

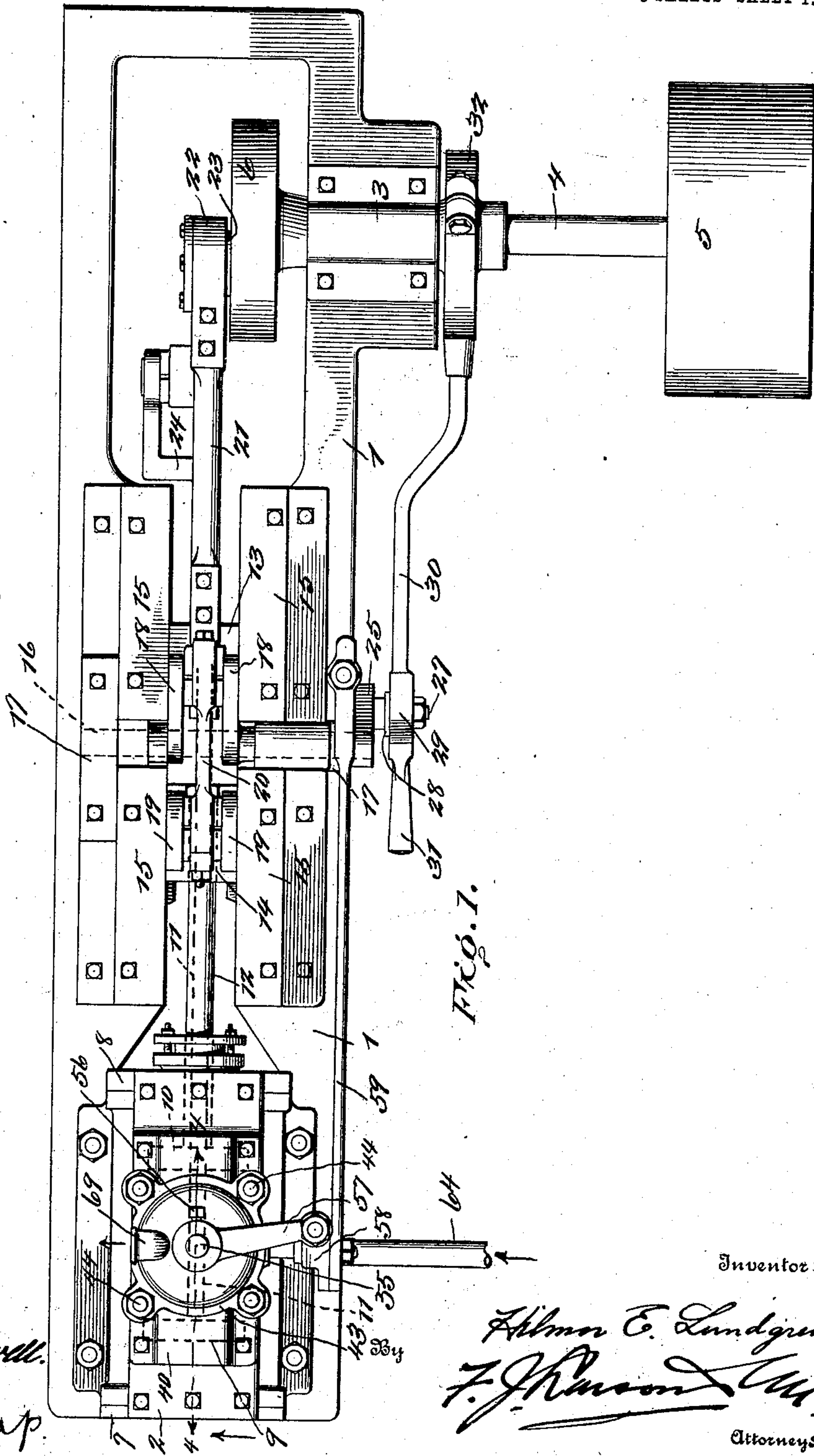
No. 889,703.

PATENTED JUNE 2, 1908.

H. E. LUNDGREN.
STEAM ENGINE.

APPLICATION FILED JULY 1, 1907.

5 SHEETS—SHEET 1.



Witnesses:

R. A. Powell.

A. V. Reap.

Inventor:

Hilmer E. Lundgren
F. J. Hanson

Attorneys

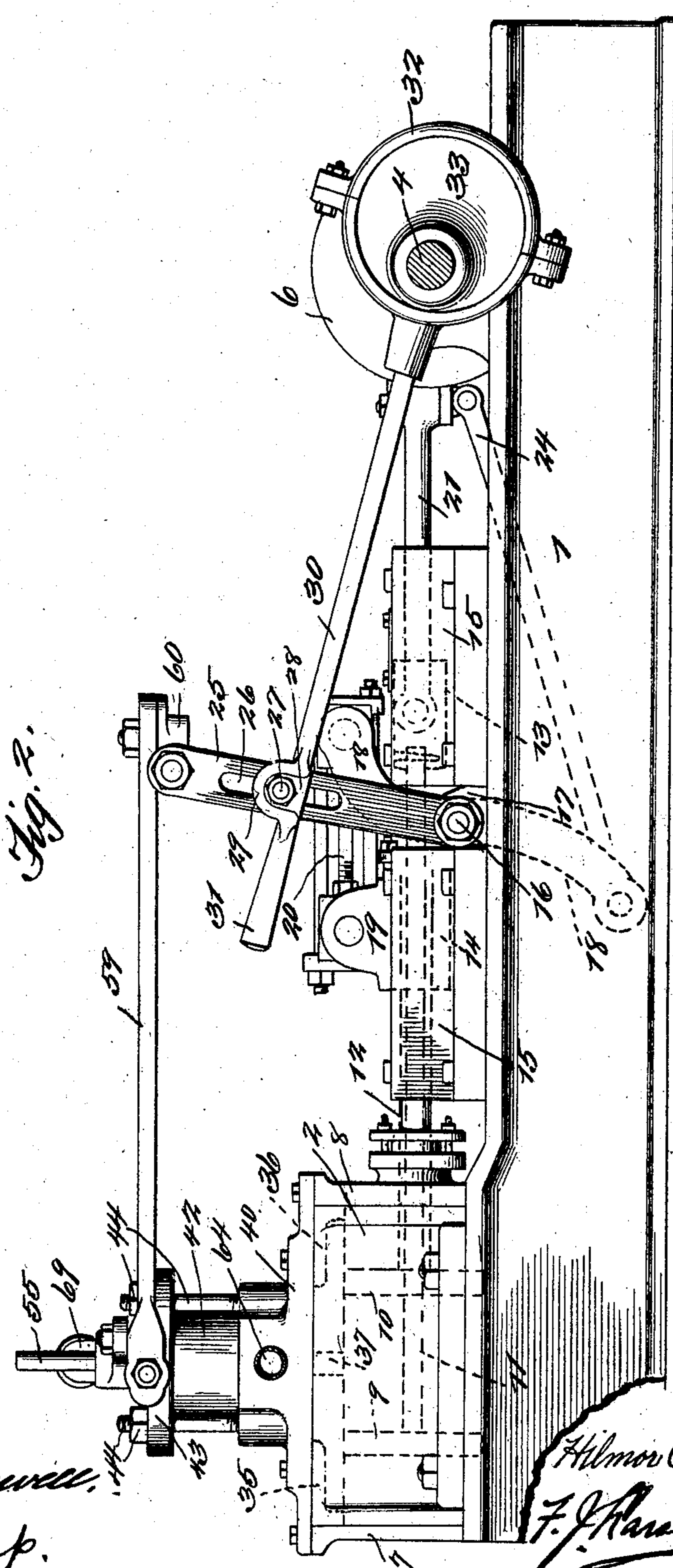
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6 SHEETS—SHEET 2.



Witnesses

R. A. Brown.

H. V. Reep.

Inventor:

Hilmer C. Lundgren.

F. J. Hanson & Co.

Attorneys

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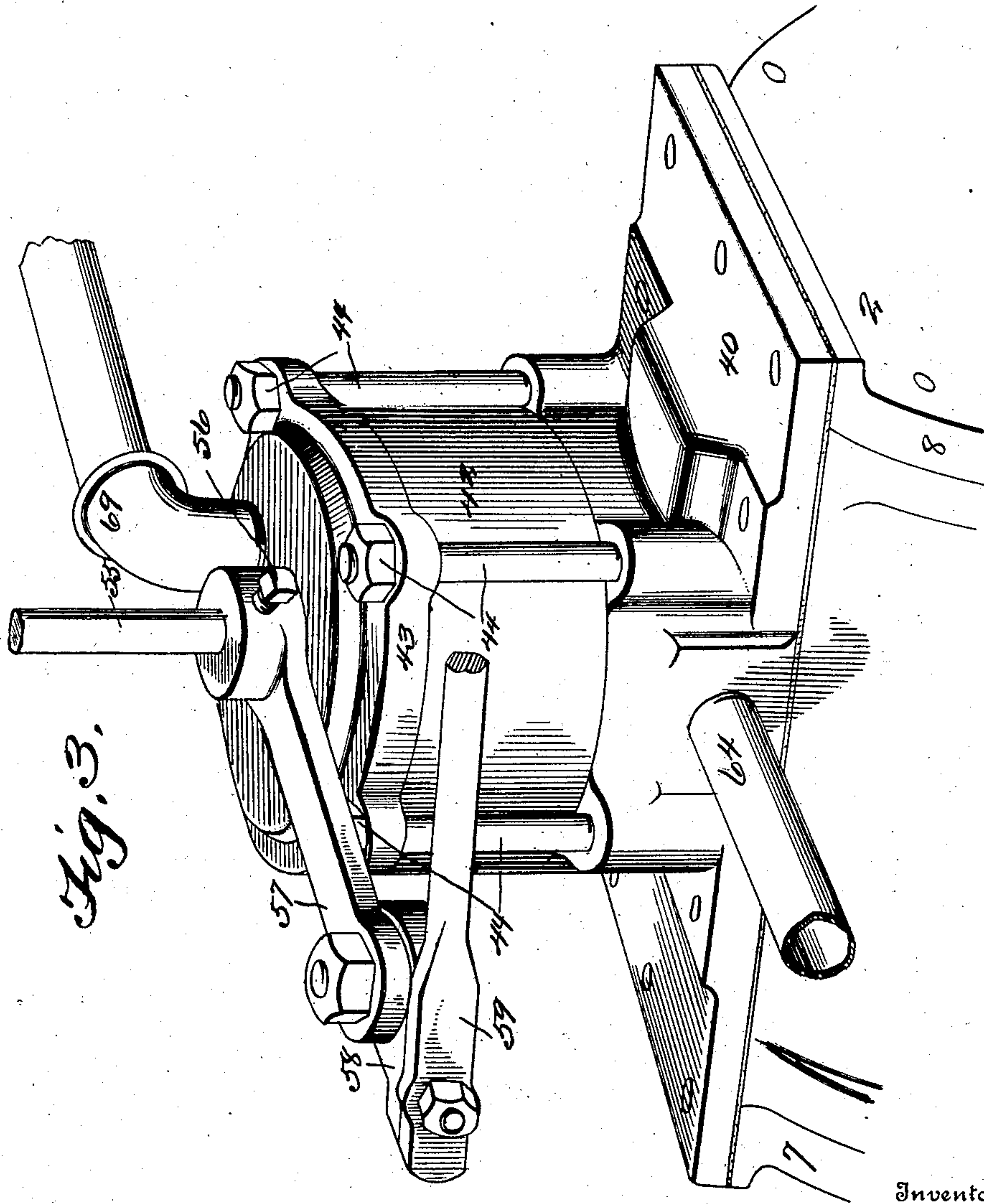


Fig. 3.

Witnesses:

R. H. Dowell.
H. V. Reap.

By

Inventor:
Almon E. Lundgren.
F. H. [Signature]
Attorneys

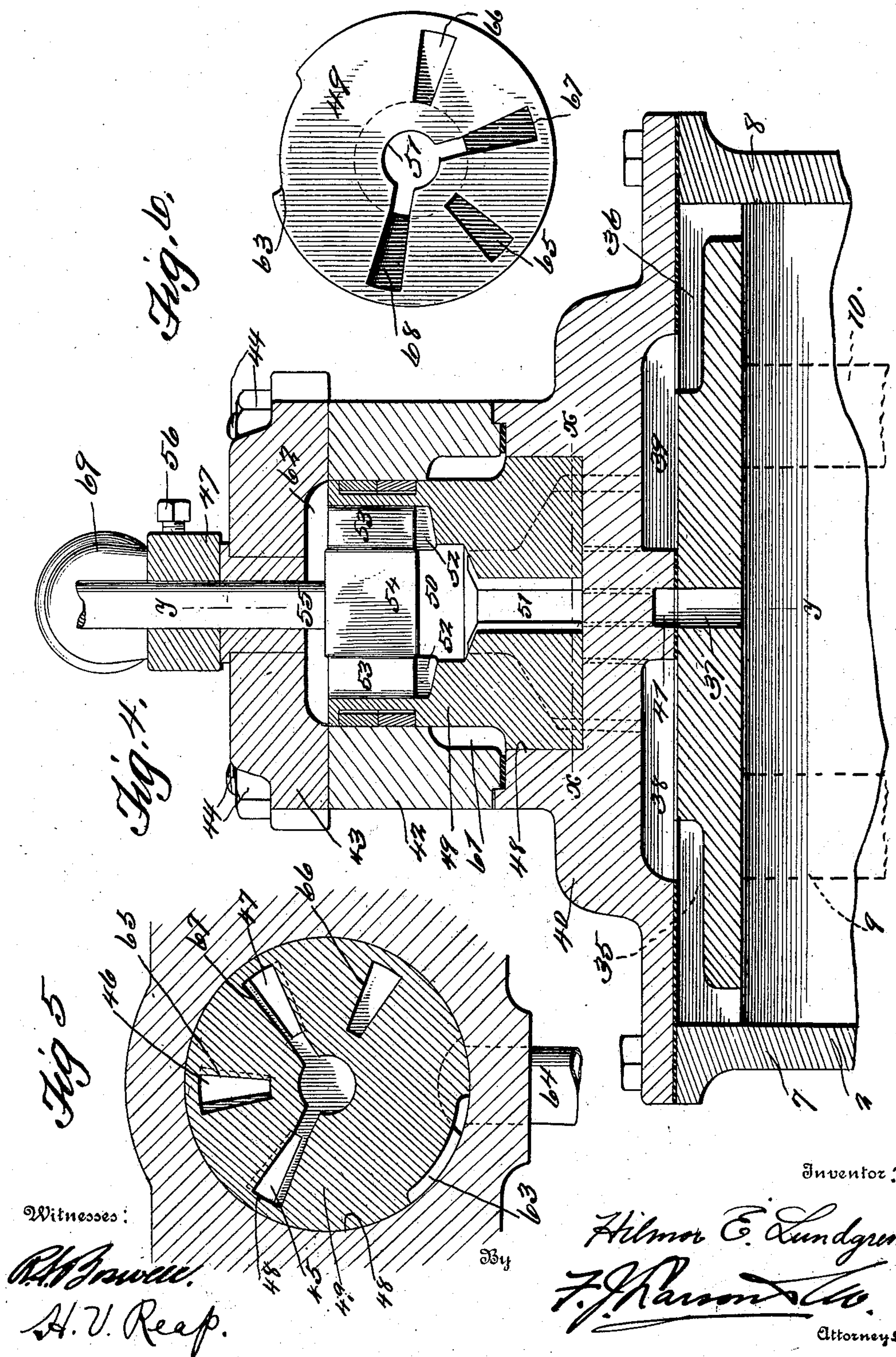
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5 SHEETS—SHEET 4.



Witnesses:

R. H. Brown.
H. V. Reap.

Inventor:

Hilmer E. Lundgren
F. J. Hanson & Co.
Attorneys.

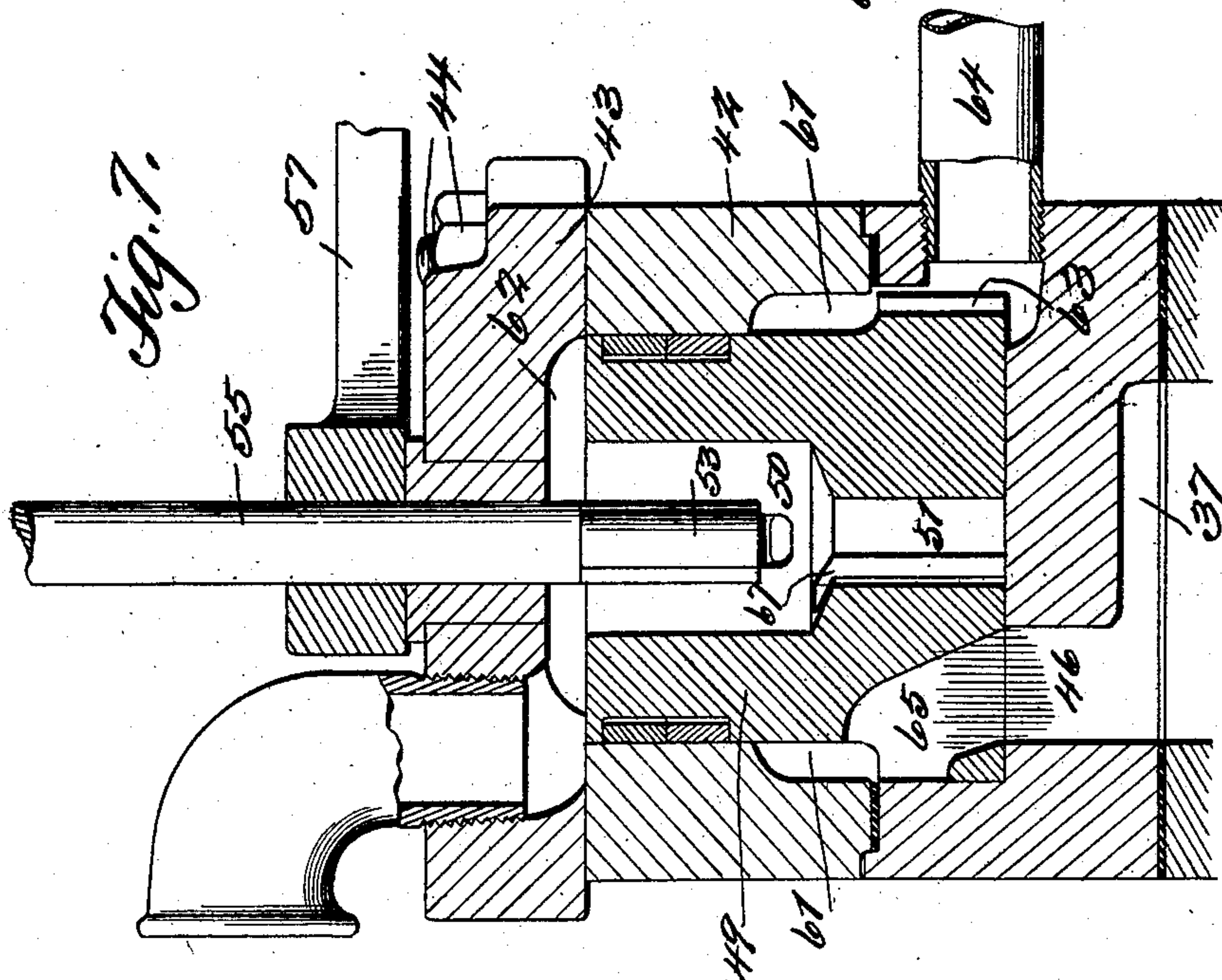
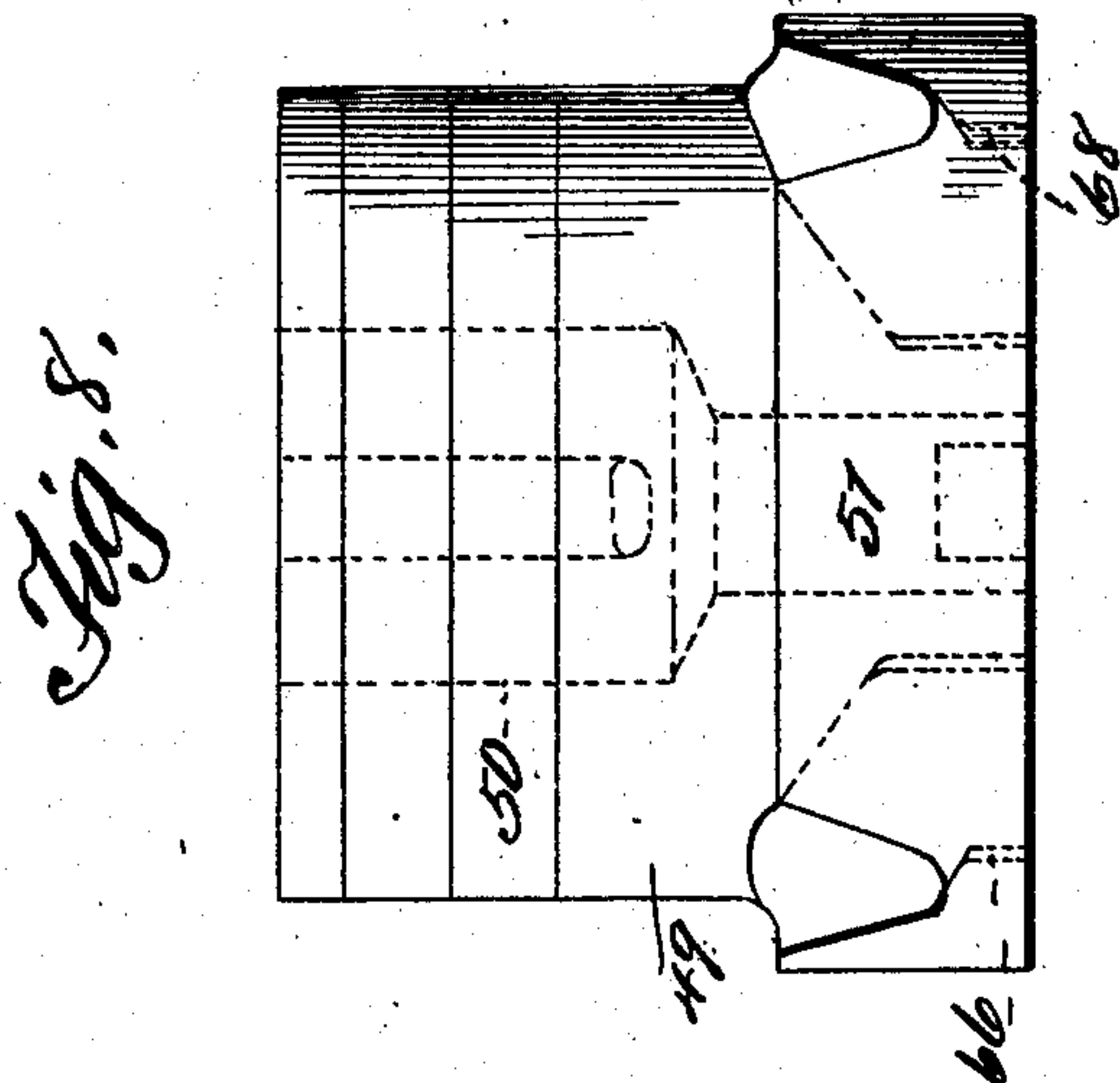
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STEAM ENGINE.

APPLICATION FILED JULY 1, 1907.

5 SHEETS—SHEET 5.



Witnesses

R. H. Jewell.
H. V. Reap.

Inventor:

Hilmer E. Lundgren.
F. J. Harwood & Co.

Attorneys.

UNITED STATES PATENT OFFICE.

HILMOR E. LUNDGREN, OF FORT CROOK, NEBRASKA.

STEAM-ENGINE.

No. 889,703.

Specification of Letters Patent.

Patented June 2, 1908.

Application filed July 1, 1907. Serial No. 381,780.

To all whom it may concern:

Be it known that I, HILMOR E. LUNDGREN, a citizen of the United States, residing at Fort Crook, in the county of Sarpy and State of Nebraska, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

This invention relates to new and useful improvements in steam engines, and it has more particular reference to the controlling valve therefor, and to the operative connections between such controlling valve and the cross heads of the engine.

In its broadest aspect the invention includes an engine in which two opposed pistons are employed, the rod of one piston concentrically surrounding the rod of the other piston. These piston rods are connected with reciprocating cross heads, one of the piston rods having a direct connection with the crank shaft of the engine in a manner to be described, and the other piston rod having connection with the reversing lever, which is in turn connected with the crank shaft. The said reversing lever is mounted on a rock shaft which carries an upwardly projecting arm and the latter, directly operated from the crank shaft of the engine, serves to operate the reversing valve within the steam chest. The reversing valve is generally of the rotary type, and broadly speaking, is constructed to admit steam between the opposed pistons and to permit of the exhaust of steam from the other sides of said pistons between the same and the ends of the cylinder on one stroke of the engine, and on the other stroke of the engine to admit steam simultaneously to the ends of the cylinder, whereby the pistons are moved together and to permit of the exhaust of the previous charge of steam into the space between the pistons.

In connection with a reversing valve and its mechanism constructed generally as above described, the invention has for its object to provide a novel construction, combination and arrangement of parts, the details of which will appear in the course of the following description in which reference is had to the accompanying drawings forming a part of this specification, like characters of reference designating similar parts throughout the several views, wherein:

Figure 1 is a top plan view of the engine and its adjuncts as an entirety. Fig. 2 is a side elevation thereof. Fig. 3 is a detailed

perspective view showing the controlling valve casing assembled upon the steam chest together with the arm carried by the valve stem, the said arm having connection with the operating elements of the valve mechanism. Fig. 4 is a section taken longitudinally of the engine cylinder and through the reversing valve. Fig. 5 is a horizontal section on the line $x-x$ of Fig. 4. Fig. 6 is a bottom plan view of the reversing valve *per se*. Fig. 7 is a central vertical section taken on the line $y-y$ of Fig. 4, and Fig. 8 is a view in elevation of the valve.

In the accompanying drawings there is shown an engine bed 1 of conventional form, which at one end supports the engine cylinder 2, and at its other end is provided with an enlarged bearing 3 for the crank or power shaft 4, the latter carrying at its outer end a belt wheel 5, serving also as a balance wheel, and at its inner end a crank disk 6. The cylinder 2 is closed at its ends by heads 7 and 8 of usual construction. The pistons 9 and 10 are provided in said cylinder adjacent the respective heads 7 and 8, the piston 9 being carried upon an elongated piston rod 11, and the piston 10 being carried upon a shorter hollow piston rod 12, which surrounds the rod 11. The piston rod 11 at its outer end has connection with a cross head 13, and the rod 12 has connection with a cross head 14, the cross heads 13 and 14 working in guides 15 of ordinary form.

Between the guides 15 is a transverse rock shaft 16, mounted in suitable bearings 17 secured to the sides of the bed 1. The shaft 16 is provided with spaced parallel coincident two-armed levers 18, having their ends curved in opposite directions on each side of said shaft. The cross head 14 is constructed with upwardly extending ears 19 and is connected by means of a pivoted link 20 with the upper ends of the levers 18, it being understood that the link 20 is constructed to have its end portions pivotally received between the ears 19 and the ends of the levers 18. The cross head 13 has pivotal connection with a link 21, and the latter is in turn pivotally connected by a yoke 22 with the wrist pin 23 of the crank disk 6. The yoke 22 is likewise constructed for pivotal connection with a link 24 which latter has its other end pivotally received between the lower ends of the levers 18.

The above description relates generally to the connections between the pistons and the

power shaft 4, and the valve mechanism together with the detailed construction of the valve will now be taken up.

The shaft 16 carries at one side thereof an upwardly projecting arm 25, constructed with a longitudinal slot 26. The arm 25, to the end of effecting the operation of the valve is rocked by connections from the shaft 4, and with this object in view, the said arm has a pin 27 adjustably engaged in its slot 26, the pin 27 carrying a pivoted babbitt block 28 which conformably fits in an extension 29 of a link 30, the latter having a handle 31 at one end thereof and at its other end having connection with an eccentric strap 32 of conventional form, and which surrounds an eccentric disk 33 provided upon the shaft 4.

The cylinder 2 is constructed with ports 35 and 36, adjacent the heads 7 and 8, and with a centrally located port 37. The ports 35 and 36 communicate with respective passages 38 and 39 cut into the bottom face of a plate 40, imposed on said cylinder, and the port 37 communicates with a centrally located passage 41, cut into said plate. The plate 40 forms the base of the steam chest, the latter being constituted of a body portion 42, and a head 43 which are detachably engaged with one another and with said plate by bolt and nut fastenings 44, as shown more particularly in Fig. 3. The passages 38, 39 and 41, in the plate 40, extend to one side of said plate and severally communicate with radially disposed openings 45, 46 and 47, formed in an annular recess 48 cut into the upper surface of said plate and affording a seat for a rotatable valve 49. The valve 49 is constructed with an enlarged bore 50 extending from the upper end thereof to an approximately central point and with a reduced bore 51 extending to the lower face thereof and communicating with the bore 50 concentrically thereof. The bore 50 is recessed at opposite sides as at 52 to receive the laterally projecting extensions 53 of a narrow head 54 carried upon the valve stem 55, the latter being projected through the head 43 and beyond said head being connected by means of a set screw 56 with a horizontal arm 57. The arm 57 is in turn connected by means of a compensating link 58 with a link 59 and the latter is in turn connected by means of a compensating link 60 with the upper end of the arm 25. The valve 49 is of reduced diameter in its upper portion, whereby a space occurs between the same and the undercut portion of the body 42, the said space affording an annular steam passage 61. The head 43 is likewise undercut in its bottom surface to afford a steam passage 62 which communicates with the bore 50 and with an exhaust conductor 69, leading from said head. The valve 49 is constructed at one side thereof with a groove 63, affording a steam passage and being of

sufficient width to be in continuous communication in either position of said valve with a steam supply pipe 64. The said valve is likewise constructed with inlet ports 65 and 66 between the bottom and the outer faces thereof, the ports 65 and 66 being in continuous communication with the steam passage 61. Between the ports 65 and 66 is an exhaust port 67 communicating with the bore 51, and at the other side of the port 65 is a similarly constructed exhaust port 68.

By reference to Fig. 5, it will be noted that the valve 49 is in such position that the port 65 registers with the opening 46 and that the ports 68 and 67 register with the respective openings 45 and 47. With the valve in this position, steam enters the chest from the pipe 64, through the passage 63, circulating into the passage 61 from whence it passes by way of the port 65 and opening 46 in their registering relation, through the port 37 into the engine cylinder 2 between the pistons 9 and 10 forcing them away from one another, and the charge previously admitted to the ends of said cylinder is, in this movement of the pistons, forced through the ports 35 and 36 and the respective openings 45 and 47, through the ports 68 and 67 communicating with the openings 45 and 47 into the bore 51, from whence it has egress by way of the bore 50 and steam passage 62 through the exhaust pipe 69. When the pistons 9 and 10 reach the termination of their outward movement, the valve 49 will be shifted by means of the connections described to such position that its port 47 will register with the opening 46 and that its ports 65 and 66 will register with the respective openings 45 and 47. In this position of the valve the steam admitted into the steam chest will, pass through the openings 45 and 47 into the ends of the cylinder 2, forcing the pistons 9 and 10 towards one another, and the previous charge of steam will exhaust through the port 37, opening 45, and port 67, into the bore 51, and thence through the pipe 69 in the manner above described. It will thus be seen that the ports 65 and 67 serve as respective inlet and exhaust ports in their registering relation with the single opening 46 leading from the center of the cylinder 2, in addition to the same function in connection with the respective openings 45 and 47, leading from the ends of said cylinder, and that the ports 68 and 66, likewise afford exhaust and inlet passages for said last named ports in accordance with the relations of the ports 65 and 67 to the port 46 as will be readily understood.

The various cooperating parts are of course suitably packed to prevent the escape of steam between the chambers of the steam chest and from said chambers, such packing being made in any desirable manner.

What I claim as new is:—

1. The combination with an engine cylin- 130

der, opposed pistons working therein a steam
chest plate on said cylinder, and a steam
chest on said plate, said plate having three
ports, the central port communicating with
5 the cylinder centrally thereof and the ex-
treme ports communicating therewith at its
ends, of a rocking valve in said steam chest
and constructed to coöperate with the wall
of said chest to afford independent inlet and
10 exhaust steam passages, said valve being
formed with an enlarged upper bore com-
municating with the exhaust steam passage,
and with a reduced lower bore, said valve be-
ing formed with four ports, extending from
15 the lower face alternately to the outer surface
thereof and to the surface of said lower bore
and formed to register with the ports of said
plate, as and for the purpose set forth.

2. The combination with an engine cylin-
20 der, opposed pistons therein and a steam chest
having three ports, the central port com-
municating with the engine cylinder cen-

trally thereof, and the extreme ports com-
municating with the respective ends of said
cylinder, of a rocking valve in said steam 25
chest shaped to co-act with the walls thereof
to afford independent inlet and exhaust pas-
sages, said valve being provided with four
alternately arranged inlet and exhaust ports
communicating with said respective passages 30
the two intermediate ports of said valve be-
ing designed for register alternately with the
central port of said steam chest and the two
extreme ports being designed for registry
alternately with the adjacent extreme ports 35
of said steam chest as and for the purpose set
forth.

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

HILMOR E. LUNDGREN.

Witnesses:

GEO. E. TURKINGTON,
FREDK. J. LAPSON.