3 Sheets—Sheet 1.

F. M. MAHAN.

Ice-Breaking Vessel.

No. 212,715. Patented Feb. 25, 1879.

Fig. 1.

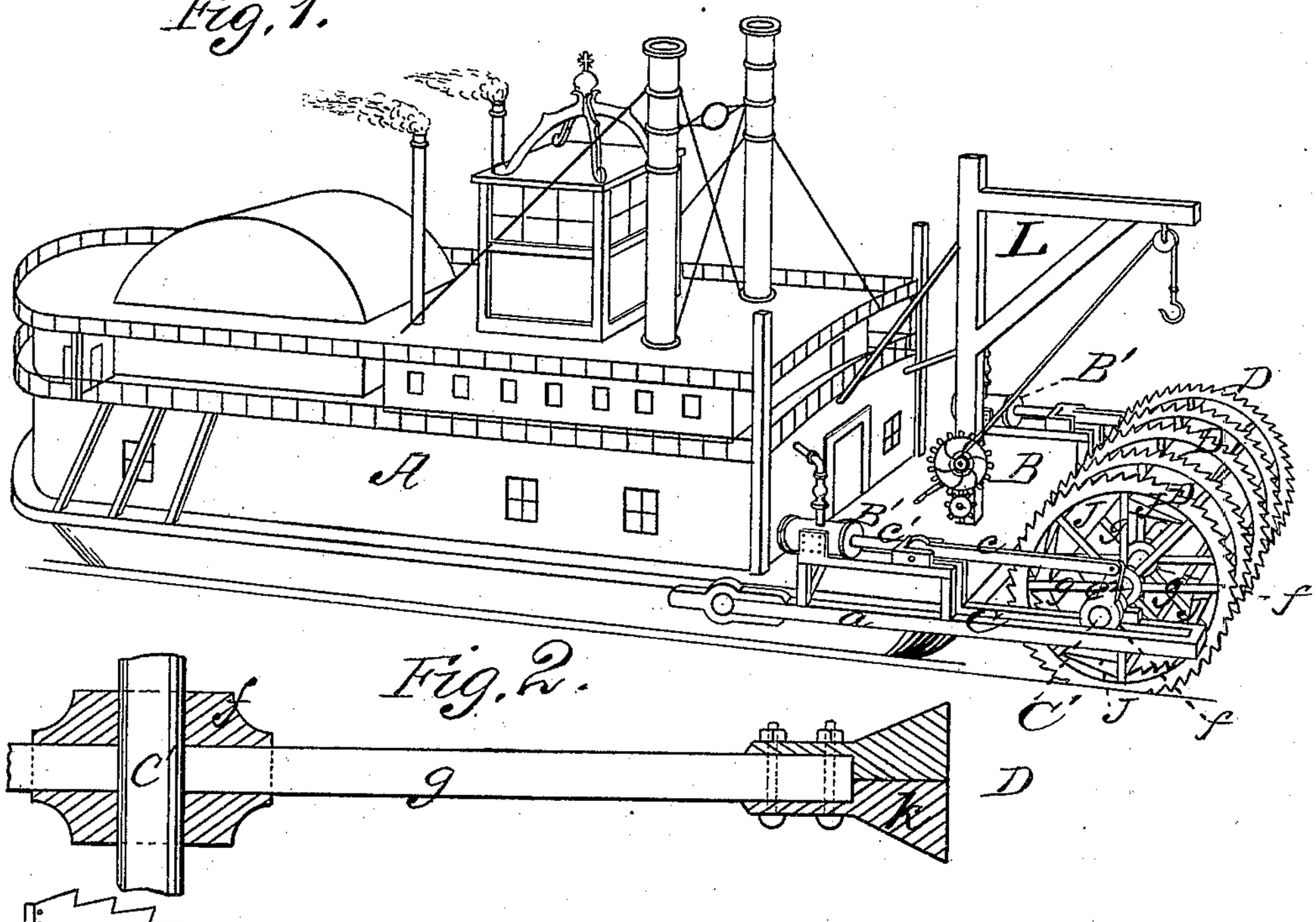

Fig. 2.

Fig. 3.

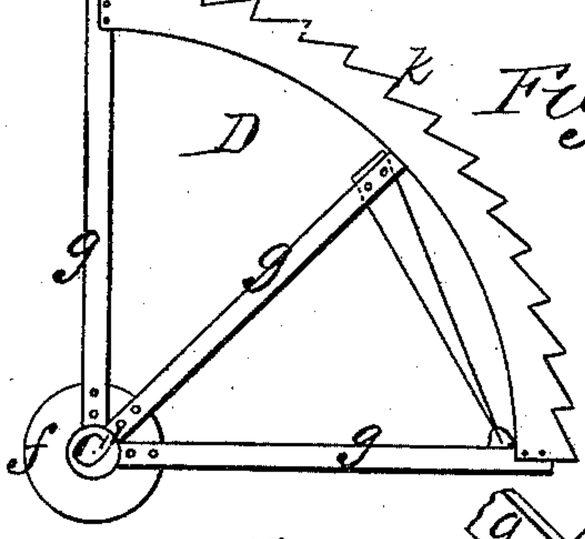

Fig. 4

Fig. 5.

WITNESSES

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Fig. 6.

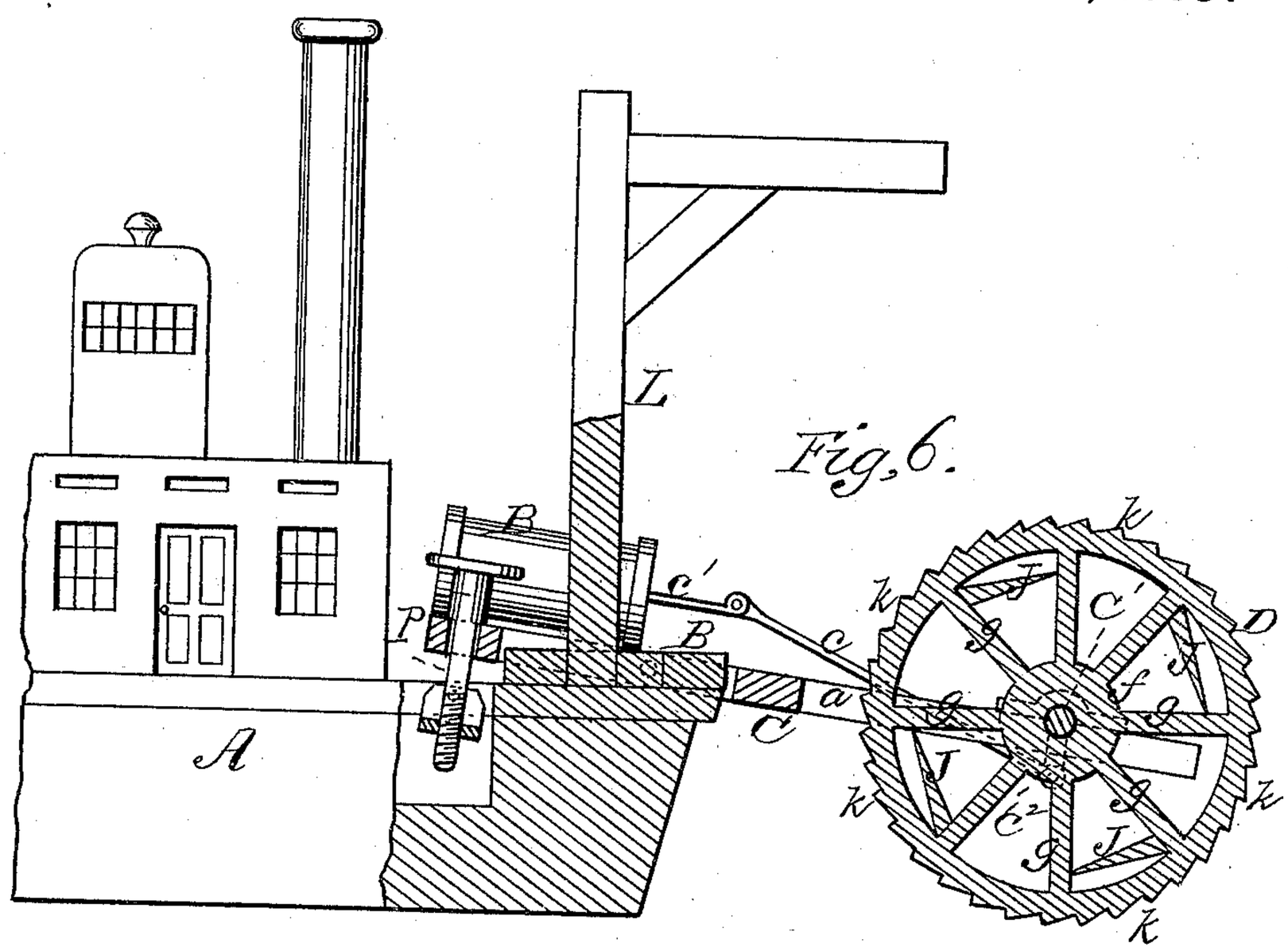
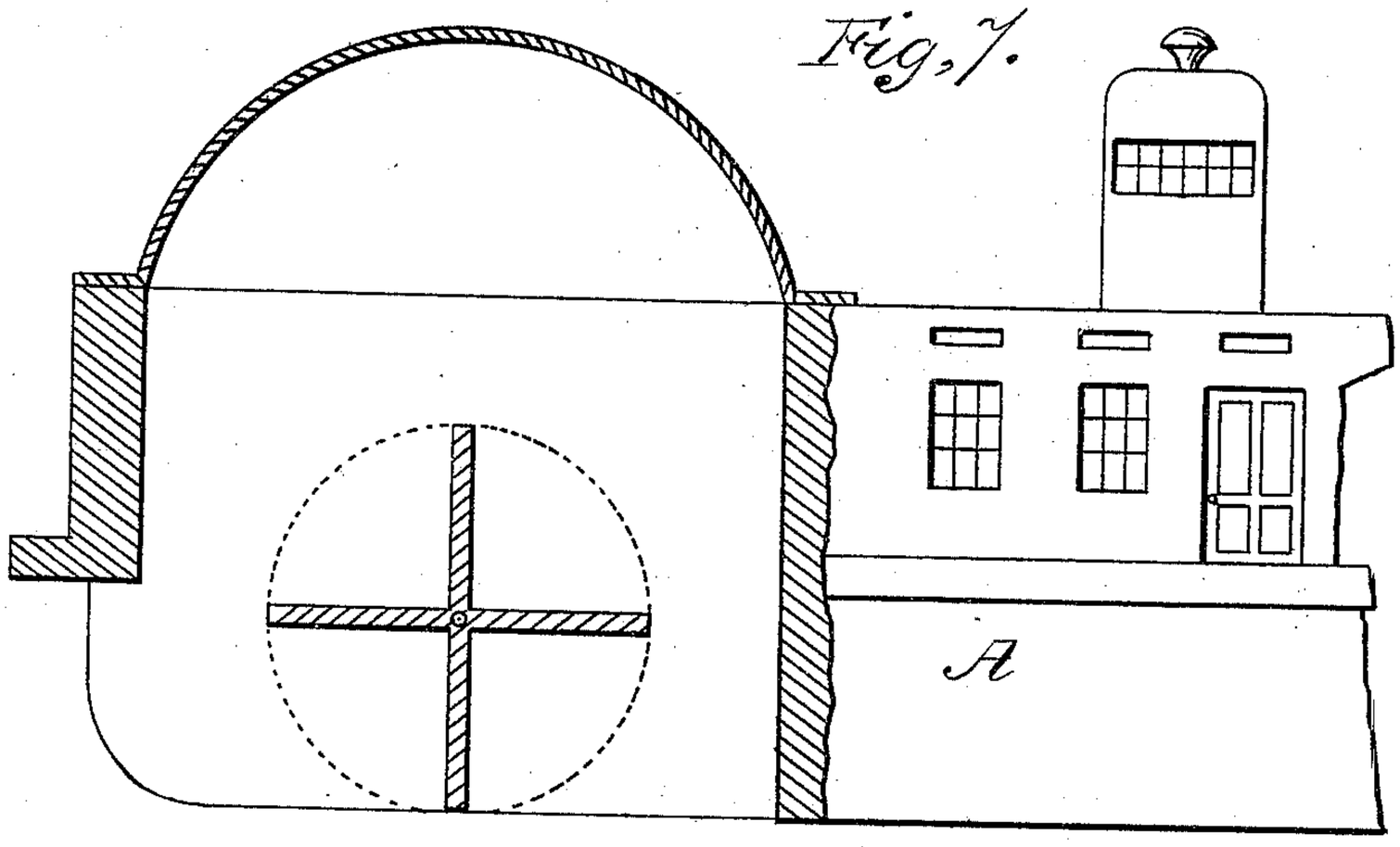


Fig. 7.



WITNESSES

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3 Sheets—Sheet 3.

F. M. MAHAN.

Ice-Breaking Vessel.

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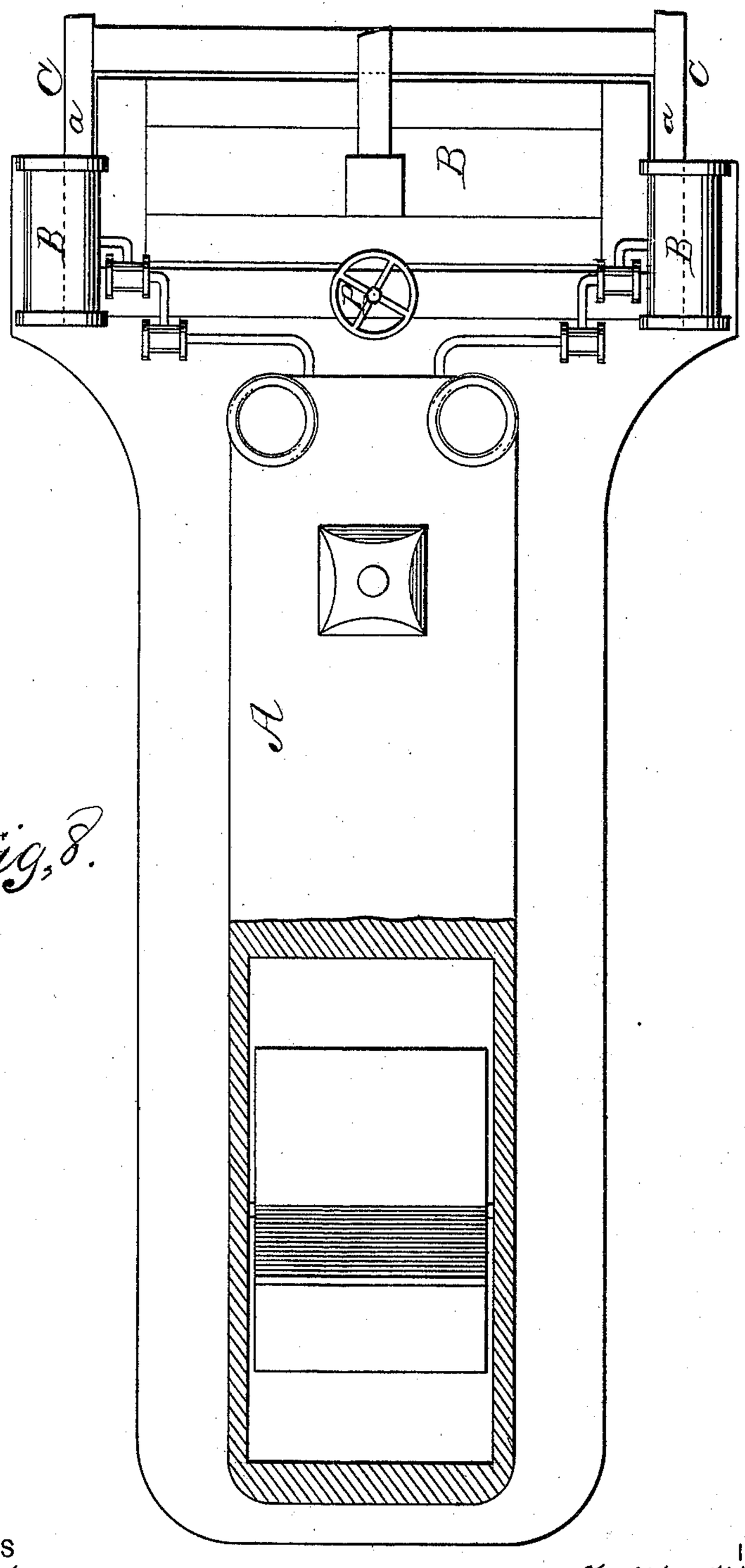

Fig. 8.

WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK M. MAHAN, OF ST. JOSEPH, MISSOURI, ASSIGNOR TO HIMSELF, STOKLY W. SLAYDEN, AND SILAS R. OWEN.

IMPROVEMENT IN ICE-BREAKING VESSELS.

Specification forming part of Letters Patent No. **212,715**, dated February 25, 1879; application filed August 24, 1878.

To all whom it may concern:

Be it known that I, FRANK M. MAHAN, of St. Joseph, in the county of Buchanan and State of Missouri, have invented a new and valuable Improvement in Combined Steam Ice-Breaker and Dredge; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a perspective view of my combined ice-breaker and dredge; and Figs. 2, 3, 4, and 5 are details. Fig. 6 is a longitudinal vertical section of the fore part of the boat. Fig. 7 is a like view of the rear part of the same; and Fig. 8 is a top view of the hull, with the rear part horizontally sectioned.

The nature of the invention consists in combining with a steam-vessel a gang of saws upon its bow, and breakers arranged inside of the periphery or cutting-edges of said saws and across the gang, and working in unison therewith to knock off the ice-blocks.

It also consists in combining with a steam-vessel and a vertically-adjustable frame arranged at its bows a gang of circular saws, journaled in said frame, and breakers extending across the gang inside of the cutting portion of said saws, and secured to the radial arm supporting the same, as hereinafter described.

In the annexed drawings, the letter A designates an ordinary steamboat, built at its stern upon the double-hull principle, and having in the space between the hulls the propelling mechanism. At the bow of this boat is constructed an overhang, B, the plan view of which presents a square outline, to the sides of which is pivoted, by means of strong trunnions or their equivalent, a frame, C, composed of parallel side pieces *a* and a proper cross brace or braces. Upon these side beams are mounted the cylinders B′, that are connected with the boilers by means of adjustable steam-pipes, and impart rotary motion to the ice-breaker through the medium of a connecting-rod, *c*, piston c^1, and a crank-arm, c^2. This latter is rigidly secured upon the end of a shaft, C′, having its bearings in the beams *a* of frame C, and provided with a number of spaced hubs, *f*, to which are rigidly bolted the radial arms *g*. The free ends of these arms may be connected together by means of annular saw-toothed bands, made in sections or in one piece, and rigidly bolted to the arms *g* aforesaid, or, as shown in Fig. 3, by the saws D, composed each of a number of curved cast-steel sections, *k*, joined end to end and extending completely around the said bands. The teeth of these saws are broader at their cutting-edges than at their bases, in order that they may not bind in the kerf in the ice.

At or about eighteen inches inside of the saws D are rigidly secured the ice-breakers J, which, being brought down upon the ice, break off the parts between the kerfs from the body and allow them to float off to the rear.

The breakers are arranged between the arms *g*, and rigidly secured thereto in a position such that when they strike the ice they will be at right angles, or nearly so, to the field. I may, however, so arrange them that they will exercise a chipping action upon the edge of the ice, if I so elect.

The breakers J are preferably triangular or wedge shaped plates of cast-iron or steel, as shown in Fig. 4, and their working edges may be plane surfaces or double beveled, as I may elect. They may be also horizontal or inclined to the horizontal plane, by which latter means the breaking action is exercised at one end of the gang of saws, and extends rapidly to the other, after the manner of a draw-cut, instead of simultaneously upon all the blocks divided by the saws.

The frame carrying the gang-saw is adjustable vertically according to the thickness of the ice by screw-jacks P or other equivalent devices, usually actuated by steam from the generator, and, after passing out of their control, by a crane, L, the winding-drum of which is usually operated by steam also. The bow of the boat being sharp divides the ice-blocks upon either side, allowing them to pass astern beyond the double hulls at that portion of the boat, thus keeping the space be-

tween said hulls practically clear of ice-blocks and effectually guarding the propeller from all dangerous contact therewith.

The boat may be steered by a rudder at the middle of the stern, or each of the hulls may have an independent one.

When used as a dredge, the gang-saw is lowered to the bottom, the boat being bows on to the bar on its down-stream side, and set in motion. The surface of the bank is thereby broken up minutely, and the separate particles carried by the current or tide into deep water.

In moving to a new field of operations the saw may be raised entirely out of the water by the crane aforesaid, the frame swinging freely upon the trunnions aforesaid.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a steam-vessel, of a gang of saws upon its bows and breakers arranged inside of the periphery or cutting-edges of said saws and across the gang, and working in unison therewith to knock off the ice-blocks, substantially as specified.

2. The combination, with a steam-vessel and a vertically-adjustable frame arranged at its bows, of a gang of circular saws, journaled in said frame, and breakers extending across the gang inside of the cutting portion of said saws and secured to the radial arm supporting the same, substantially as specified.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

FRANK M. MAHAN.

Witnesses:

JAS. C. OGDEN,

CONRAD HARTZELL.