H. C. HOLM.

DEVICE FOR GOVERNING AND REGULATING STEAM ENGINES.

APPLICATION FILED JULY 27, 1909.

965,904.

Patented Aug. 2, 1910.

3 SHEETS—SHEET 1.

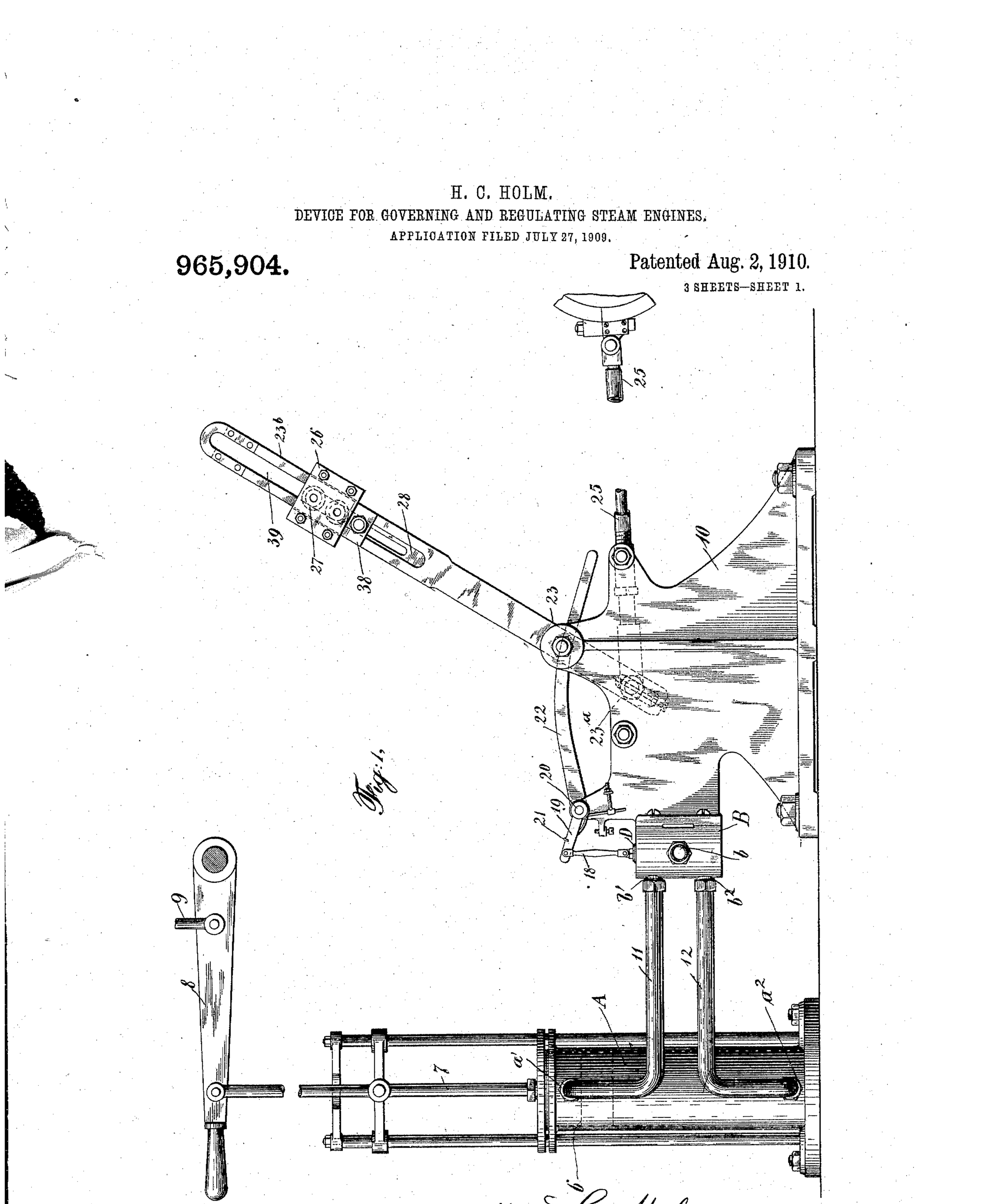

Fig. 1.

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M. A. Helmke

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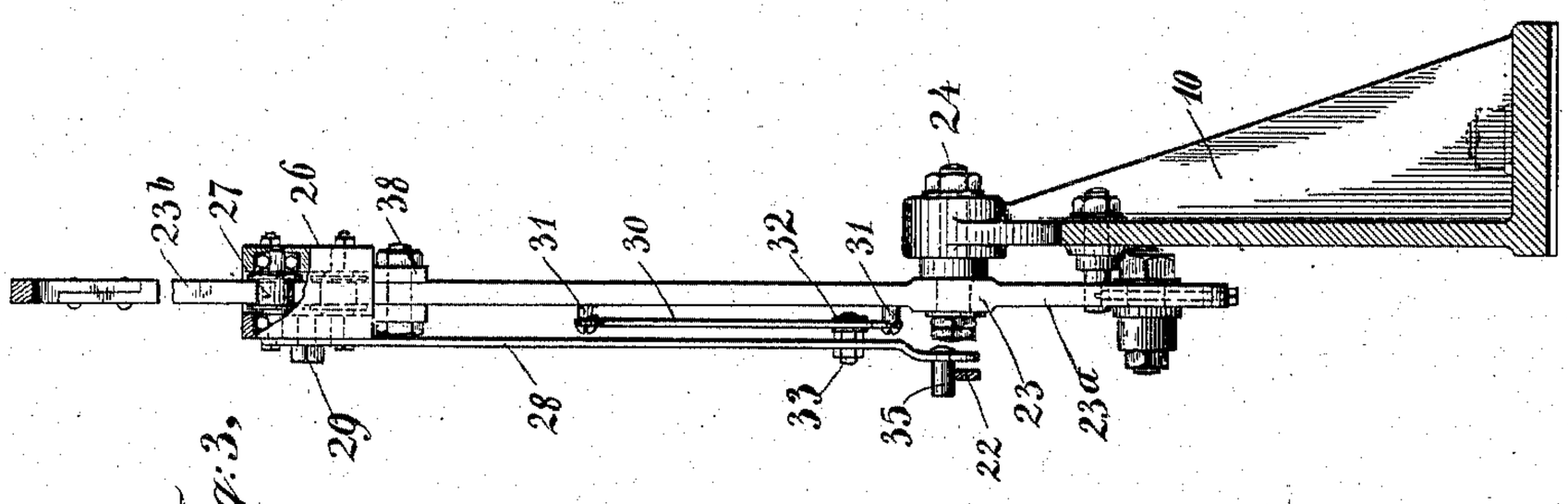

Fig. 3.

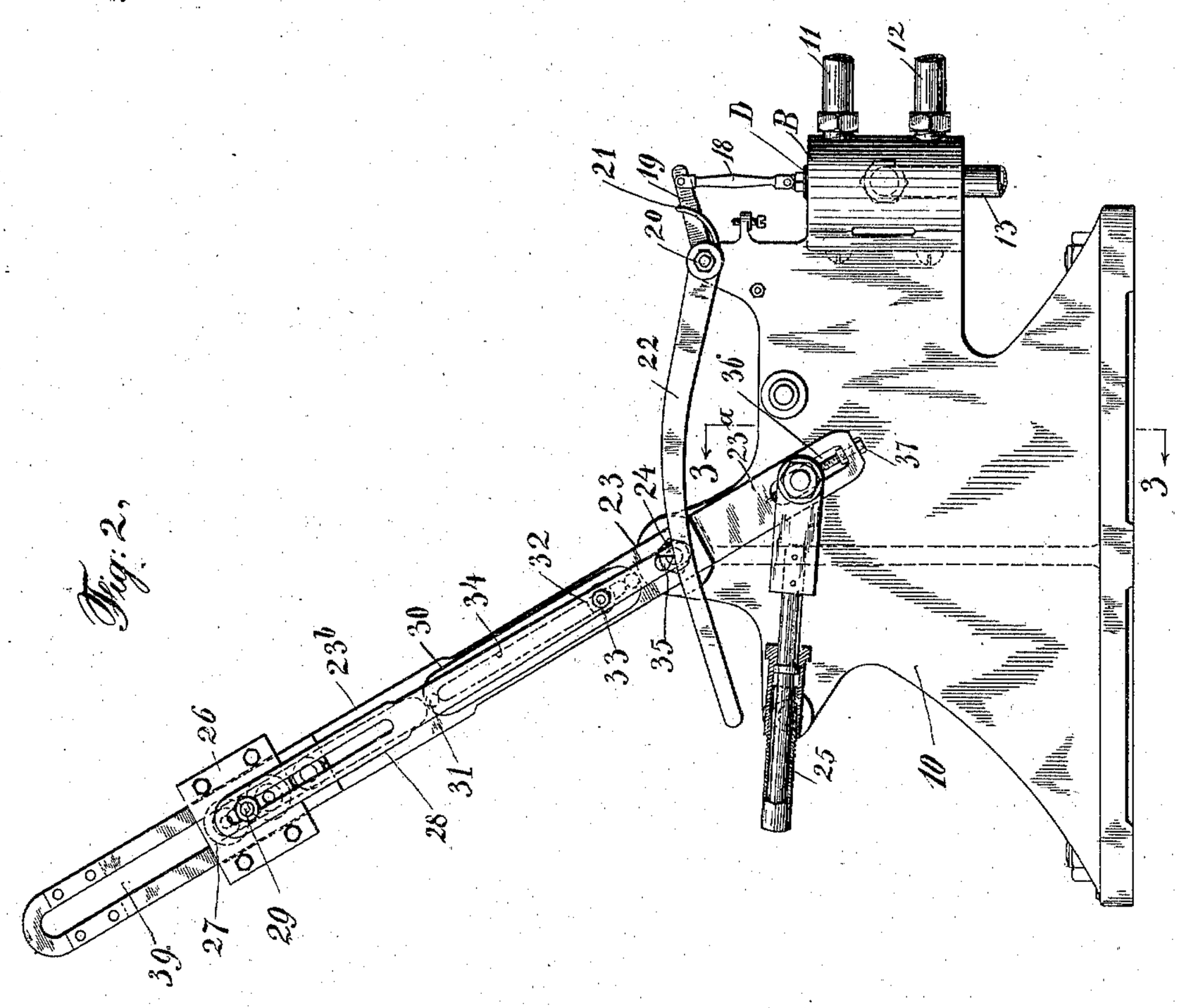

Fig. 2.

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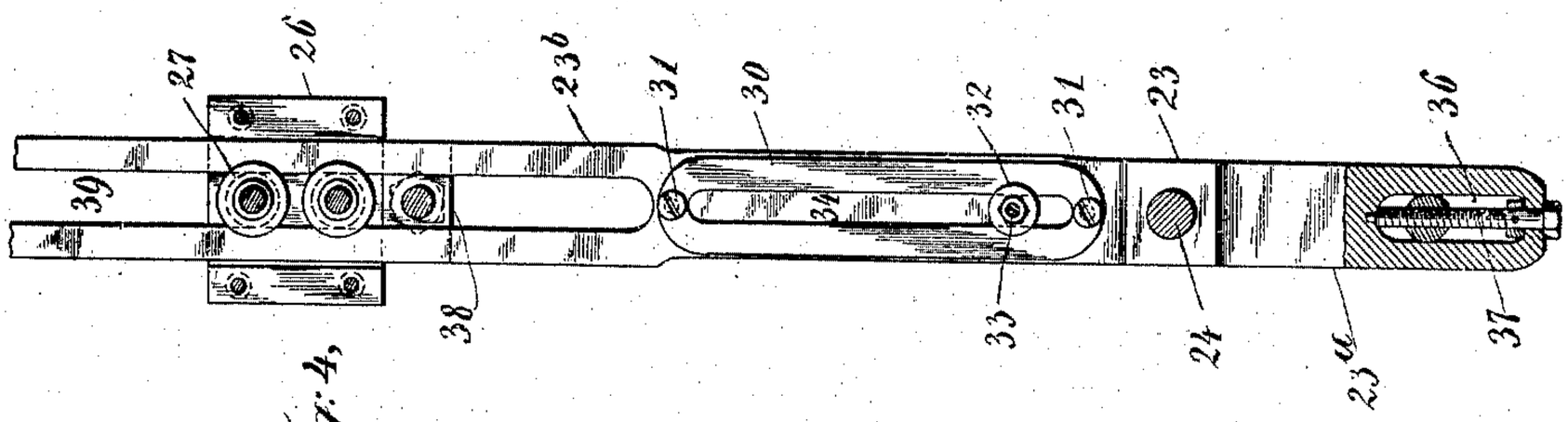


Fig. 4.

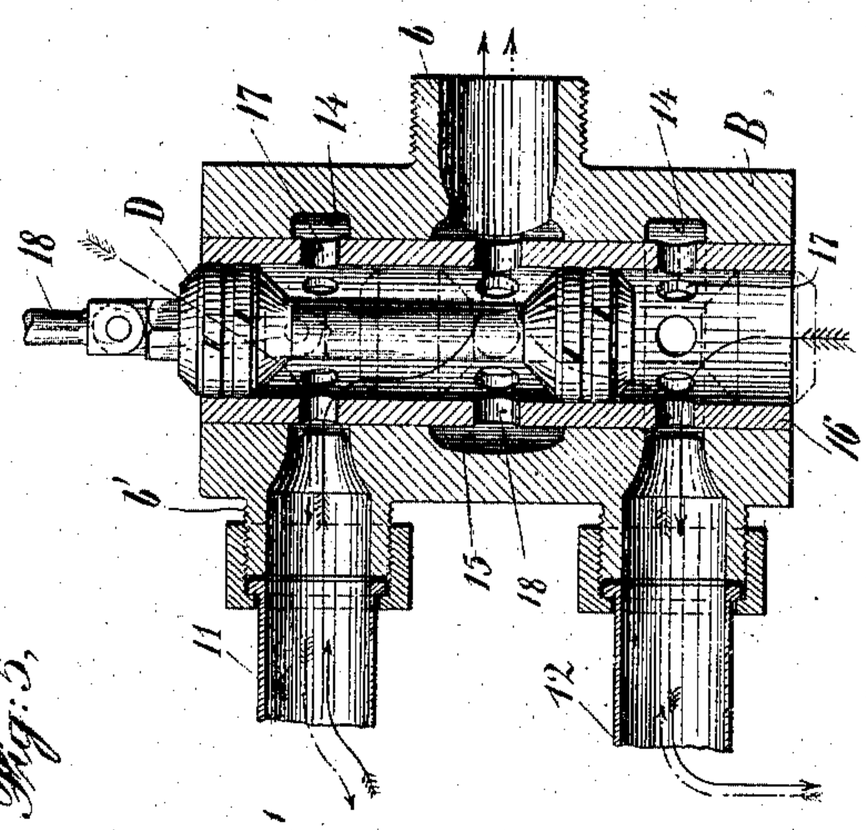
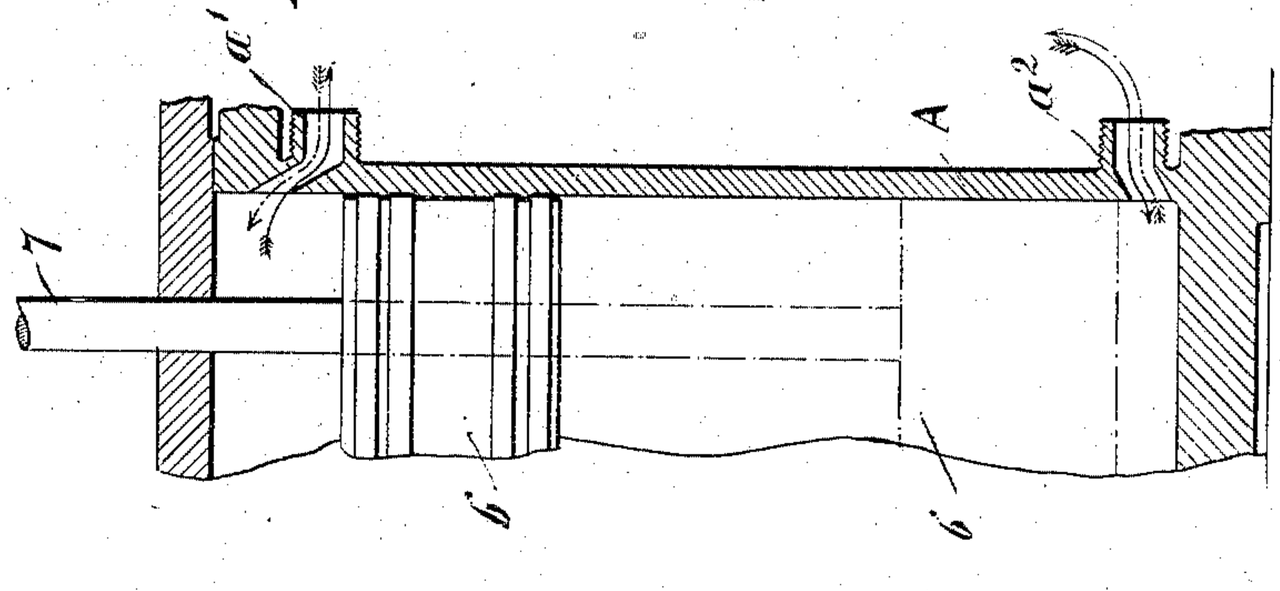


Fig. 5.



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UNITED STATES PATENT OFFICE.

HANS CHRISTIAN HOLM, OF BROOKLYN, NEW YORK.

DEVICE FOR GOVERNING AND REGULATING STEAM-ENGINES.

965,904. Specification of Letters Patent. **Patented Aug. 2, 1910.**

Application filed July 27, 1909. Serial No. 509,804.

To all whom it may concern:

Be it known that I, HANS CHRISTIAN HOLM, a citizen of Denmark, now temporarily residing in Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Devices for Governing and Regulating of Steam-Engines, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings, wherein—

Figure 1 is a front elevation of my improved governing device, set up in operative connection with an engine; Fig. 2 is a rear elevation thereof; Fig. 3 is a fractional side view, partly sectional view, on line 3—3, indicated in Fig. 2, looking to the left; Fig. 4 is a fractional front view of the device, oscillating lever, with the front part of the weight block and the rod removed; Fig. 5 is an elevation, partly longitudinal sectional view, of the piston cylinder and of the valve casing (the valve casing and valve being drawn on a larger scale than the cylinder and the piston, and the port (*b*), connecting the valve casing with the condenser, being shown shifted 90° to the right) showing the piston and the valve in their "normal" positions, that is, when the engine runs at its normal speed, in full lines; their respective positions, when the device acts, being indicated in dotted lines.

My invention relates to devices for governing or regulating the speed of engines, or "to prevent racing," as it is termed, when the load thereon is diminished, and the device embodying my invention, while designed with particular regard for use on marine engines, to prevent the racing of the propeller, is, however, as well adapted for use with other steam engines.

In the drawings illustrating my device, in connection with an ordinary marine engine, the reference letter A designates the cylinder wherein the piston 6 is reciprocated; the piston-rod 7 is pivotally connected to the oscillating lever 8, and the latter by rod 9, to the throttle valve. The valve casing B is mounted on the standard 10. On one side of the casing are two ports b' and b^2 connected by conduits 11 and 12 respectively with the ports a' and a^2 located one on each end of the cylinder A. Port *b*, located on the other side of the valve casing, is connected, by the conduit 13, with the condenser of the engine. The interior arrangement of the valve casing is shown in Fig. 5. The annular enlargements 14 and 15 are provided to facilitate a more rapid communication of the air through the conduits and the casing of the valve; and the bushing 16, which is provided with perforations 17 and 18, communicating with the annular enlargements 14 and 15, serves to facilitate a more exact fitting and consequently, more reliable operation of the valve. Valve D is made in the shape of a double-headed piston, the distance between the longitudinal centers of its heads, being equal to the distance between the centers of ports b' and b^2, (openings 17 in the bushing 16) and their length slightly in excess of the diameters of the openings 17, to insure safe and effective closing thereof. In the position of valve D, shown in Fig. 4 in full lines, the port *b*, connecting with the condenser, is connected with the port b', connecting with the port a' of the cylinder. Consequently, in this position of the valve, the air is exhausted into the condenser from the cylinder A above, and is admitted to the space of the cylinder underneath, the piston 6 through the lower open end of the valve casing B, the port b^2, conduit 12 and port a^2 of the piston cylinder.

Valve D is connected by stem 18 to the arm 19 of rock-shaft 20. A spiral spring 21, wound around the end of rock-shaft 20, projecting beyond its bearings (not shown in the drawing) and having one end fixed in standard 10, is set to act upon the arm 19, to press the valve down. Its resiliency and extent of action must be sufficient to drive the valve, when released from the counter-balancing action of the device hereinafter more fully described, into the casing, into its position, indicated in dotted lines in Fig. 4. The balancing mechanism, when acting, maintains the valve in the position shown in Fig. 4 in full lines against the action of the spring. On the other end of rock-shaft 20, arm 22 is secured thereto, extending in a direction opposite to that of arm 19, so that these two arms, 19 and 22, and the rock-shaft 20 constitute a double-armed lever, of which rock-shaft 20 is the fulcrum.

Double-armed lever 23 is pivoted on stud 24 secured in standard 10. Its longer arm 23^b is slotted and a block 26 is mounted thereon by means of flanged rollers 27 rotatably set therein, and engaging in the slot 39 of the arm. To insure a smooth, easy

running of the block 26, ball bearings are provided for rollers 27. Rod 28 is fixed to block 26 by screw 29. A slotted guide-plate 30 is affixed to the longer arm 23^b by studs and screws 31, and a guide-roller 32, affixed to rod 28 by stud and screw 33, engages in the slot 34 of guide-plate 30. Rod 28 extends from block 26 to arm 22 affixed to rock-shaft 20 and in its end, adjoining arm 22, stud 35 is set projecting over arm 22 at right angle thereto. Stud 35 rests normally on arm 22 and the weight of block 26 is calculated to counterbalance the spring 21, acting on valve D, as above explained. The shorter arm 23^a of lever 23 is connected by rod 25 to the eccentric of the engine, and thus lever 23 is oscillated synchronously with the running of the engine. The connection is made adjustable, for which purpose slot 36 and set-screw 37 are provided. A set block 38 is adjustably secured in slot 39 of arm 23^b, to limit the drop of block 26. When my improved device is used to regulate rapidly rotating engines, a stop device, similar to set block 38 may be set in the other end of slot 39 of arm 23^b, to limit the motion of block 26 in that direction. These accessories are provided to permit such an adjustment of the device as changes in speed or load upon the engine require, to maintain valve D steadily in its position, shown in full lines in Fig. 5, in which the device exerts no action upon the throttle valve. This regulating device acts almost instantaneously, when the engine starts to revolve at a more rapid rate of speed than intended. At the first stroke of such more rapid motion, the equilibrium between the block 26 and the spring 21 is disturbed, block 26 being driven by centrifugal force toward the end of the longer arm 23^b of lever 23. Rod 28, being affixed to block 26, is thereby withdrawn from arm 22 and spring 21, being thus released from the counterbalancing action of block 26, re-acts instantaneously, depressing arm 19, and thereby moving valve D to or near the position indicated in dotted lines in Fig. 4. Then the connection of the port a' through conduits 11 and 13 with the condenser of the engine is closed, its connection with the atmospheric air, and also the connection of port a^2 of the cylinder through conduits 12 and 13 with the condenser opened, the air supporting the piston 6, in its position, holding the throttle valve open, is exhausted and the pressure of air, admitted to the cylinder A in the space above the piston 6, causes it to descend almost instantaneously. The descending motion of the piston is communicated to lever 8, operating the throttle valve, by rod 7, thereby closing the throttle valve and cutting off the steam supply for the engine.

My improved device may also be used on engines not provided with a condenser, in which event, a vacuum pump could be used as a substitute for the condenser, or compressed air could be used for operating piston 6, in which event the connection between ports b' and b^2 of the valve casing and ports a' and a^2 of the piston cylinder would have to be reversed.

I claim as my invention:

1. A device for automatically operating the throttle valve of an engine, comprising a cylinder with ports on each end thereof, a piston, movably fitted in the cylinder, and means for operatively connecting the piston with the throttle valve; an exhauster; a valve casing, ports in the valve casing; separate conduits, one from each of the ports of the cylinder to one port of the valve casing, and one from the valve casing to the exhauster; a valve movably fitted in the valve casing and shaped to control, by its position in the casing, the connections of the conduits from the cylinder to the exhauster; means for moving the valve constantly in one direction; and means operatively connected with the running gear of the engine for moving the valve in opposite direction and holding it in position while the speed of the engine does not exceed a predetermined limit, the means ceasing to hold the valve when the engine starts to revolve at a greater than its predetermined speed.

2. A device for automatically operating the throttle valve of an engine, comprising a cylinder with ports on each end thereof, a piston movably fitted in the cylinder, and means for operatively connecting the piston with the throttle valve; an exhauster, a valve casing, ports in the valve casing; separate conduits, one from each of the ports of the cylinder to one port of the valve casing, and one from the valve casing to the exhauster; a valve movably fitted in the valve casing and shaped to control, by its position in the casing, the connections of the conduits from the cylinder to the exhauster; means for moving the valve constantly in one direction; a standard; a rock-shaft mounted thereon, arms fixed to the rock-shaft, one on each end thereof; means for connecting one arm on the rock-shaft with the valve; and means operatively engaging the other arm for moving the valve in opposite direction and holding it in position while the speed of the engine does not exceed a predetermined limit, the means ceasing to hold the valve when the engine starts to revolve at a greater than its predetermined speed.

3. A device for automatically operating the throttle valve of an engine, comprising a cylinder with ports on each end thereof, a piston movably fitted in the cylinder, and means for operatively connecting the piston with the throttle valve; an exhauster, a

valve casing, ports in the valve casing; separate conduits, one from each of the ports of the cylinder to one port of the valve casing, and one from the valve casing to the exhauster; a valve movably fitted in the valve casing and shaped to control, by its position in the casing, the connections of the conduits from the cylinder to the exhauster; means for moving the valve constantly in one direction; a standard; a rock-shaft mounted thereon, arms fixed to the rock-shaft, one on each end thereof; means for connecting one arm on the rock-shaft with the valve; a two-armed lever pivoted on the standard; means for connecting one arm of the lever with the running gear of the engine to oscillate the double-armed lever synchronously therewith; a block slidably mounted on the other arm of the lever, a rod, fixed to the block, and operatively engaging the arm fixed to the rock-shaft.

4. A device for automatically governing the running of an engine at a constant speed, the device comprising a cylinder with ports on each end thereof; a piston fitted in the cylinder, means for connecting the piston with the throttle valve of the engine; a condenser; a valve casing, ports in the valve casing, separate conduits, one from each of the ports of the cylinder, to a port in the valve casing, and a conduit from the valve casing to the condenser; a valve movably fitted in the casing adapted to control the connections of the conduits from the cylinder to the condenser; means for moving the valve constantly in one direction; a standard, a rock-shaft mounted thereon, arms fixed on the rock-shaft, one on each end thereof; means for connecting one arm on the rock-shaft with the valve; a two-armed lever pivoted to the standard; a rod connecting one arm of the double-armed lever with the running gear of the engine so as to oscillate the lever synchronously therewith; a block slidably mounted on the other arm of the lever, a rod, fixed to the block, and operatively engaging the arm fixed to the rock-shaft.

5. A device for automatically operating the throttle valve of an engine, comprising a standard; a rock-shaft mounted thereon, arms fixed to the rock-shaft, one on each end thereof; means for operatively connecting one arm on the rock-shaft with the valve; a spring set to move the valve constantly in one direction; a two-armed lever pivoted on the standard; means for connecting one arm of the lever with the running gear of the engine to oscillate the two-armed lever synchronously therewith; a block slidably mounted on the other arm of the lever, a rod fixed to the block and operatively engaging the arm fixed to the rock-shaft.

6. Mechanism for automatically actuating a valve by variations in the speed of an engine, the mechanism comprising means for moving the valve constantly in one direction; a standard; a rock-shaft mounted thereon, arms fixed to the rock-shaft, one on each end thereof; means for connecting one arm on the rock-shaft with the valve; a two-armed lever, pivoted on the standard; means for connecting one arm of the lever with the running gear of the engine to oscillate the two-armed lever synchronously therewith; a block slidably mounted on the other arm of the lever, a rod fixed to the block and operatively engaging the arm fixed to the rock-shaft.

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