(No Model.) 2 Sheets—Sheet 1.

R. SMITH.

RECIPROCATING PROPELLER AND OPERATING MECHANISM.

No. 279,987. Patented June 26, 1883.

Fig. 1.

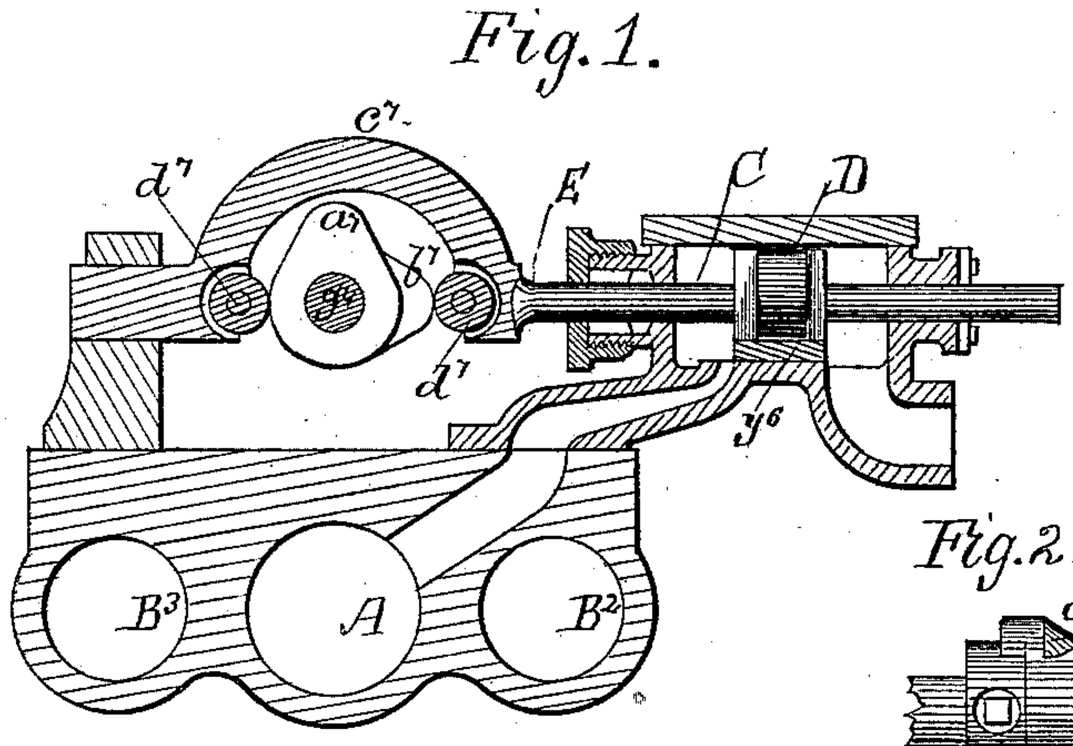


Fig. 2.

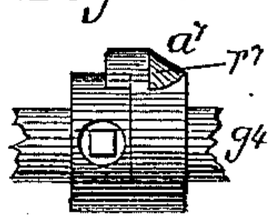


Fig. 3.

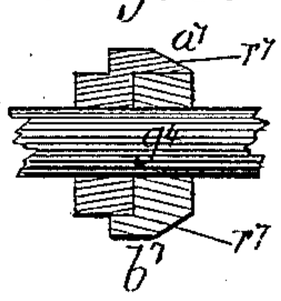


Fig. 4.

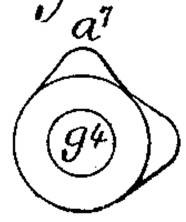


Fig. 5.

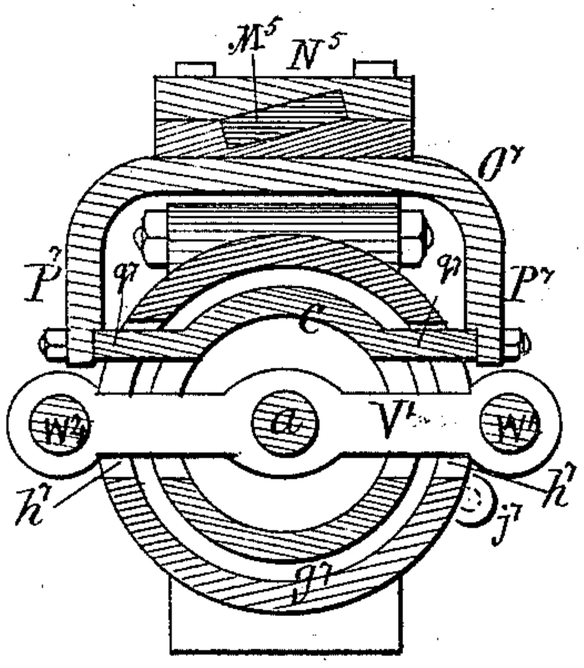


Fig. 6.

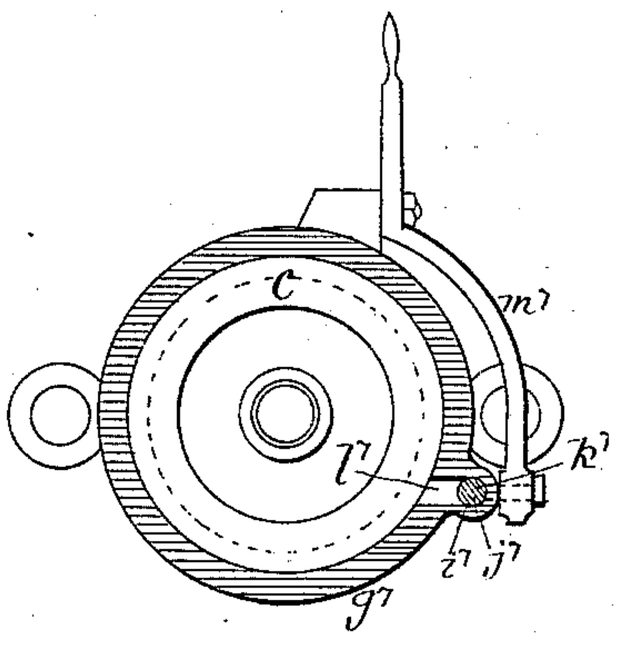
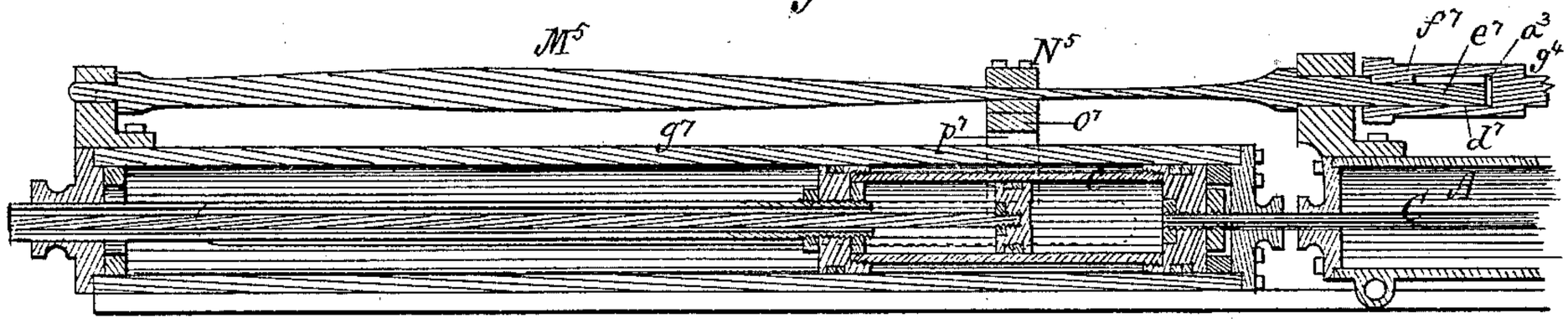


Fig. 7.

Fig. 8.



Witnesses.
H. C. Lodge
L. J. Baker.

Inventor.
Richard Smith.
H. Curtis Atty.

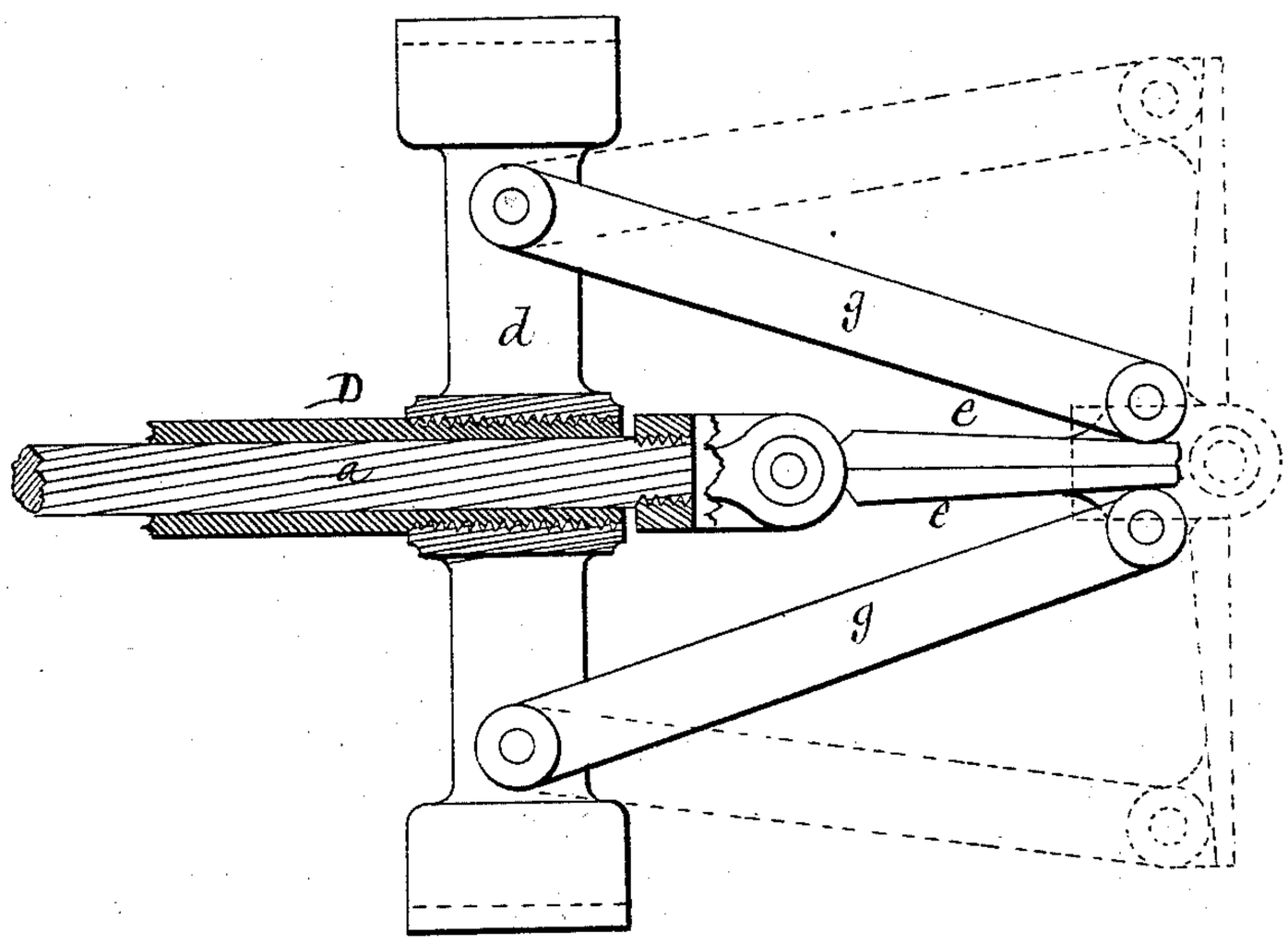
(No Model.) 2 Sheets—Sheet 2.

R. SMITH.

RECIPROCATING PROPELLER AND OPERATING MECHANISM.

No. 279,987. Patented June 26, 1883.

Fig. 9.



Witnesses.
H. E. Lodge.
L. J. Baker.

Inventor.
Richard Smith.
F. Curtis. Atty.

UNITED STATES PATENT OFFICE.

RICHARD SMITH, OF SHERBROOKE, QUEBEC, CANADA.

RECIPROCATING PROPELLER AND OPERATING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 279,987, dated June 26, 1883.

Application filed September 25, 1882. (No model.)

To all whom it may concern:

Be it known that I, RICHARD SMITH, a citizen of Canada, residing at Sherbrooke, in the county of Sherbrooke and Province of Quebec, Canada, have invented certain new and useful Improvements in Reciprocating Propellers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My present invention is an improvement upon a class of propellers shown and described in Letters Patent issued to myself, numbered 264,903, and dated September 26, 1882. In such patented propeller the valves were drop-valves, lowered by a spring and lifted by levers operated by cams secured to a shaft put in continuous rotary motion by a train of gears and ratchets connecting it with the spiral blade, (designated in the drawings and specification by the letter M⁵.) My present improvements consist, first, in dispensing with the said gears and ratchets, and employing in place thereof a simple tenon-and-socket connection between the spiral blade and the cam-shaft, by which the latter follows the reciprocal movements of said blade; and, secondly, in the employment, in place of the drop-valves, of horizontal slide-valves operated each by a yoke embracing one of the cams upon the cam-shaft.

The drawings accompanying this specification represent, in Figure 1, a vertical cross-section of the cylinder, valve, and operating-cams of my propeller-engine, showing a portion of my present improvements, while Fig. 2 is a side elevation, Fig. 3 a longitudinal section, and Fig. 4 an end view, of one pair of cams for operating one of the valves. Figs. 5 and 6 in said drawings are cross-sections of the dash-pot connected with the propeller-shaft. Fig. 7 is a longitudinal section of one end of the dash-pot cylinder. Fig. 8 is a longitudinal section of the dash-pot, spiral blade, and cam-shaft. Fig. 9 is a detail view of the propeller-blades and proximate devices.

In said drawings, A represents the main cylinder, and B^2 B^3 the auxiliary side cylinders, as shown in my said patent.

C represents one of the valve-chambers, and D a slide-valve contained therein, such valve operating to alternately open and close the live and exhaust ports.

E is a horizontal stem, swiveled to the valve D and extending through one side of the valve-chamber, and terminating in a yoke, c^7, which straddles the cam-shaft g^4 and carries anti-friction bowls d^7 d^7, which operate with two wiper-cams, a^7 b^7, secured to the said shaft g^4 and disposed quartering thereupon, as shown in Figs. 1 and 4. Reciprocating motions of the cam-shaft through circular arcs of one hundred and eighty degrees, or thereabout, effect reciprocating movements of each valve D. To impart rotary reciprocating motions to the cam-shaft g^4 by and with like motions of the spiral blade M^5, I connect the two by a connection which permits them to slide longitudinally upon one another, but compels them to reciprocate together. One form of such a connection is shown in Fig. 8 of the drawings as a socket, a^3, in the outer end of the cam-shaft, into which a tenon or journal, b^3, upon the inner end of the spiral blade loosely enters, a spline-and-groove connection, f^7, being employed to prevent rotary slip between the two.

In the method shown in my patent, in which the reciprocating motions of the spiral blade are converted into continuous rotary motions of the cam-shaft, gears, and ratchets, as stated, a given point must be reached at each reciprocation; hence no latitude is allowed for loss of motion and the greatest nicety must be observed in adjusting the ports. In addition, considerable expense is involved in the use of the gears in addition to the friction. In my present plan the cam-shaft simply follows the movement of the spiral blade, and as the points of the cams more than pass by the bowls d^7 d^7 at each reciprocation, I am not confined to the nice adjustment attending the employment of the train of gears.

The dash-pot in my present improvements is constructed as follows, (see Figs. 5, 6, and 7 of the drawings:) g^7 represents a continuous cylinder of a length greater than the stroke of the cross-head, which is shown at *c*, and I dispose this cross-head, which is a straight cylin-

drical plunger, within such cylinder, the latter serving as a guide or ways to direct the movements of the cross-head. The yoke V′, connecting the two side piston-rods, passes laterally through slots or openings h^7 in opposite sides of the cylinder, such openings serving to admit air to the central portion of such cylinder g^7. The ends of the cylinder g^7 are closed and receive alternately opposite ends of the cross-head *c*, thereby offering the requisite resistance to the propeller-shaft as it reverses its motion.

To vary the effective length of each dash-pot as occasion may require, I employ a straight horizontal pocket or chamber, i^7, formed in a boss, j^7, cast upon the outside of each end of the cylinder g^7, the outer end of each chamber or pocket, i^7, being closed, and each containing a cylindrical plunger or valve, k^7, operating with a series of holes or ports, l^7 l^7, or a slot leading from the chamber i^7 to the interior of the cylinder g^7. By means of the ports l^7 and the plunger k^7 the effective length of each dash-pot may be varied, as by moving said plunger to cover or uncover more or less of the said ports the air-tight space within each end of the cylinder g^7 is increased or diminished in length. If the engine is laboring hard, a portion of the ports l^7 may be uncovered, thereby admitting more air and offering less resistance to the entrance of the cross-head, and vice versa, if the engine is running too fast.

I do not confine myself to the pockets i^7, ports l^7, and plunger k^7 as a means of varying the capacity of each dash-pot, as these may be varied to a considerable extent without involving more than the ordinary skill of a mechanic. For instance, in lieu of said chambers or pockets and the plungers contained in them, a simple gate applied to the outside of the cylinder and sliding in suitable guides may be employed to regulate the ports l^7.

To operate each plunger k^7, I employ an upright shipper-bar, M^7, pivoted to the upper exterior part of the cylinder g^7, the lower end of such bar being pivoted to said plunger, while its upper end serves as a handle. The nut or slotted head N^5 for operating the spiral blade or bar M^5 is in my present machine secured to the upper part of a yoke, o^7, the pendent arms p^7 p^7 of which straddle the cylinder g^7 and are secured to horizontal arms q^7 q^7, projecting laterally from the cross-head or plunger *c*, as shown in Fig. 5 of the drawings.

In order that each cam a^7 b^7 may crowd its way beneath the yoke c^7 by lifting the latter as it passes it at each shug of the cam-shaft, I form upon each disk which bears the cam a sloping face or inclined plane, r^7, which extends from the crown of the cam to the periphery of the disk, as shown in Figs. 2 and 3 of the drawings.

The subject-matter described as pertaining to the dash-pot will probably form the subject-matter of another application.

In Fig. 9 of the drawings I show a modified construction of the propeller proper. In this modification I dispense with the bar G employed in the first case, and pivot the links *g g* at their outer ends to the edges of the blades *e e*, as before, the inner ends of such links being pivoted to the ends of the cross-head *d* in lieu of to the bar G. The hinge of the blades is secured to the outer extremity of the center rod or shaft, *a*. In this case the opening of the blades is effected by pushing out the central shaft, *a*, with the hinge of the blades, while the outer shaft, D, remains stationary. In folding the blades the reverse takes place, the center rod or shaft, *a*, remains stationary, and the outer moves over it and folds the blades.

I claim—

1. In a propeller, the combination of a reciprocating propeller-shaft and blades with a rotary cam-shaft actuated by said propeller-shaft through intervening mechanism, and provided with a pair of cams, a sliding yoke reciprocated by said cams, and a piston operated by said yoke and caused to open and close alternately the live-steam port and exhaust-port of a cylinder which drives said propeller-shaft.

2. The spiral shaft M^5, in combination with cam-shaft g^4, having a sleeve-and-spline attachment thereto, and a piston reciprocated by cams on said shaft g^4 to alternately open and close the live-steam port and exhaust-port of a cylinder for operating the propeller-shaft which drives said spiral shaft, substantially as set forth.

3. The cams a^7 b^7, each provided with an inclined face, r^7, in combination with the yoke c^7, arranged to be lifted by said inclined planes, as stated, and longitudinally reciprocated by said cams, the shaft g^4 on which said cams are attached, the propeller-shaft and intervening devices for actuating said cam-shaft, and a valve operated by said yoke to open and close the live-steam and exhaust ports, as set forth.

4. The head or nut N, in combination with the spiral shaft M^5, which it operates, the propeller-shaft and intervening connections for attaching said nut thereto, and the cam-shaft g^4, yoke c^7, and piston D, operating substantially as set forth.

5. A reciprocating propeller-shaft and slotted head or nut carried thereby, in combination with a spiral blade or bar, M^5, on which said head or nut slides, thereby giving reciprocating axial motion to said blade or bar, for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

RICHARD SMITH.

Witnesses:
H. E. LODGE,
F. CURTIS.