

No. 785,318.

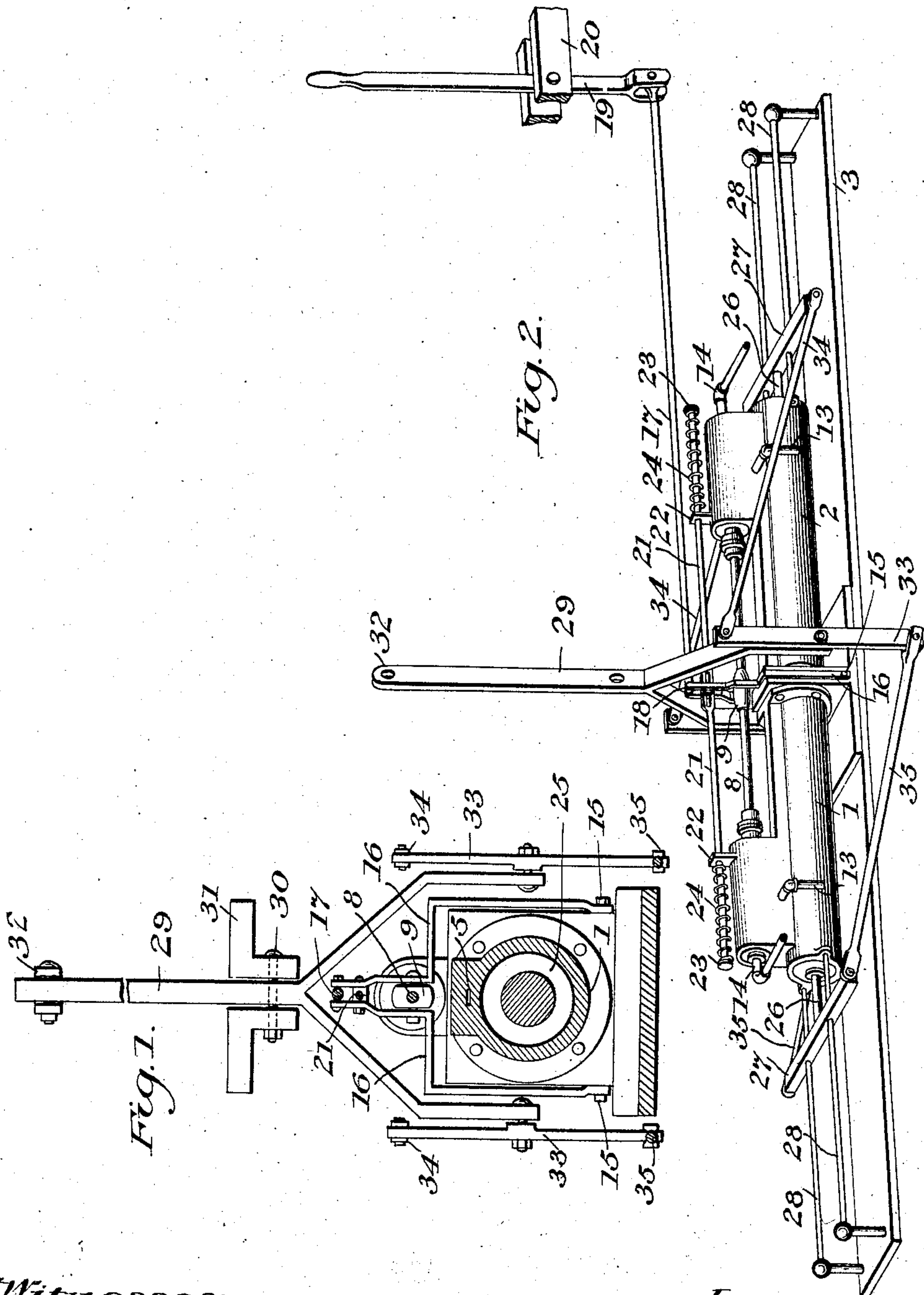
PATENTED MAR. 21, 1905.

V. R. METHOD & A. W. STEWART.

RECIPROCATING ENGINE.

APPLICATION FILED MAY 14, 1903.

3 SHEETS—SHEET 1.



Witnesses:
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Alexander W. Stewart
by James Watson
Their attorney

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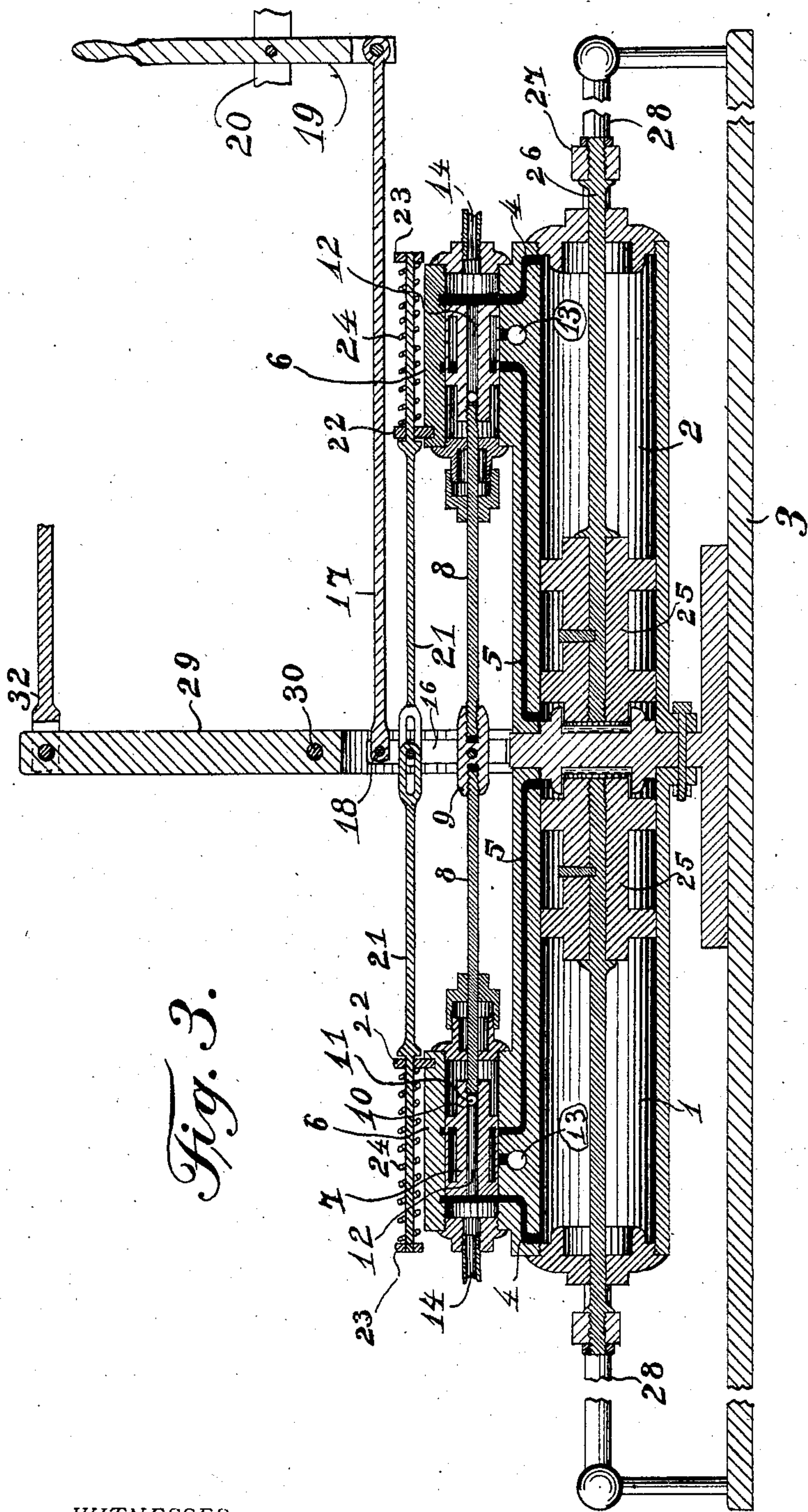


Fig. 3.

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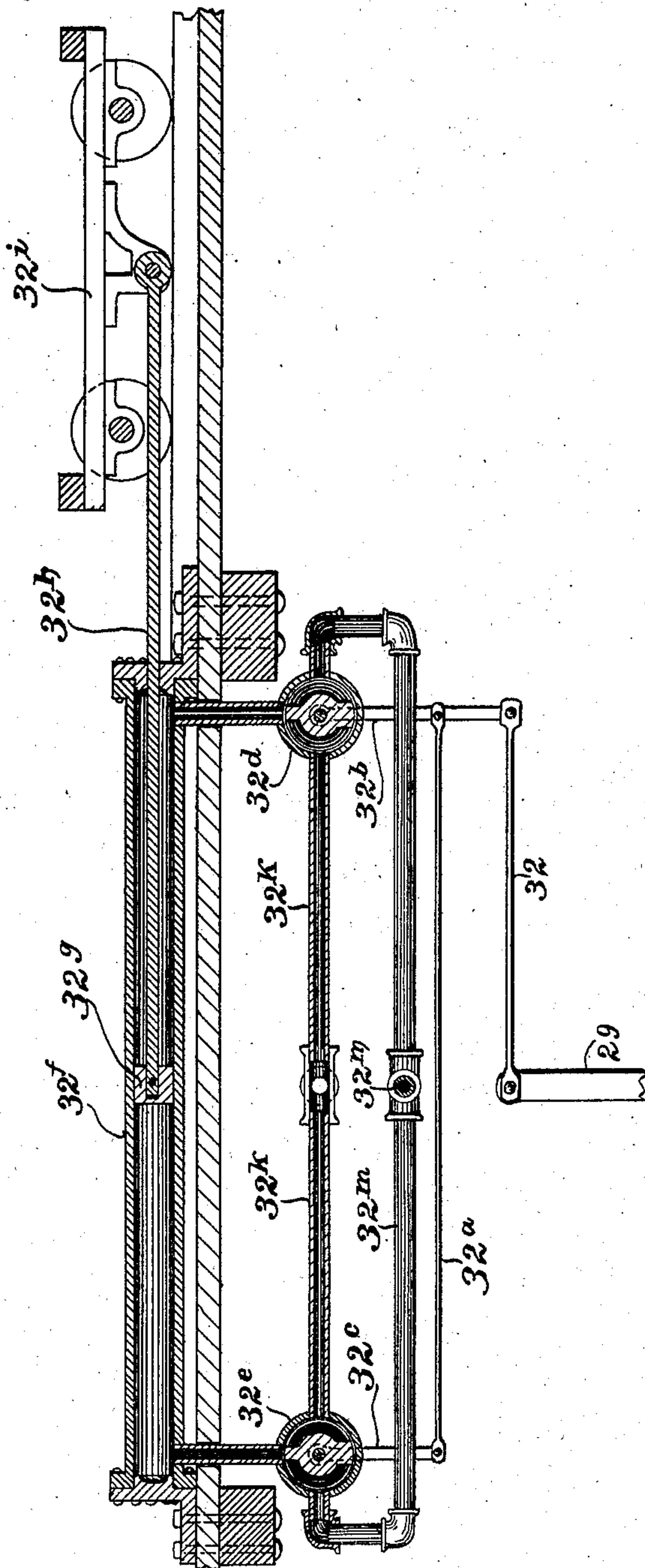
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3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

VICTOR R. METHOD AND ALEXANDER W. STEWART, OF DULUTH,
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RECIPROCATING ENGINE.

SPECIFICATION forming part of Letters Patent No. 785,318, dated March 21, 1905.

Application filed May 14, 1903. Serial No. 157,191.

To all whom it may concern:

Be it known that we, VICTOR R. METHOD and ALEXANDER W. STEWART, citizens of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Reciprocating Engines; and we 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 the same.

Our invention relates to reciprocating engines, and has for its object the construction of an engine adapted to have each stroke of its pistons arbitrarily controlled by the engineer and adapted especially to operate a steam-feed valve governing the supply of steam to the motive mechanism of sawmill-carriages.

With these and other objects in view it consists of two opposed cylinders each containing a piston, means for supplying steam to said cylinders simultaneously either at the outer ends of each of them or at the outer end of either one of them and at the inner end of the other of them and for exhausting the steam simultaneously either from the inner ends of both of said cylinders or simultaneously from the outer end of either of them and from the inner end of the other of them, piston-rods connected to said pistons, respectively, and extending through the outer ends of said cylinders, cross-heads on said piston-rods, a rocker pivoted intermediate of its ends to a fixed support near said cylinders, a lever pivoted intermediate of its ends to one end of said rocker, a link pivoted at one end to one end of said lever and at the other end to one of said cross-heads, a second link pivoted at one of its ends to the other end of said lever and pivoted at its other end to the other of said cross-heads, and means for arbitrarily operating the valves governing the supply of steam to or the exhaust from said cylinders.

It also comprises certain other constructions, combinations, and arrangements of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is

an end elevation of our said invention, partly in cross-section. Fig. 2 is a perspective view, on a reduced scale, of said invention. Fig. 3 is a vertical central longitudinal section of the same; and Fig. 4 is a longitudinal elevation, partly in section, of a sawmill-carriage and of the steam-feed mechanism for operating the same, showing the connection of said mechanism with our said invention.

Heretofore it has been usual to operate the valve governing the supply of steam to the motive mechanism of sawmill-carriages directly by a hand-lever or train of levers, requiring great strength and endurance on the part of the operator and in case of accident to the carriage or other mechanism in his vicinity often subjecting him to great danger. To obviate these difficulties, we have produced an engine capable of performing the great labor of controlling said valve and capable of being itself easily and constantly controlled by the engineer or of being safely abandoned by him in case of accident to other machinery in his vicinity.

In the drawings, 1 and 2 are oppositely-arranged cylinders secured to any suitable base or support, as 3. Each of said cylinders is provided with suitable steam-ports 4 and 5, respectively. Valve-casings 6, containing valves 7, adapted to govern said ports, are provided for each of said cylinders, which valves are adjustably connected in such manner, as by valve-stems 8 and a turnbuckle or adjusting-collar 9, that they will move simultaneously and are so arranged with respect to said ports as to permit the admission of steam or other motive gas or liquid at the will of the operator simultaneously to the outer ends of each of said cylinders or to the outer end of one cylinder and simultaneously to the inner end of the other cylinder and to open the exhaust from the end of each cylinder opposite to the end at which steam is being admitted. Said valves may be of any suitable construction; but we preferably employ spool-shaped slide-valves having extensions 10, preferably of the same diameter as the barrel of the spool, adapted to receive and secure said

valve-stems and transversely apertured in one or more places, as at 11, to permit live steam to flow from the chamber forward of the valve through its central passage 12 and said aperture 11 to the chamber in rear of said valve. An exhaust-port 13 is formed in each of said valve-casings at any suitable point within the constant span of its contiguous valve, and a steam-supply pipe 14 communicates with each of the valve-chambers beyond the span of said valves. In order to arbitrarily operate said valves, we pivot to said base, as at 15, one end of a lever 16, which lever may, for greater stability and better balance, be forked and adapted to straddle the bulkhead dividing said cylinders, and intermediate of its ends we pivot said lever to said adjusting-collar 9. A draw-rod 17 or equivalent means is also pivoted to said lever, as at 18, and is adapted to extend directly or to be connected by any suitable intermediate means to an operating-lever, as at 19, preferably pivoted intermediate of its ends to a suitable fixed support, as 20. In order to automatically return said valves to center in case of the abandonment of said operating-lever 19 by the engineer or sawyer, we preferably provide oppositely-arranged draw-rods 21, each slotted at one of its ends and pivoted to said lever 19 by a pivot-bolt extending through said slots. The slotted or inner ends of said draw-rods 21 overlap each other, whereby said rods are made independent of each other in action when said valve is not on center. The opposite or outer ends of said rods 19 are directed through apertured posts 22 and are provided with terminal nuts 23. Coiled springs 24 are mounted upon said rods 19 between said nuts and said apertured posts to exert a spring tension upon said rods, whereby said lever 16 is normally centered. Within each of said cylinders is a piston 25, each provided with a piston-rod 26, extending through the outward end of the cylinder. Cross-heads 27 or equivalent means are secured to the outer ends of the respective piston-rods and are preferably adapted to engage slides or guide-rods 28. A rocker 29 is pivoted intermediate of its ends, as at 30, to a fixed support 31 and at one of its ends may be connected in any suitable manner, as by the links 32 and 32^a, to the valve-stems 32^b and 32^c, of the corresponding valves 32^d and 32^e, governing the supply of steam to another engine, comprising the cylinder 32^f, the piston 32^g, the piston-rod 32^h, attached to a sawmill-carriage 32ⁱ, the steam-supply pipe 32^k, connected to a suitable steam-generator, (not shown,) and the exhaust-pipe 32^m. We do not, however, claim any invention in said latter engine, but only in our said means for operating and controlling the valves thereof. To the opposite end of said rocker is pivoted, intermediate of its ends, a lever 33. A link 34 is pivoted at one of its ends to the cross-head of

one of said piston-rods and at its opposite end to one of the ends of said lever 33, and a link 35 is pivoted at one of its ends to the cross-head of the other of said piston-rods and is pivoted at its other end to the opposite end of said lever 33. Said rocker may, if desired, be forked, and for the purpose of obtaining a better balance of the parts levers 33 may be pivoted to each of the branches or tines of said fork, as shown, and similar links connect each of said levers to said cross-heads.

While we have described certain details of our said construction, it is obvious that many modifications thereof may be made and equivalent means employed without departing from the spirit and scope of our said invention. It is obvious, also, that our said engine may within the scope our invention be connected with any other or different mechanism adapted to be operated or controlled by it.

The operation of our engine is as follows: When the operating-lever 19 is released or held on center either by hand or by the action of said springs 24 through intermediate connections, the valves 7 will be in position to admit steam to the outer ends of each of said cylinders 2, and each of the pistons 25 will then be held at the inner ends of said cylinders, respectively, exerting an equal influence, through intermediate connections, upon the rocker 29 to hold it at center. The movement of the operating-lever 19 in either direction will not affect the previous operative relation of both of said valves 7 with regard to the ports controlled thereby, but will cause either one or the other of said valves to effect the communication of the port 4, governed by it, with the contiguous port 13 and of the adjoining port 5 with the source of steam-supply, thus admitting pressure to the inner end of only one of said cylinders and permitting pressure to continue in the outer end of the opposite cylinder. The piston held at the inner end of one of the cylinders will thus act as a fulcrum for the lever 33, and the opposite piston moving outward will operate as the power upon said lever.

Having now described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an engine, the combination of oppositely-arranged cylinders, a valve-chamber connected with each cylinder and each provided with ports extending respectively into the opposite ends of the corresponding cylinder and with a port extending to the open air, a valve positioned in each of said valve-chambers and each normally arched in single span over the valve-chamber mouths of the ports extending from its corresponding chamber to the open air and to the inner end of the corresponding cylinder, and when arbitrarily moved from such position one of said valves being arched in single span over the valve-chamber mouths of the ports extending from

the corresponding chamber to the open air and to the outer end of the corresponding cylinder, the other of said valves at such time continuing arched in single span over the valve-chamber mouths of the ports extending from its corresponding chamber to the open air and to the inner end of its corresponding cylinder, and means for arbitrarily operating said valves, substantially as described.

2. In an engine, the combination of oppositely-arranged cylinders, a valve-chamber connected with each cylinder and each provided with ports extending respectively into the opposite ends of the corresponding cylinder and to the open air, a valve positioned in each of said valve-chambers and connected with each other, and each normally arched in single span over the valve-chamber mouths of the ports extending from the corresponding chamber to the open air and to the inner end of the corresponding cylinder, and when moved from such normal position one of said valves being arched in single span over the valve-chamber mouths of the ports extending from the corresponding chamber to the open air and to the outer end of the corresponding cylinder, the other valve at such time continuing arched in single span over the valve-chamber mouths of the ports extending from its corresponding chamber to the open air and to the inner end of its corresponding cylinder, means for arbitrarily governing the movement of said valves to admit steam to the outer end of one cylinder and to the inner end of the other cylinder, and means adapted to automatically return said valves to the position for admitting steam to the outer ends of both cylinders when the arbitrary means of operation is idle, pistons within said cylinders, provided with outwardly-extending piston-rods, a rocker pivoted to a suitable fixed support, a lever pivoted intermediate of its ends to said rocker, a link pivoted at one end to one end of said lever and at its opposite end to the outer end of one of said piston-rods, a link pivoted at one of its ends to the opposite end of said lever and pivoted at its opposite end to the outer end of the other of said piston-rods, and means pivoted to said rocker at another point and adapted to be connected to mechanism to be operated by said rocker, substantially as described.

3. In an engine, the combination of oppositely-arranged cylinders provided with feed and exhaust ports, connected valves governing said ports, means for arbitrarily controlling each movement of said valves, pistons within said cylinders, provided with piston-rods extending through the outer ends of said cylinders and provided with cross-heads at their outer ends, a rocker pivoted intermediate of its ends to a suitable fixed support, a lever pivoted intermediate of its ends to one end of said rocker, a link pivoted at one of its

ends to one end of said lever and pivoted at its opposite end to the cross-head of one of said piston-rods, and a link pivoted at one of its ends to the opposite end of said lever and pivoted at its opposite end to the cross-head of the other of said piston-rods, substantially as described.

4. In an engine, the combination of oppositely-arranged cylinders, each provided with feed and exhaust ports, coacting valves, governing said ports, means for arbitrarily operating said valves to admit steam to the outer end of one cylinder and to the inner end of the opposite cylinder, means adapted to automatically return said valves to the position for admitting steam to the outer ends of both cylinders when said means for arbitrary operation is idle, a forked swinging arm pivoted to a fixed support, levers pivoted intermediate of their ends to the branches or tines of said forked arm, parallel links pivoted at one of their ends to corresponding ends of said levers and pivoted at their opposite ends to the outer end of one of said pistons, and other parallel links pivoted at one of their ends to the corresponding opposite ends of said levers and pivoted at their opposite ends to the outer end of the other of said pistons, substantially as described.

5. In an engine, the combination with oppositely-extending piston-rods attached to independent pistons, of a swinging arm pivoted to a fixed support, a lever pivoted intermediate of its ends to said arm, a link pivoted to one end of said lever and to the outer end of one of said piston-rods, and a link pivoted to the opposite end of said lever and to the outer end of the other of said piston-rods, substantially as described.

6. In means for the purposes described the combination with a suitable support of a rocker-arm pivoted thereto, a lever centrally pivoted to one end of said rocker, a link pivoted at one end to one end of said lever and extending at an angle thereto, a second link pivoted at one end to the other end of said lever and extending in the opposite direction to the first said link, means interposed between the opposite ends of said links and pivoted thereto and adapted to hold either one of said links against longitudinal movement and to cause the longitudinal movement of the opposite link, and means for operating said intermediate means, substantially as described.

7. In an engine, the combination of oppositely-arranged cylinders, a valve-chamber connected with each cylinder and each provided with ports extending respectively into the opposite ends of the corresponding cylinder and with a port extending to the open air, a valve positioned in each of said valve-chambers and each normally arched in single span over the valve-chamber mouths of the ports extending from its corresponding chamber to the open air and to the inner end of the corre-

sponding cylinder, and when arbitrarily moved from said normal position, one of said valves being arched in single span over the valve-chamber mouths of the ports extending from
5 the corresponding chamber to the open air and to the outer end of the corresponding cylinder, the other of said valves at such time continuing arched in single span over the valve-chamber mouths of the port extending
10 from its corresponding chamber to the open

air and to the inner end of its corresponding cylinder, substantially as described.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

VICTOR R. METHOD.
ALEXANDER W. STEWART.

Witnesses:

S. W. HANCHETT,
JAMES T. WATSON.