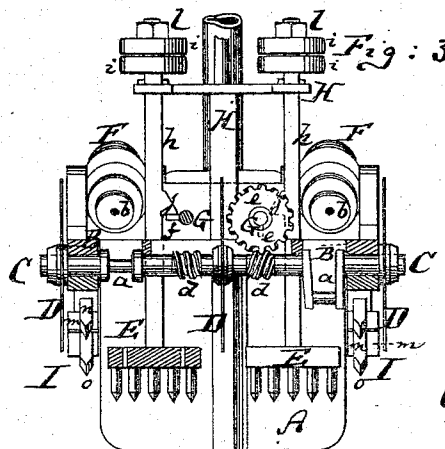
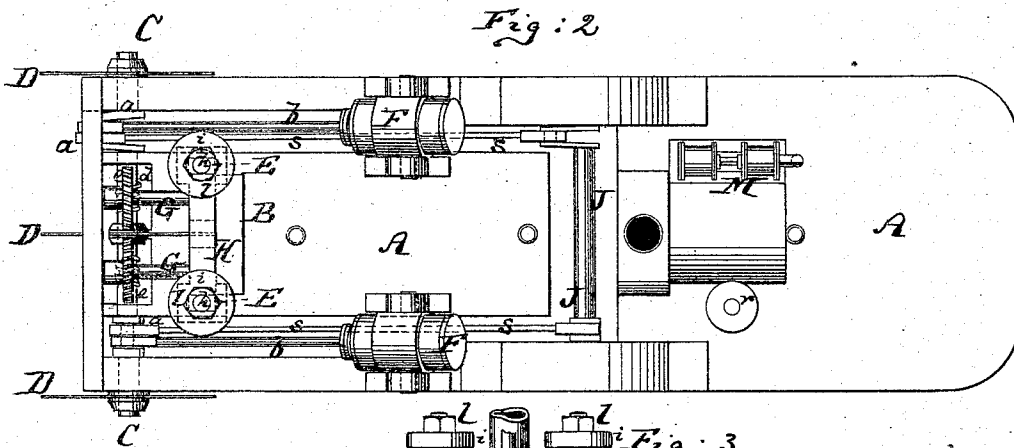
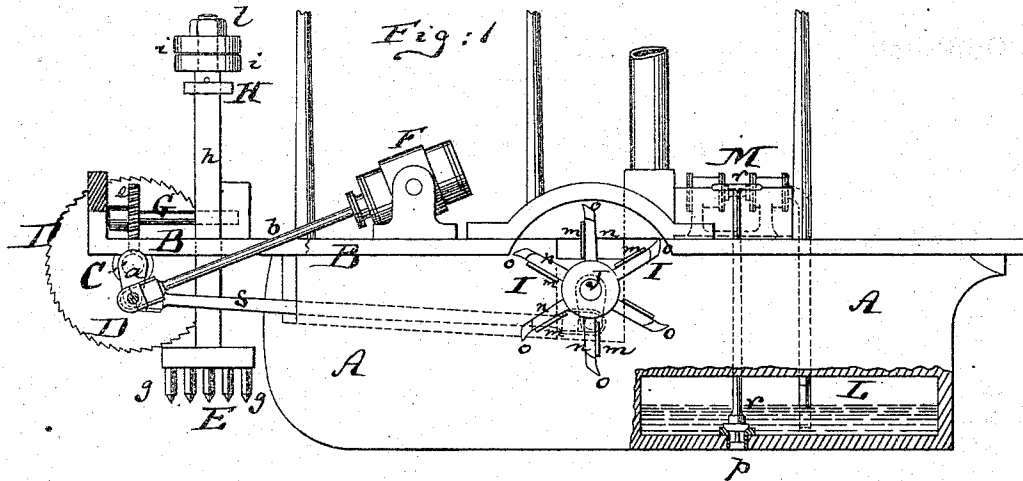


C. SCHAAL.  
Ice-Breaking Boats.

No. 157,546.

Patented Dec. 8, 1874.



Witnesses:

A. Moraga.  
E. C. Newby

Inventor:

Christoph Schaal  
by his attorney  
A. J. Briesey

# UNITED STATES PATENT OFFICE.

CHRISTOPH SCHAAL, OF BROOKLYN, NEW YORK, ASSIGNOR TO HIMSELF  
AND CONRAD BAUER, OF NEW YORK, N. Y.

## IMPROVEMENT IN ICE-BREAKING BOATS.

Specification forming part of Letters Patent No. **157,546**, dated December 8, 1874; application filed  
November 6, 1874.

*To all whom it may concern:*

Be it known that I, CHRISTOPH SCHAAL, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Ice-Breaking Boat, of which the following is a specification:

Figure 1 is a side view of my improved ice-breaking boat; Fig. 2, a top view of the same, and Fig. 3 a front view, partly in section, of the same.

Similar letters of reference indicate corresponding parts in all the figures.

The object of this invention is to produce a vessel which is to be specially adapted for breaking and crushing the ice in rivers, canals, creeks, and other navigable waters, for opening the same to navigation during the winter, and thereby increasing the facilities of transportation to a very great extent.

My invention consists in a novel arrangement of devices for breaking and crushing the ice, and also in improvements in the construction of the boat to which these devices are attached, all as hereinafter more fully described.

In the accompanying drawing, the letter A represents the hull or body of the boat, made of suitable size, and of materials sufficiently strong for supporting the machinery hereinafter specified, while such machinery is at work to break the ice around the boat. B is a frame extending beyond the bow of the boat, on a level about with the deck of the same, and carrying in front of the bow a horizontal transverse shaft, C. Upon this shaft are mounted a series of cutting-blades, D D, made on the style of circular saws, their object being to cut the ice in front of the boat into narrow strips for facilitating the action of the crushers E. The shaft C is provided with suitable cranks *a a*, which are, by rods *b*, connected with the pistons of oscillating engines F. I prefer to use these oscillating engines one on each side of the boat, as indicated in Fig. 2; but it is certainly evident that my invention may be carried into effect by the use of other suitable engines, one or more. By means of worms *d d*, that are formed on the shaft C, rotary motion is imparted to worm-wheels *e e* that are mounted on short longi-

tudinal shafts G G, as indicated in the drawing. Each of these shafts carries one or more projecting fingers, *f*, which are used for the purpose of raising the crushers E. Every crusher E is a block of metal, having downwardly-projecting prongs *g g*, and attached to the lower end of a vertical rod, *h*, which is guided in a vertically-projecting frame-work, H, of the boat. The upper ends of the rods *h* carry weights *i i*. Every rod *h* has also a projecting stud, *j*, which can be taken hold of by the finger *f* for raising the crusher. Thus it is that by the rotation imparted to the shafts G their fingers *f* are caused to alternately elevate and let fall the crushers E, such crushers, as they are in front of the bow, as shown in Fig. 1, serving to break the ice that has previously been cut into strips by the saws or blades D D.

In order to insure complete success in this operation I prefer to arrange a crusher, E, between every pair of blades D D, as indicated in Fig. 3. The blocks that constitute the bodies of the crushers E are preferably perforated, as indicated in Fig. 3, to let the water that may be reached by the crusher pass through such block, and offer as little resistance as possible.

The weights *i i* are removable from the rods *h*, and my intention is to apply the more weights to each crusher the thicker the ice to be broken. For this purpose I secure the weights to the rods *h* by a suitable nut or key, *l*, which can be easily taken off to admit more weights or permit the removal of some of those on the rod. The boat A is to be propelled through the water by means of paddle-wheels I I, each paddle-wheel being composed of buckets *m* attached to radial arms *n* in the customary or suitable manner, but each radial arm *n* is made to project beyond its bucket, and to form a claw-extension, *o*, to the wheel, in the manner clearly indicated in the drawing, so that the paddle-wheel itself will, by having such claw-extensions, be in condition to break the ice in its way, and thereby to protect its buckets from injury by the ice. The paddle-wheel shaft J may be rotated by connection, S, with the shaft C, as shown, or by other suitable means.

When the ice to be broken is of great strength and thickness, the boat A will be liable to be lifted upon it by the rotating blades, which, on very strong ice, might serve as creepers, unless the weight of the boat is sufficient to overcome this tendency; and, to prevent the boat from being lifted upon the ice, I have devised a plan for increasing the weight of the boat in cases of emergency, and for reducing it again when the cause of increase no longer exists. This plan is to form one or more water-tight compartments, L L, in the stern, or in any other part of the hull, every such compartment having a hole, *p*, in its lower portion, which hole can be closed by a suitable valve, *r*, that is accessible from the deck or other convenient part of the ship. Every compartment L is, however, also in communication with a suction-pump, M. When it is desirable to increase the weight of the

ship the valve *r* is raised and water allowed to flow into the compartment L, and the valve *r* is thereupon reclosed to confine such water within the vessel. When, however, the weight needs to be again reduced the pump M is put in operation and draws the water out of the compartment L, throwing it overboard.

I claim as my invention—

In an ice-breaking boat, the combination of the rotary saws D D with the vertically-reciprocating crushers E E, said crushers being made with perforated blocks and downwardly-projecting prongs, all arranged to operate substantially as described.

The foregoing description of my invention signed by me this 4th day of November, 1874.

CHRISTOPH SCHAAL.

Witnesses:

H. BRESABER,  
E. C. WEBB.