

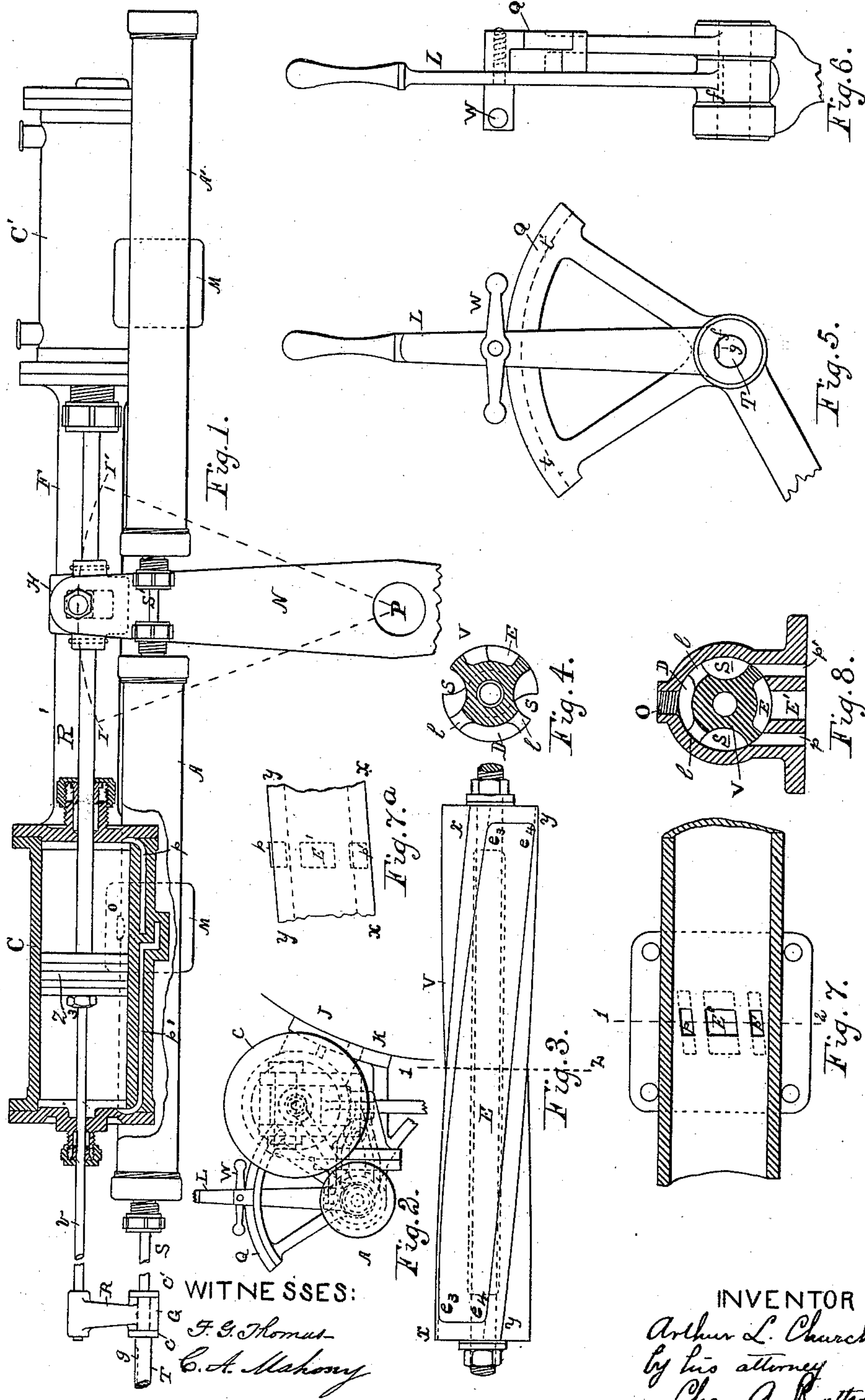
(No Model.)

3 Sheets—Sheet 1.

A. L. CHURCH.  
STEAM REVERSING GEAR.

No. 330,959.

Patented Nov. 24, 1885.



(No Model.)

3 Sheets—Sheet 2.

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STEAM REVERSING GEAR.

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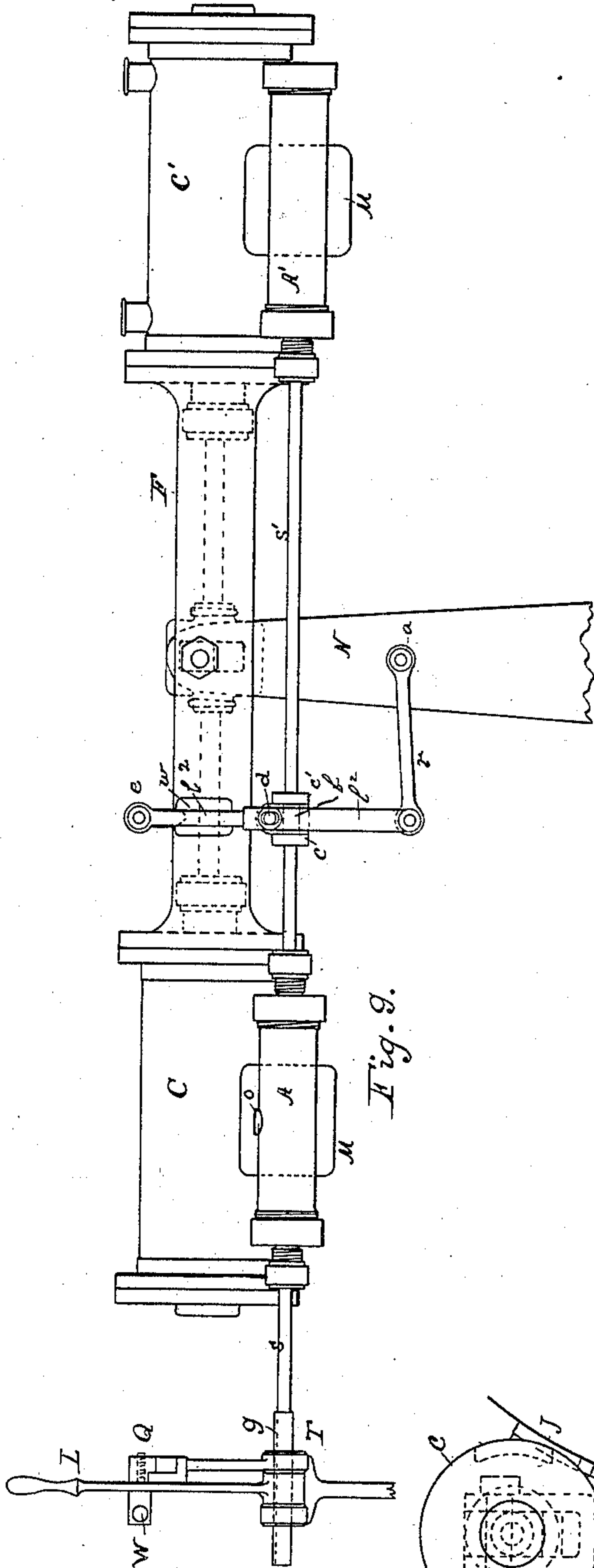


Fig. 9.

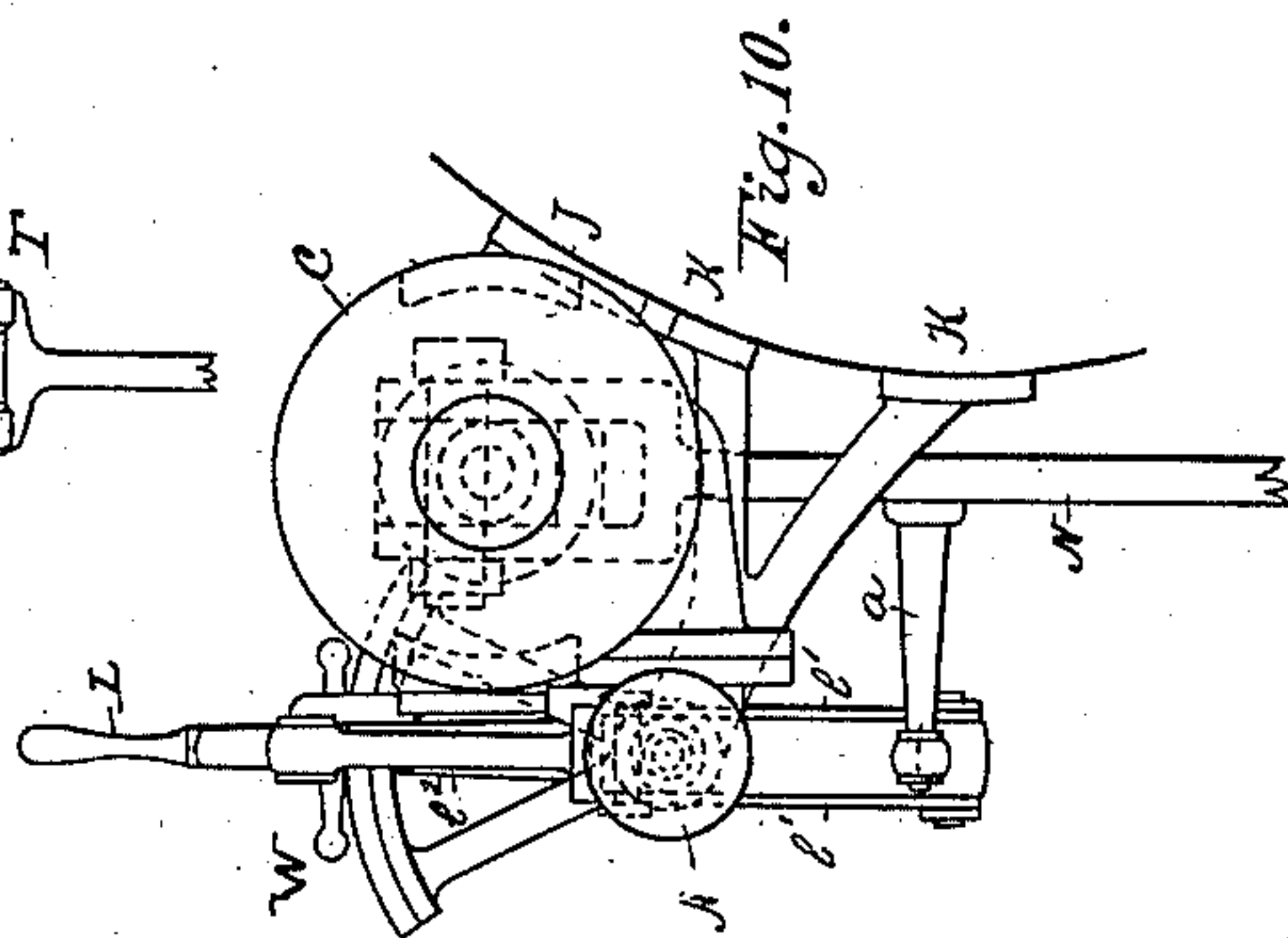


Fig. 10.

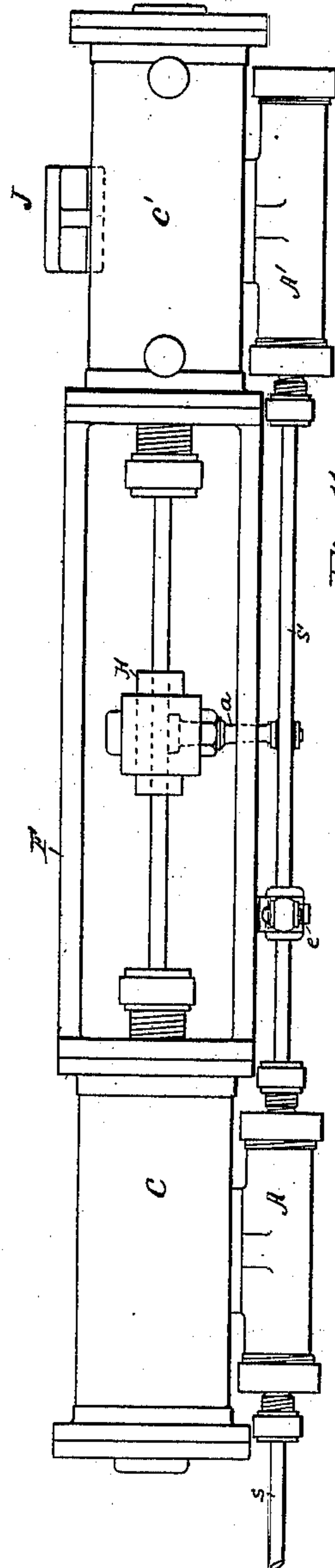


Fig. 11.

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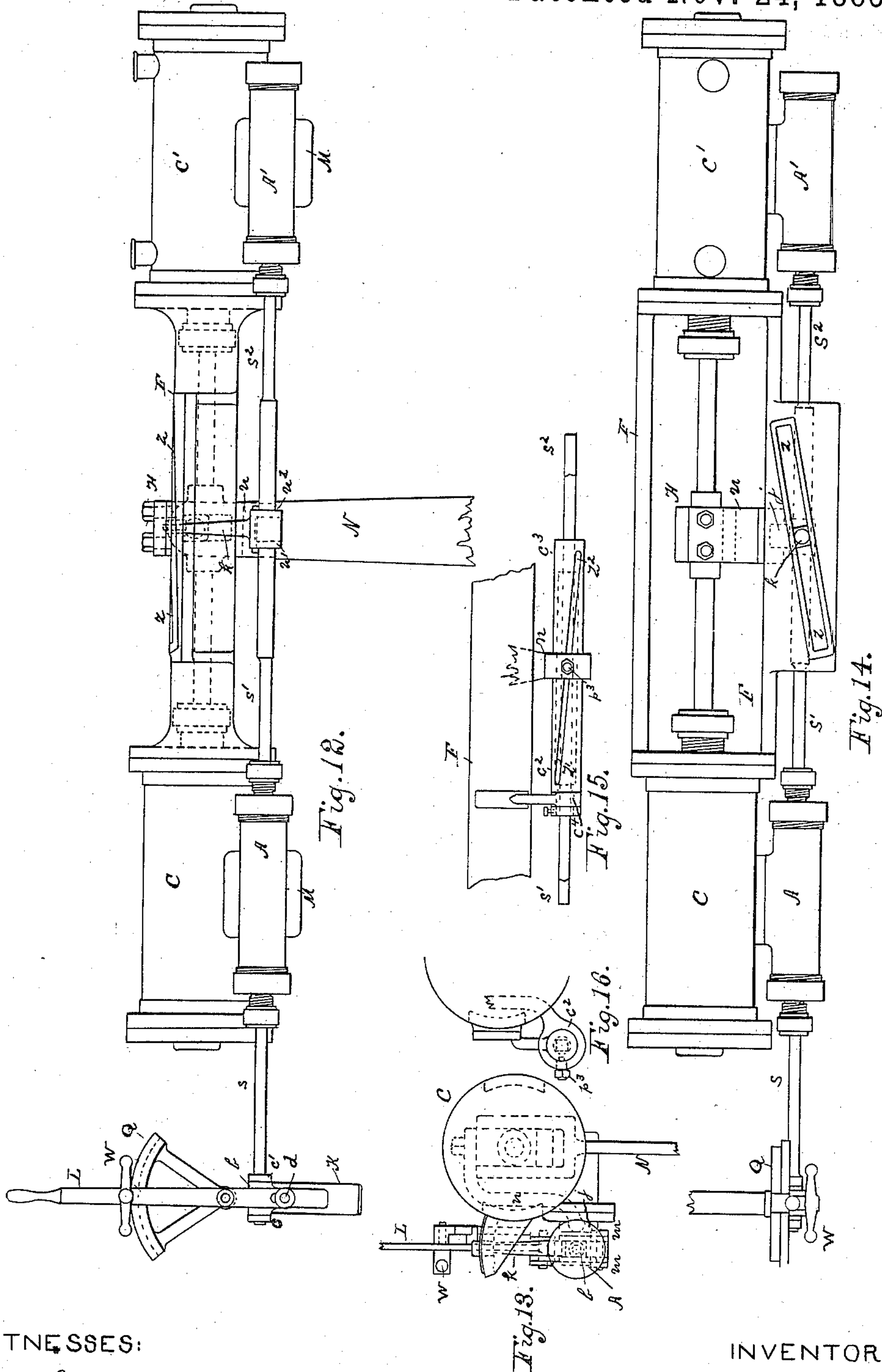
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# UNITED STATES PATENT OFFICE.

ARTHUR L. CHURCH, OF PHILADELPHIA, PENNSYLVANIA.

## STEAM REVERSING-GEAR.

SPECIFICATION forming part of Letters Patent No. 330,959, dated November 24, 1885.

Application filed April 27, 1885. Serial No. 163,663. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR L. CHURCH, a citizen of the United States, and a resident of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Steam Reversing-Gears, of which the following is a specification.

The object of my invention is to furnish an inexpensive, efficient, and simple device for saving labor in reversing locomotive, marine, or stationary engines.

In the accompanying drawings, forming part of this specification, and in which similar letters of reference indicate similar parts throughout the several views, Figure 1 is a side elevation of my reversing-gear as applied to a locomotive-engine, the steam-cylinder being shown in section; Fig. 2, an end view of Fig. 1; Fig. 3, a side elevation of the valves; Fig. 4, a section of the same on line 1 2; Fig. 5, an end view of reversing-lever; Fig. 6, a side view of the same; Fig. 7, a plan of the steam and oil ports; Fig. 7<sup>a</sup>, an expanded view of the steam-ports; Fig. 8, a section of Fig. 7 on line 1 2, with the valve in position; and Figs. 9, 10, 11, 12, 13, 14, 15, and 16, elevations, plans, and end views of modifications of my invention.

C is a steam-cylinder; C', a cataract-cylinder filled with oil, water, or other suitable fluid, the object of which is to act as a dash-pot and clamp; F, a frame connecting the two cylinders; N, an arm pivoted at P, the lower end of which is connected by a link (not shown) to the rocker-shaft of the locomotive, (also not shown.)

A A' are valve-chambers, A being for steam-cylinder, and A' for cataract-cylinder. These chambers are bolted to cylinders C C' by flanges M M, Figs. 1, 9, and 12.

V, Figs. 3, 4, and 8, are the valves, which are similar to each other, except that the exhaust-port E of the cataract-valve is cut through at the ends, in order to allow fluid escaping from one end of the cylinder to flow to the opposite end.

In Figs. 1 and 8 steam is admitted through the opening o, and passes by the channel D, Fig. 8, which extends from end to end of the valve and the cross-channels l l, cut at intervals, to the spaces s s, Figs. 4 and 8. A movement of rotation of the valve will open one of

the steam-ports, p or p', Fig. 8, and allow steam to pass through p or p', Fig. 1, to one end or the other of the cylinder C, at the same time opening the opposite end of the cylinder to exhaust into the atmosphere through E E', Fig. 8, and a suitable chamber in the cylinder-casting, Figs. 1 and 2. It will be noticed that the edges of the valves are not straight lines parallel to the axes, but helices drawn on a cylinder of the same diameter as the valve, the edges being lettered x x, y y, e<sup>3</sup> e<sup>3</sup>, and e<sup>4</sup> e<sup>4</sup>. The valves are both fastened firmly to the same stem, S S', Fig. 1, which passes through the boss G of the arm R, having a free rotary motion in the boss G, and by the collars c c', having the same lateral motion as the arm R, which is securely fastened to the prolongation of the piston-rod v, and has the same motion as the cross-head H and pistons of steam and cataract cylinders. T has cut in it a groove, g, in which the feather f in the foot of the reversing-lever L, Fig. 5, slides, the end T being free to move laterally through the foot of the lever and the base of the quadrant Q. By turning W the reversing-lever may be clamped in any position. By means of the reversing-lever L and the groove and feather a motion of rotation may be given to the valves, and by means of the prolongation v, the arm R, and the collars c c' a motion of translation may be given.

Fig. 7<sup>a</sup> shows an expanded view of the ports p, p', and E', with the edges of the valve x x y y, and by referring to this figure, in connection with others on this sheet, it will be seen that the lever L, Fig. 5, has been moved to the left. The port p, Figs. 1, 7, and 8, is open to steam and p' to exhaust, and the motion of translation of the valves to the left, which will be given by the movement of piston Z<sup>3</sup>, Fig. 1, will close both ports p and p'. A motion then of the lever L from t to t', or vice versa, will give a motion of cross-head from I to I', or vice versa, and any smaller motion between t and t' a correspondingly smaller movement of cross-head H. The reversing-quadrant Q, or the prolongation of valve-stem T, is graduated, and the position of a pointer on the reversing-lever or foot of reversing-quadrant will show whether links are in full forward or full backward motion, or at what position in the main cylinders the steam is cut off.



Fig. 2 shows an end view of the arrangement as bolted to the side of a locomotive-boiler, the reversing-quadrant being bolted by the feet K and the cylinders by the flanges J, Figs. 10 and 2.

The arrangement described above requires that the valve-chambers be twice as long as the stroke of the reversing-engine, and should it be desirable to have them shorter the arrangement shown in Sheet 2 may be used. *b* is a block in which the valve-stem is free to rotate, and through which is a pin, *d*, passing also through the two legs *l' l'*, Fig. 10, of the lever *l'*. In this case the collars *c c'* give the valve-stem the same lateral motion as the pin *d*. A small arm, *w*, which has a bearing, *e*, is bolted to the side of the frame. The link *l'* is pivoted at *e*, and by its connection with rod *r* and arm *a*, Figs. 10 and 11, which projects from the lever N, gives the valves the proper motion of translation. In some cases it may be desirable to have the motion of translation of the valves given by the hand and the rotary motion by the cross-head of the reversing-engine through proper connections. This arrangement is shown in Sheet 3. The foot of the reversing-lever L, Fig. 12, divides into two legs, *m m*, Fig. 13, between which is the block *b*, the rod *s s'* being free, as before, to turn in the block, and the collars *c c'* giving it the same lateral motion as the pin *d* of the reversing-lever. The cross-section of the valve-stem between *s'* and *s*<sup>2</sup> is square and passes through the foot of the arm *k*, the upper end of which slides in the slot Z Z, Fig. 14, said slot being formed in the casting of the frame F. An arm, *n*, Fig. 13, is bolted to the cross-head of the reversing-engine, its lower end having two jaws, *n' n*<sup>2</sup>, Fig. 12, which engage with the lug *j* of the arm *k*. The arm *k* thus travels with the cross-head H, its upper end at the same time moving in slot Z Z, and the valve-stem *s s'* is turned a corresponding amount. To accomplish the same end, the arrangement in Figs. 15 and 16 may be used. The valve-stem between *s'* and *s*<sup>2</sup> has a square

cross-section, as before, and runs through the sleeve *c<sup>2</sup> c<sup>3</sup>*, in which is the slot Z' Z<sup>2</sup>. The arm *n* is bolted to the cross-head, as in the preceding case, and carries the pin *p<sup>3</sup>*, Figs. 15 and 16, which slides in the groove Z' Z<sup>2</sup>, giving the valve the requisite rotary motion. The sleeve *c<sup>2</sup> c<sup>3</sup>* is prevented from moving laterally by the collar *c<sup>4</sup>*, which is bolted to the frame F. The quadrant Q may be graduated, showing the point of cut-off, &c., in the main cylinders.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The herein-described cylindrical valve V, furnished with helical edges *x x*, *y y*, *e<sup>3</sup> e<sup>3</sup>*, *c<sup>4</sup> c<sup>4</sup>*, for the admission and release of steam or other fluids, in combination with the valve-chamber A and cylinder C, substantially as set forth.

2. In a steam reversing-gear, the combination of the steam-cylinder C and cataract-cylinder C' with lever N, cross-head H, piston-rod R, prolongation of piston-rod *v*, arm R', boss G, collars *c c'*, reversing-lever L, quadrant Q, valve-stem T *s s'*, valves V, and chambers A A', substantially as set forth.

3. In a steam reversing-gear, and as a device for reducing the lateral motion of the valves, the arm *w*, the levers *l' r*, and arm *a*, in combination with block *b*, pin *d*, and collars *c c'*, substantially as described.

4. In a steam reversing-gear, the combination of the reversing-lever L with quadrant Q, block *b*, pin *d*, collars *c c'*, valve-stem *s s'*, valves V, chambers A A', arm *k*, slot Z Z, lug *j*, and arm *n*, substantially as described, and for the purposes set forth.

5. In a steam reversing-gear, the combination of the reversing-lever L with quadrant Q, block *b*, pin *d*, collars *c c'*, valve-stem *s s'*, valves V, chambers A A', sleeve *c<sup>2</sup> c<sup>3</sup>*, slot Z' Z<sup>2</sup>, pin *p<sup>3</sup>*, arm *n*, and collar *c<sup>4</sup>*, substantially as described, and for the purposes set forth.

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