(No Model.)

3 Sheets—Sheet 1.

R. M. McKEE.

VIBRATING PROPELLER.

No. 282,656. Patented Aug. 7, 1883.

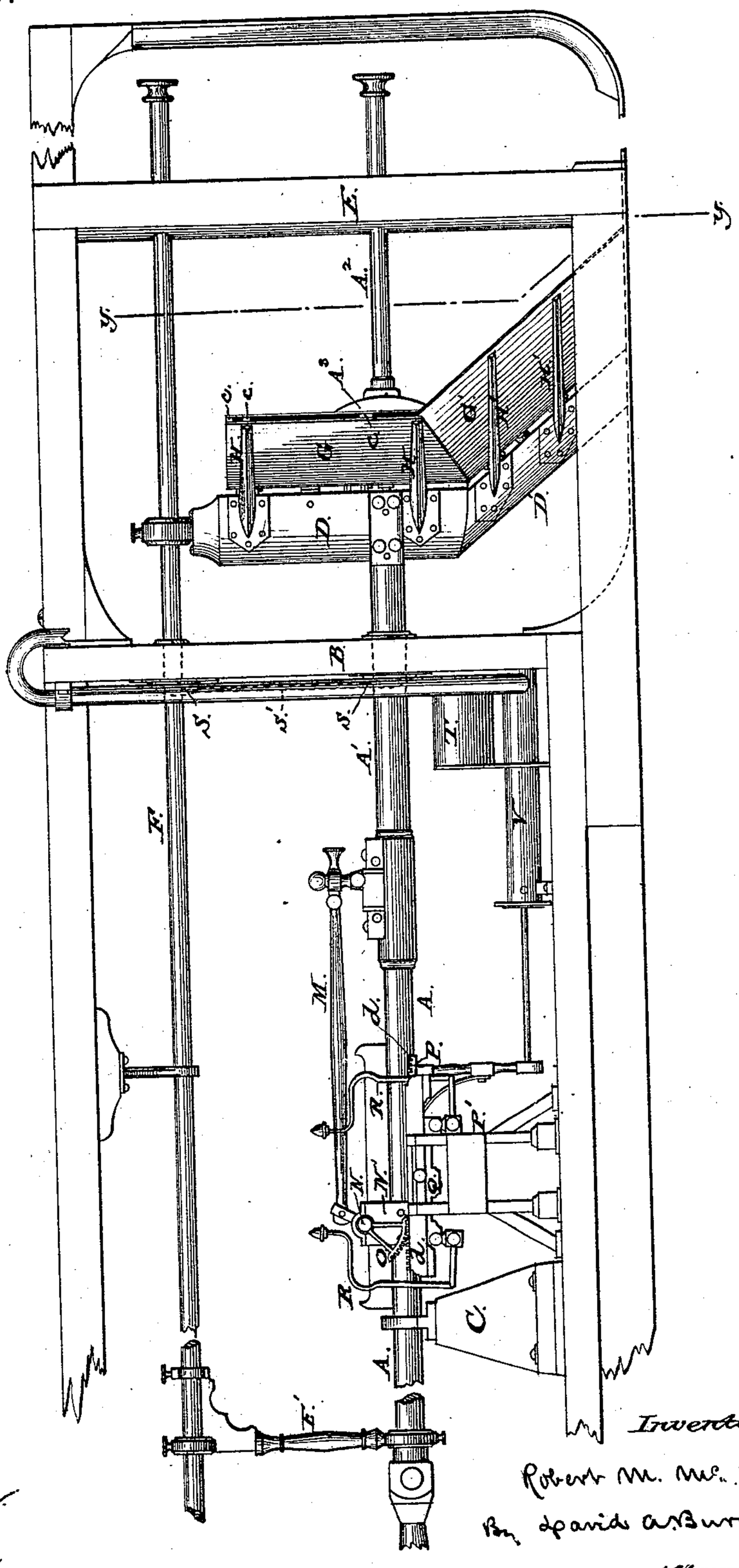

Fig. 1.

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(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

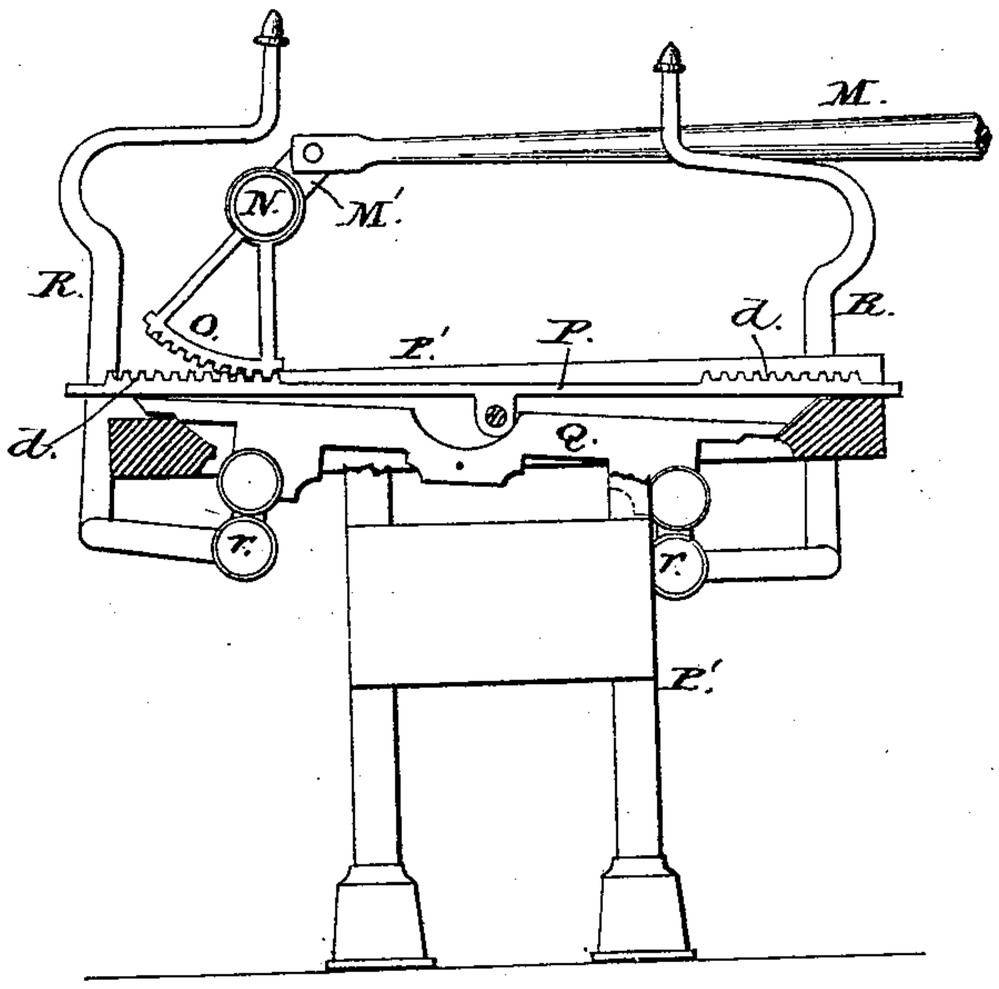


Fig. 3.

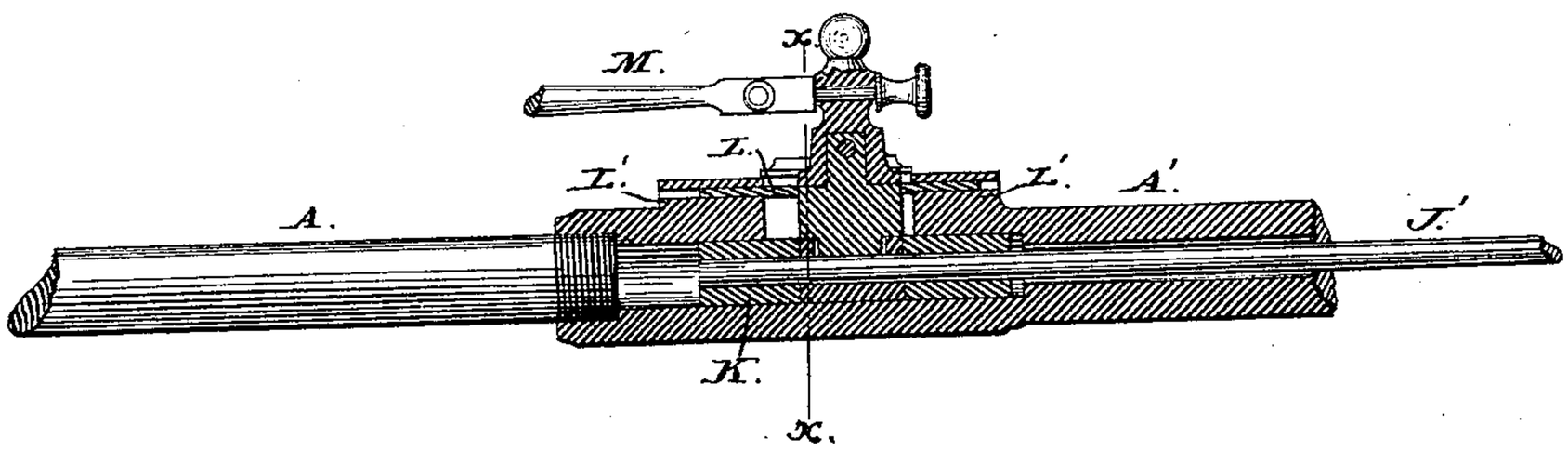
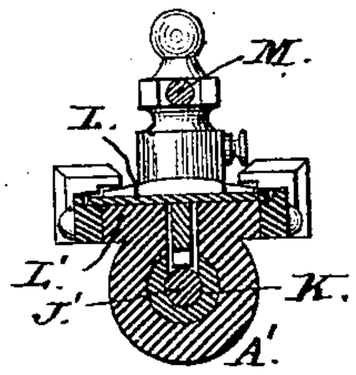


Fig. 4.



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(No Model.)

3 Sheets—Sheet 3.

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VIBRATING PROPELLER.

No. 282,656. Patented Aug. 7, 1883.

Fig. 5.

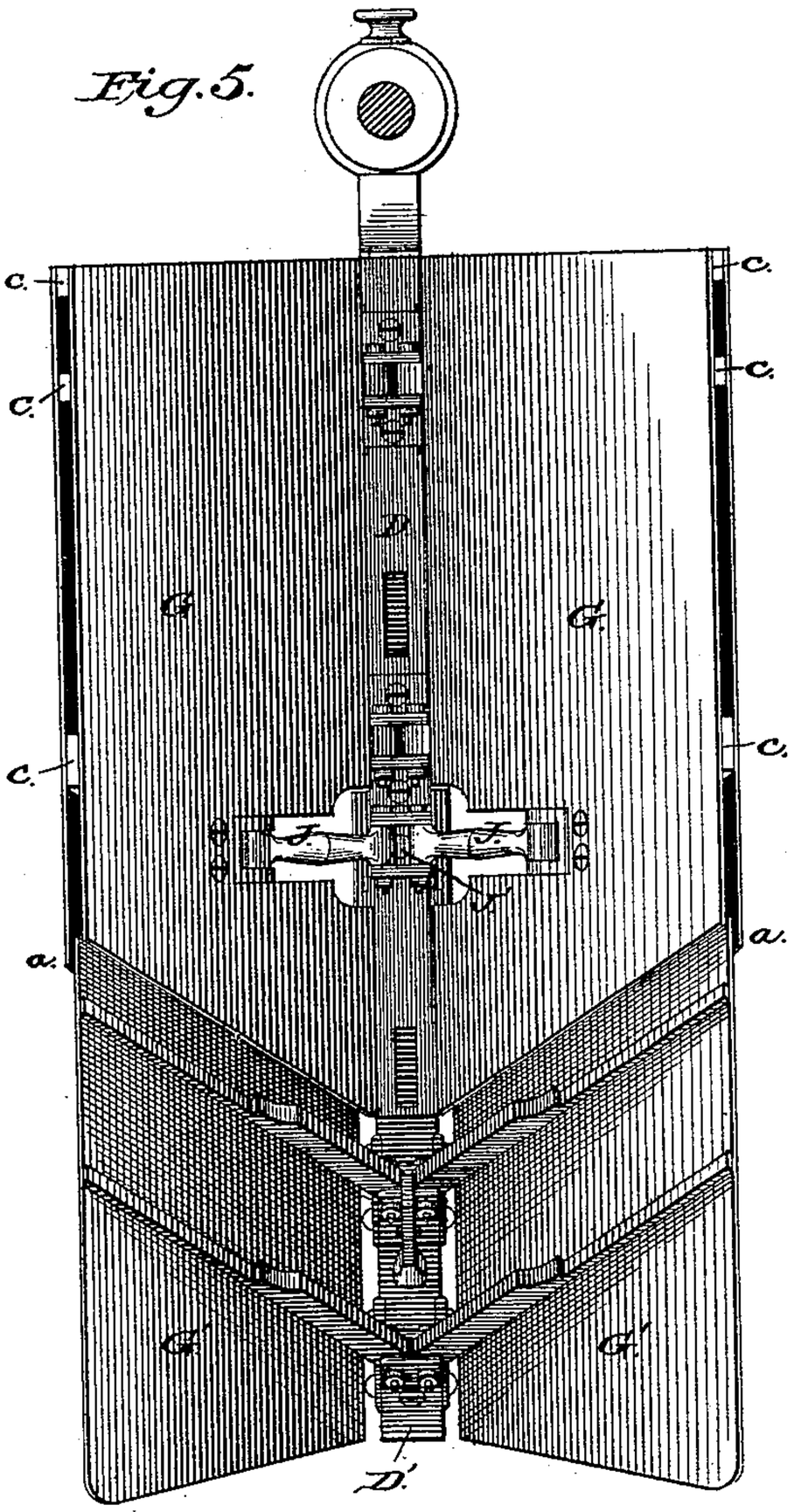


Fig. 6.

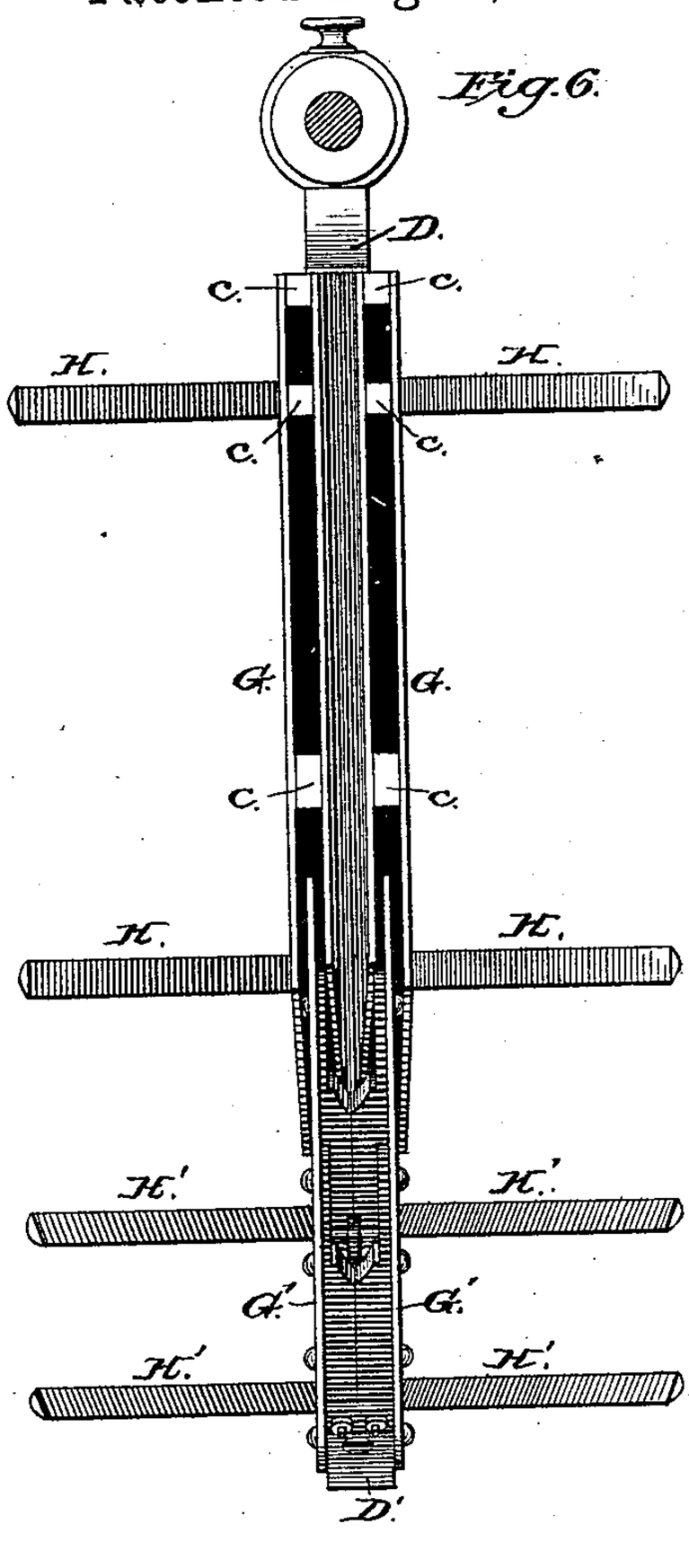
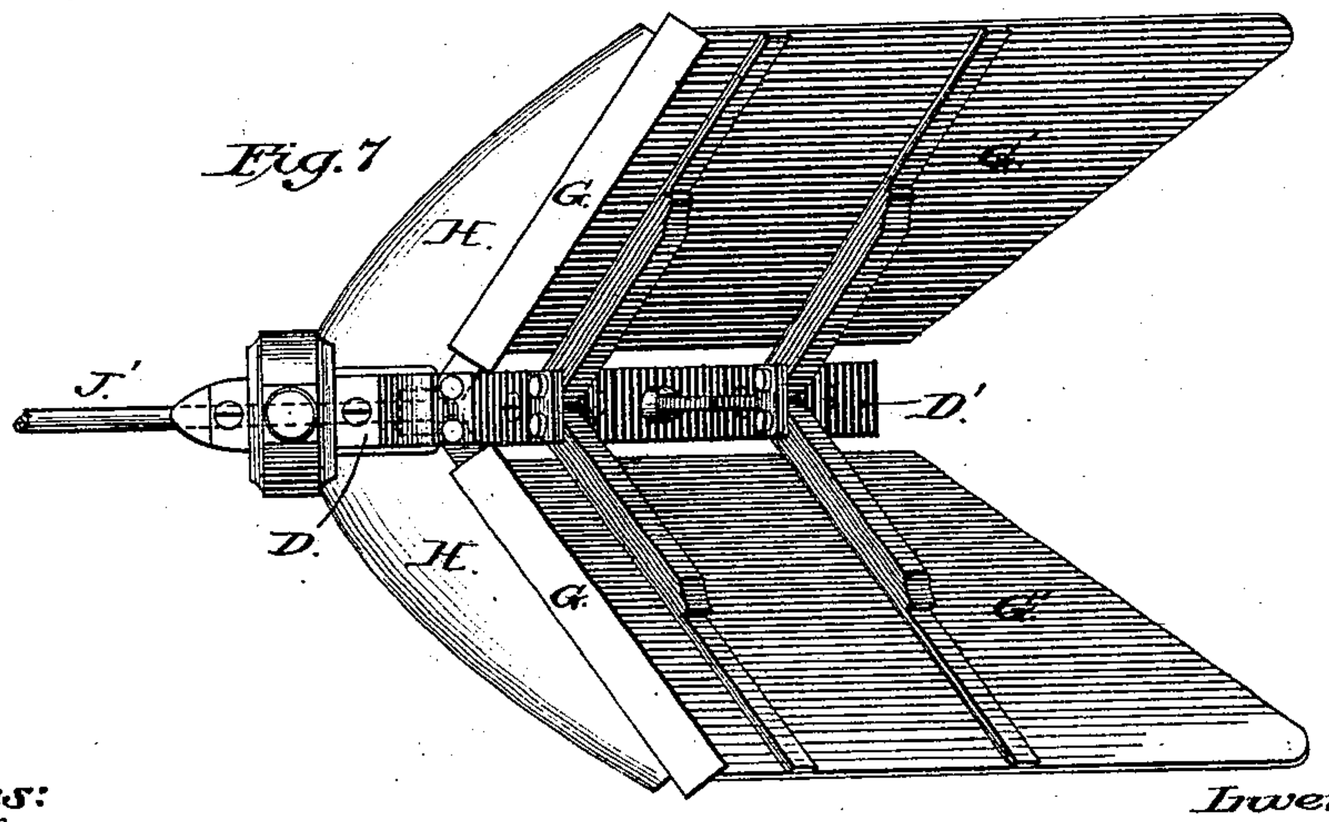


Fig. 7



Witnesses:
John A. Ellis.
A. J. Steiger

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UNITED STATES PATENT OFFICE.

ROBERT M. McKEE, OF GREENEVILLE, TENNESSEE.

VIBRATING PROPELLER.

SPECIFICATION forming part of Letters Patent No. 282,656, dated August 7, 1883.

Application filed May 3, 1883. (No model.)

To all whom it may concern:

Be it known that I, ROBERT M. McKEE, residing at Greeneville, in the county of Greene and State of Tennessee, have invented a new and useful Improvement in Propellers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My invention relates to the class of propellers which expand and collapse like the feet of aquatic fowls, and has for its object a simple, compact, and effective construction of this form of propelling-engine and its adaptation for use with the largest steamers.

It consists in the construction of the propelling-blades on each side of the post to which they are pivoted in two sections—viz., an upper vertical section and a lower section diverging from the lower end of the first in a plane at an obtuse angle therewith, each upper section being adapted to engage the upper edge of the lower section—so that the two shall move in unison substantially as one continuous plate or "web."

It consists, secondly, in the connection, with the main reciprocating shaft or "leg" by which the propelling-blades are moved back and forth, of an independent reciprocating rod or "sinew" inclosed within the shaft or leg, and to whose outer end or heel are hinged the spreaders or "extensors," which operate to open and close the propelling blades or web, and in improved mechanism, as hereinafter fully described, for automatically operating the reciprocating rod or sinew governing the blades or web to open and close them at the proper moment synchronically with each reversal of the reciprocating movement of the main shaft or leg.

It consists, also, in the combination of fixed stops or "toes" with the post carrying the propelling-blades to stay and support the web at its distension, and against which the blades rest during propulsion, and in the combination, with the main shaft, of an auxiliary supporting-shaft for the purpose of giving stability to the whole mechanism and to aid in maintaining the line of action.

In the accompanying drawings, Figure 1 is a side elevation of my improved propelling-engine, which I designate as the "auk-foot" propeller; Figs. 2 and 3, vertical longitudinal sections, on an enlarged scale, of the mechanism for expanding and collapsing the propeller; Fig. 4, a transverse section thereof in line *x x* of Fig. 3; Fig. 5, a section in line *y y* of Fig. 1, affording a rear elevation of the propeller expanded; Fig. 6, a similar view of the same contracted; Fig. 7, a top or plan view of the propeller expanded, as in Fig. 5.

A A′ represent the main reciprocating shaft, supported in suitable bearings in the stern-post B and in a pillow-block, C. The outer end, A′, of this shaft is made tubular, and is connected with the solid portion A by a screw-joint. (See Fig. 3.) It terminates outwardly in a vertical propeller-post, D, which is firmly and rigidly bolted thereto, and is supported outside of this post by an outer shaft, A^2, extended in a right line with the shaft A A′, through bearings in the rudder-post E, and which is secured to the propeller-post D by means of a thin, wide, central bracket, A^3, whose edge is in line vertically with the middle of the propeller-post, so as to permit the propeller-plates pivoted to the post to close toward each other against said bracket into nearly parallel planes. The lower portion, D′, of the propeller-post D is inclined outward from its upper part at an obtuse angle therewith, as illustrated in Fig. 1.

The main shaft A A′, its outward extension, A^2, and the propeller-post D D′ receive auxiliary support from a parallel shaft, F, extending the entire length of both the main shaft and its extension, and above the same, through suitable bearings provided therefor within the vessel, and also in the stern-post and rudder-post. The main shaft A A′ is rigidly connected to this auxiliary supporting-shaft F by means of an upright bar, F′, at its inner end, and by the propeller-post itself at the other, the upper end of the post being rigidly secured to said shaft F, as shown in Fig. 1.

Two vibrating propelling-plates, G G, are pivoted to the vertical outer edge of the post D D′, so as to close toward each other until they attain a position parallel, or nearly so, to each other and to a vertical plane in line with the shaft A A′, and to open out at an obtuse

angle with each other. (See plan view, Fig. 7.) These plates G G are each made in two thicknesses, firmly riveted or bolted together upon interposed studs, *c c*. Two additional vibrating plates, G′ G′, are pivoted in like manner to the outer edge of the oblique portion D′ of the post, to fold and open to and from each other, and the upper edge of the lower plate, G′, is made to pass up into the recess or interval between the two leaves of the plate G above it far enough to be continuously engaged thereby, the lower edge of the inner leaf of said upper plate being cut away sufficiently to accommodate the inclination of the lower plate, as shown at *a* in Fig. 5. By this connection of the upper and lower propelling-plates with each other the movement of the upper plates is communicated to the lower plates, so that the two will move together in opening and closing.

The outward opening movement or expansion of the propeller-plates is limited by stops or ribs H H, projecting at an obtuse angle with each other from the propeller-post, to which they are rigidly and firmly secured. When closed or brought into parallel planes, the central bracket, A^3, connecting the post with the outer shaft, A^2, being interposed between them, serves to protect them against damage from the inward pressure or blow of a heavy sea. A stop, H′, projecting centrally from the lower oblique portion of the post, serves the same end in reference to the lower plates.

The propeller-plates are forced apart and drawn together, as required, by means of links or spreaders J J, pivoted mediately or immediately at their inner ends to a heel-piece upon the outer end of a rod, J′, projecting through the post D from within the tubular end A′ of the main reciprocating shaft, and at their outer ends to the upper plates, G G, at about the middle of their width and in line with the shaft. These links thus form a toggle-joint with the rod and plates, affording the needful leverage for working them.

The rod J′ extends longitudinally through the tubular end A′ of the main shaft A A′, and its inner end is fixed in a sleeve, K, fitted to slide within a chamber formed by an enlargement of the bore of the shaft A′ at its juncture with its solid portion A. (See Fig. 3.) The shaft A′ is slotted longitudinally over said chamber, and a slide, L, is fitted in suitable ways in a bearing-plate, L′, upon the shaft over the slotted aperture, and is connected through the slot with the sleeve K, so that the two shall move together as one piece. This slide is coupled by means of a rod or link, M, with a crank, M′, upon a rock-shaft, N, mounted transversely to the main shaft A in suitable bearings upon a collar, N′, fitted upon and fixed to said main shaft so as to move with it.

A segment, O, is fitted upon the end of the rock-shaft N, and the periphery of this segment is toothed to engage, at the end of each stroke back and forth of the main shaft, a rack, *d*, upon either end of a tilting bar, P, pivoted in the middle of its length to a fixed frame, P′ P′, within a longitudinal recess formed in said frame parallel with the main shaft. A sliding bar, Q, is fitted in the same recess under the tilting bar P, whose ends are beveled inwardly on their under side, forming inclines, which, being brought to bear against and to slide upon counterpart inclines on the frame, are thereby lifted far enough to admit of an engagement of the rack *d* on the upper side of the superimposed tilting bar P with the teeth of the segment. To produce this engagement automatically at the proper moment, tripping-rods R R are fitted to each end of the sliding lift-bar Q, to project out therefrom clear of the frame on the side next to the shaft, and then upwardly far enough to be struck by the rock-shaft as, carried by the main shaft, it approaches therewith the end of its stroke; hence as the main shaft approaches the end of its stroke in either direction the transverse rock-shaft N, coming into contact with the appropriate rod R on that side, carries it, and with it the sliding bar Q, to which it is attached, far enough to cause the incline on the under side of that end of said bar Q to ride up on the fixed incline surface of the frame, and thereby lift the corresponding end of the tilting bar P into position to engage the teeth of the segment on the end of the rock-shaft when the rock-shaft is started back with the return movement of the main shaft. This engagement of the teeth on the segment with the rack *d* on the tilting bar, as the rock-shaft moves back over the latter, serves to produce a partial rotation or rocking of the shaft N, the extent of this movement being determined by the number of teeth on the segment. The rocking of the shaft thus produced at the inception of the return movement of the main shaft in either direction operates, by means of the crank M′ and coupling-link M, to move the slide L and its attached rod J′ within the tubular portion A′ of the main shaft A A′ independently of the main shaft, and carrying with it the spreader-links J J causes them to open or close, as the case may be, the propeller-plates G G G′ G′.

For propellers of large size the rock-shaft N may be fitted with segments O at each end thereof, to engage appropriate racks and tilting bars on both sides of the shaft.

Although this method of producing an intermittent independent reciprocating movement of the rod J in unison with the movement of the main shaft suggests itself to me as the best, I contemplate the use of other devices for actuating said rod J.

The rods R R are made adjustable in their connection to the sliding bar Q by fitting the end of each into a tubular socket in said bar and securing it therein by a set-screw, *r*.

The joints of the shafts A, A′, and F with the stern-post are properly packed, and any

possible water leaking in thereat is collected within annular chambers S S, adapted to encircle the bearings, and these are connected by a drip-tube, S′, with a reservoir, T, which is in turn connected with a simple pump, V, operated automatically by the reciprocating movement of the main shaft, to which its parallel piston-rod is attached.

The joints of the slide L, with its bearing-plate L′ over the slotted aperture in the end of the tubular section A′ of the main shaft, is also properly packed to make a water-tight joint, excluding the water which may work into said tubular section at its heel joint.

The propelling-blades are adequately protected from the danger of collision or entanglements by the rudder-post and the timbers or beams sustaining it.

As this form of propeller is capable of propulsion in one direction only, I contemplate its use in combination with an auxiliary screw, or as an auxiliary to paddle-wheels, which shall supply the means for backing the vessel. The intermittent pulsative action, due to the reciprocating movement of the propeller, will be modified by its combination with a screw or paddles, and may be overcome by placing two of the auk-foot propellers equidistant from the stern-post, one on each side of it.

My improved propeller presents the advantages of superior compactness, solidity, rigidity, and strength in its moving parts, with entire ease and freedom of movement. Notably the main shaft or leg is of uniform strength throughout. Its enlargement to inclose the propeller rod or sinew serves to compensate for its change from the solid to a tubular form. The entire mechanism is very accessible, and there is but little mechanism outside of the vessel. There is no loss of power in the operation of the propeller, the entire force of the engine being expended directly in the propulsion of the vessel, the waste attending the change of direction and leverage of paddle-wheels and the slip of a screw being avoided.

I claim as my invention—

1. The combination, with the vertical vibrating blades G G, in a propelling-engine, of auxiliary blades G′ G′, engaged by the first and pivoted to vibrate synchronously therewith in a plane at an obtuse angle thereto, substantially in the manner and for the purpose herein set forth.

2. The combination, with the vibrating blades G G, in a propelling-engine, and with a reciprocating rod projecting between the blades through the post to which they are pivoted, of spreader-links P, pivoted mediately or immediately to the end of said rod and to the middle of the blades on the inner side thereof, substantially in the manner and for the purpose herein set forth.

3. The combination, with the main reciprocating shaft carrying the blades of a propelling-engine, and with the reciprocating rod operating to open and close said blades, of a rock-shaft supported upon and carried by the main shaft, a toothed segment upon said rock-shaft, a tilting lever pivoted to a fixed frame under the segment, a rack on each end of said lever adapted to engage and partially rotate the segment when thrown into contact therewith, a subordinate reciprocating slide-bar moving at either end upon an inclined surface to lift the corresponding end of the tilting lever, and arms fixed to project from each end of said slide-bar into position to be engaged and moved by the rock-shaft at the end of the stroke of the main shaft, substantially in the manner and for the purpose herein set forth.

4. The combination, with the main reciprocating shaft carrying the propeller-post and vibrating blades in a propelling-engine, and with said propeller-post, of a parallel supporting-rod adapted to slide in independent bearings over the main shaft, and rigidly connected thereto by the propeller-post and by one or more connecting-bars, to move in unison therewith and strengthen and support the same, substantially in the manner and for the purpose herein set forth.

5. The combination, with the tubular reciprocating shaft A′, the propeller-post D, secured thereto, the vibrating blades G G′, carried thereby, and the slide L and internal shaft, J′, actuating said blades, of the solid longitudinally-reciprocating shaft A, forming an integral extension of said tubular shaft A′ of equal strength and reduced diameter, substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT M. McKEE.

Witnesses:

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A. W. STEIGER.