

(No Model.)

2 Sheets—Sheet 1.

H. H. WESTINGHOUSE.

STEAM ENGINE.

No. 322,334.

Patented July 14, 1885.

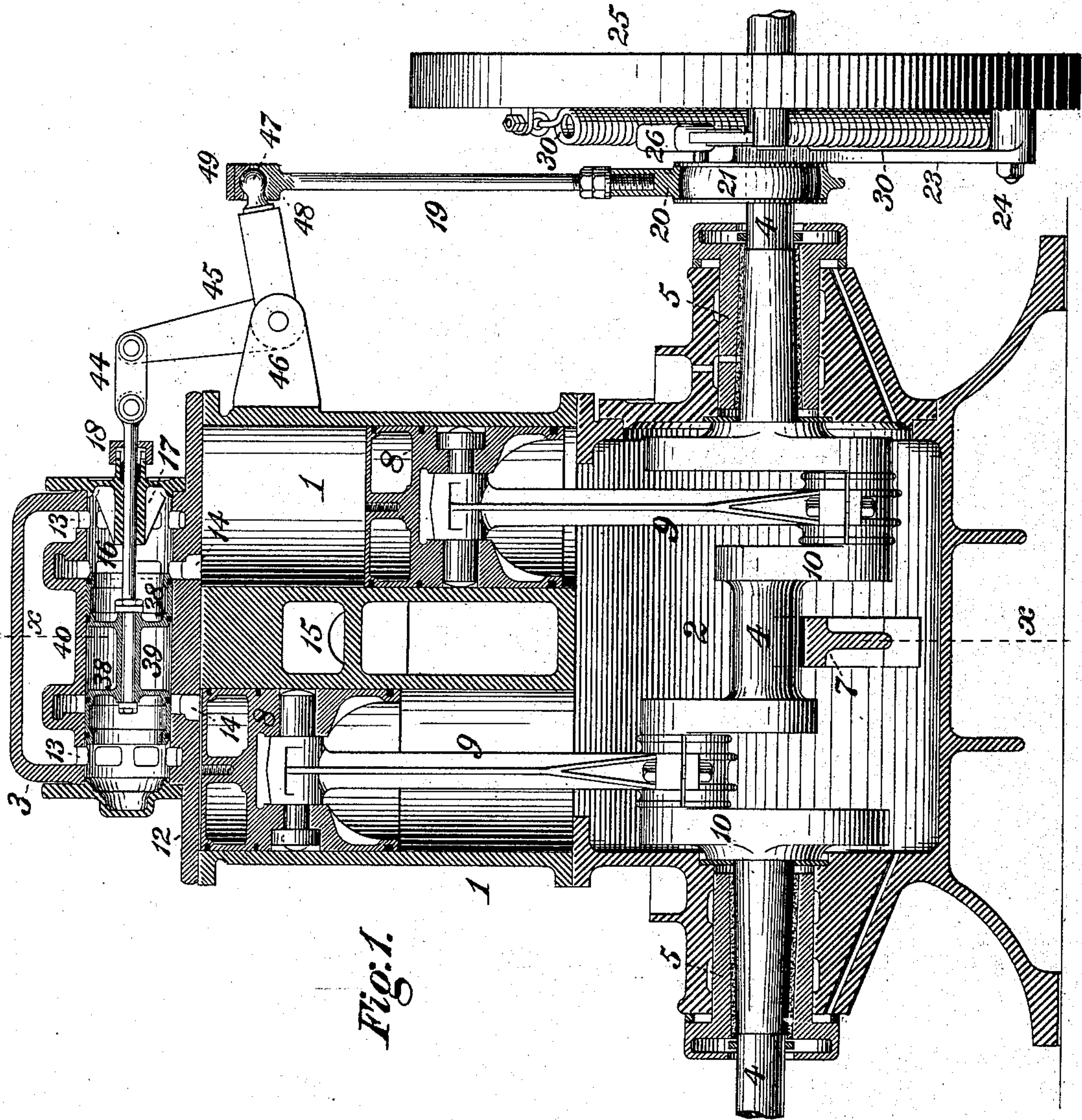


Fig. 1.

WITNESSES:

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E. M. Clarke.

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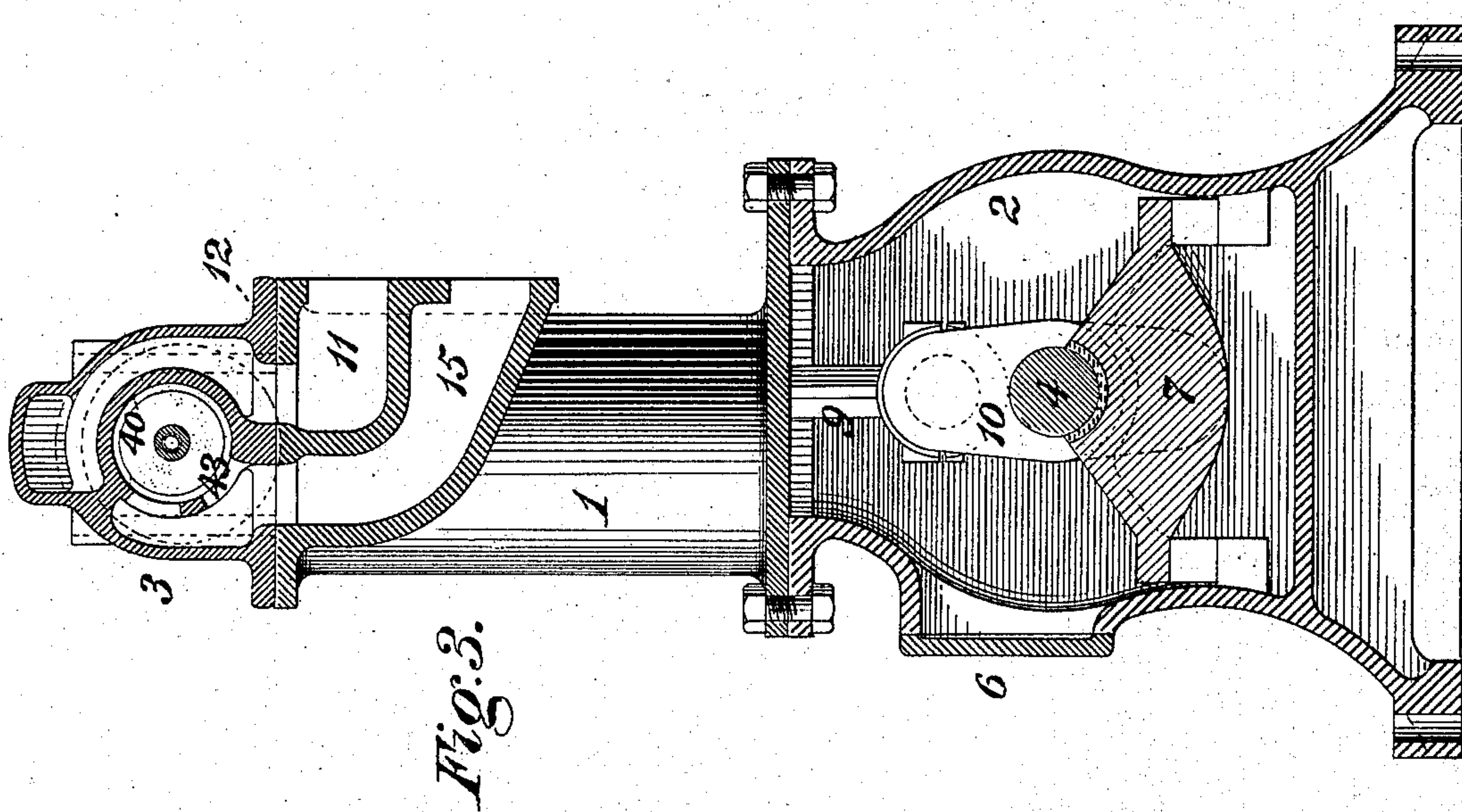


Fig. 3.

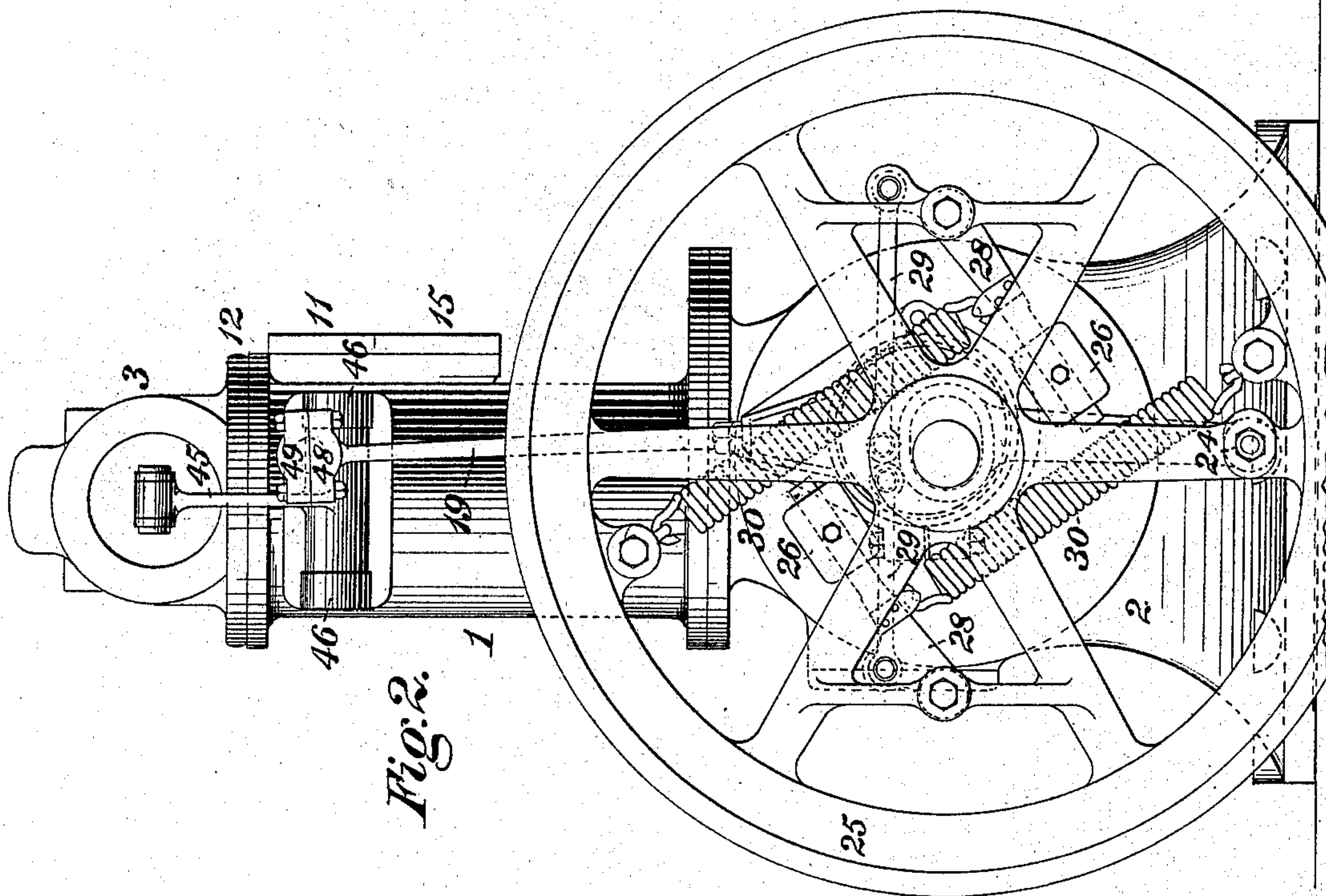


Fig. 2.

WITNESSES:

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UNITED STATES PATENT OFFICE.

H. HERMAN WESTINGHOUSE, OF NEW YORK, N. Y., ASSIGNOR TO THE
WESTINGHOUSE MACHINE COMPANY, OF PITTSBURG, PA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 322,334, dated July 14, 1885.

Application filed May 12, 1885. (No model.)

To all whom it may concern:

Be it known that I, H. HERMAN WESTINGHOUSE, residing at New York, in the county of New York and State of New York, a citizen of the United States, have invented or discovered certain new and useful Improvements in Steam-Engines, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a vertical longitudinal central section through a steam-engine embodying my invention; Fig. 2, an end view in elevation of the same, as seen from the right; and Fig. 3, a vertical transverse section at the line *x x* of Fig. 1.

My invention more particularly relates to the type of engines having one or more single-acting cylinders whose pistons are connected to the crank-pins of a crank-shaft, which rotates within a closed case, serving as the bed or support of the engine, and also as a tank or receptacle for lubricating material, instances of which are exemplified in my Letters Patent Nos. 240,482 and 303,083, dated April 19, 1881, and August 5, 1884, respectively.

The object of my invention is to provide a simple, effective, and inexpensive engine adaptable either to stationary or marine service, which shall occupy a comparatively small compass, and enable the advantages of an automatic cut-off to be attained by mechanism which is free from complication or liability to derangement and readily accessible for desired renewal or repair.

To this end my improvements consist in certain novel devices and combinations herein-after fully set forth.

In the practice of my invention one or more single-acting cylinders, 1 1, (in the instance shown two being employed,) are secured upon the top of a closed crank-case, 2, which serves as the bed or support of the engine, and also as a tank or receptacle for the lubricating material of the crank-pins and the journals of the crank-shaft 4, which rotate in bearings 5 5, secured in the ends of the case 2.

Access to the cranks may be had, when required, by the removal of a bonnet, 6, on the side of the crank-case, and additional support is afforded to the crank-shaft by a center bearing, 7. The cylinders 1 1 are open at their

lower ends, and are fitted with long pistons 8 of the trunk class, which are coupled by connecting-rods 9 9 with crank-pins set oppositely, or at an angle of one hundred and eighty degrees, upon a pair of double cranks, 10 10, on the crank-shaft 4.

So far as above set forth the construction of the engine accords generally with that of my Letters Patent aforesaid, and is not, therefore, claimed as of my present invention.

Steam is admitted to and exhausted from the cylinder-spaces above the pistons 8 by a main or distribution valve, which is preferably, as shown, of the piston type, and is fitted to reciprocate longitudinally of the engine in a valve-chest, 3, formed upon or secured to a cap-plate, 12, which closes and forms the heads of the upper ends of the cylinders 1 1. In the instance illustrated the distribution-valve is composed of a pair of suitably-packed pistons, 38, connected by a body, 39, secured upon a valve-stem, 16, passing through a long guide, 17, and packed stuffing-box 18 in one of the heads of the valve-chest, the valve-pistons fitting accurately within a cylindrical casing, 40, in the chest. Steam is admitted to the valve-chest through an inlet or supply pipe, 11, cored in the cylinder-casting between the cylinders, and passes from the chest into the valve-casing 40 through ports 13 therein. In the traverse of the valve the steam which enters the casing 40 is supplied to the cylinders through ports 14 in the head or cap plate 12 of the cylinders as said ports are alternately placed by the valve in communication with the casing-ports 13, and is exhausted through the ports 14 into the space between the valve-pistons 38, from which it passes through a port, 43, in the casing 40 into the exhaust-pipe 15, which is cored in the cylinder-casting below and adjoining the steam-pipe 11.

It will be obvious that if desired the valve-chest may be located upon the side of the cylinder, in lieu of upon the cap-plate, as shown, in which case the ports 14 would pass through the shells of the cylinders into the upper end thereof, instead of being formed in the cap-plate.

Movement is imparted to the main valve by an eccentric, 21, which is fitted freely upon the crank-shaft 4, adjacent to the outer

end of one of the bearings 5 of said shaft, and is adapted to be moved transversely to said shaft, with which it rotates, so as to cut off steam from the pistons at earlier or later periods of their stroke by correspond-
 5 ingly varying the travel of the main valve 38 39, the variations of position of the eccentric being effected by a centrifugal governor or regulator fixed upon the crank-shaft adjacent
 10 to the eccentric.

The governor herein illustrated, which is not, *per se*, claimed herein, consists of a system of weighted arms and springs, which are supported upon a fly-wheel or pulley, 25, fixed
 15 to the crank and acting as a governor-disk in addition to the performance of its ordinary function. An arm, 23, on the eccentric 21, is pivoted to a pin, 24, on the governor-disk, and the eccentric is coupled by links 29 to arms
 20 28, pivoted to the disk 25, and carrying weights 26 at or near their free ends. The requisite centripetal action is provided by springs 30, coupled at opposite ends to the weight-arms and to the disk, respectively.

The valve-stem 16 is connected by a link, 44, to the upper arm of a bell-crank or angle lever, 45, journaled in bearings 46 on the side
 25 of the cylinder nearest the eccentric, and the lower arm of the bell-crank 45 is coupled by a ball-and-socket joint to the eccentric-rod 19,
 30 said joint being composed of a ball or spherical enlargement, 47, on the end of the bell-crank arm, and a socket of corresponding form recessed in the head 48 of the eccentric-rod
 35 and in a cap, 49, secured thereto. The incident longitudinal vibration of the eccentric-rod is provided for either by pivoting the rod to the eccentric-strap 20 or by turning the eccentric to the form of a spherical zone,
 40 as shown, and correspondingly recessing the eccentric-strap.

In lieu of actuating the main valve by an eccentric, which is varied in position relatively to the crank line by a centrifugal governor
 45 regulator, as above described, the governor-may, in engines designed for marine or other service in which its employment may not be deemed essential or desirable, be dispensed

with, and the valve be actuated either by a fixed eccentric having its rod coupled, as set
 forth, by a universal joint to the bell-crank, an eccentric provided with means for chang-
 ing its position for the purpose of reversing the movement of the engine, or a link-motion,
 or other mechanism for reversing, applied in
 55 connection with a pair of fixed eccentrics.

Such minor variations of structure being within the ability of those skilled in the art to which my invention relates, and not constituting, *per se*, part of the same, need not be
 60 herein at length described.

I claim herein as my invention—

1. The combination of one or more single-acting cylinders, each having its piston coupled to a crank-pin upon a shaft fitted to rotate in a
 65 closed crank case or receptacle, a main or distribution valve adapted to reciprocate longitudinally to the cylinders in a valve-chest communicating therewith by ports opening into
 70 their upper ends, an eccentric located upon the shaft exterior to the crank-case, and a bell-crank or angle lever having one of its arms connected to the valve-stem and the other coupled by a universal joint to the rod of the
 75 eccentric, substantially as set forth.

2. The combination of a pair of single-acting cylinders, each having its piston coupled to a crank-pin upon a shaft fitted to rotate in a closed crank case or receptacle, a main or
 80 distribution valve reciprocating longitudinally to the cylinders in a valve-chest communicating therewith by ports opening into their upper ends, a centrifugal governor or regulator fixed upon the crank-shaft exterior
 85 to the crank-case, an eccentric mounted freely on the shaft and coupled to said governor, and a bell-crank or angle lever having one of its arms connected to the valve-stem and the other coupled by a universal joint to the rod
 90 of the eccentric, substantially as set forth.

In testimony whereof I have hereunto set my hand.

H. HERMAN WESTINGHOUSE.

Witnesses:

RICHMOND BREWER,
 ROBERT C. YOUNG.