No. 840,394. PATENTED JAN. 1, 1907.

R. H. STOLLAR.

FLUID PRESSURE ENGINE.

APPLICATION FILED JULY 21, 1905.

2 SHEETS—SHEET 1.

Fig. 1

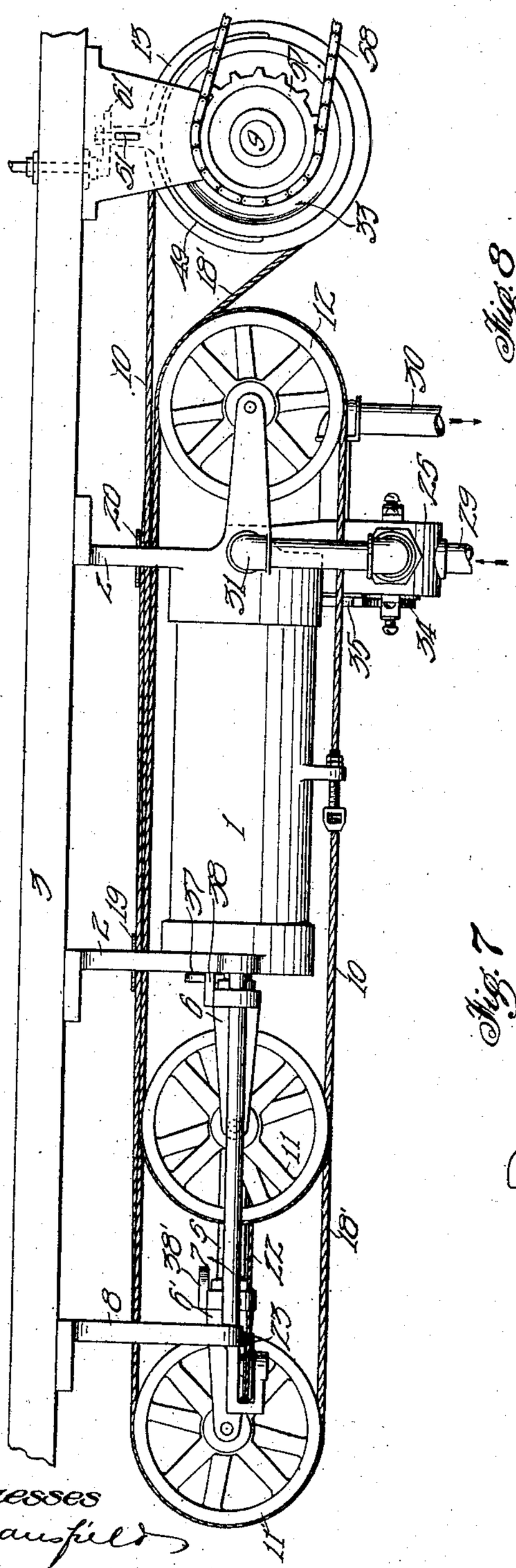


Fig. 8

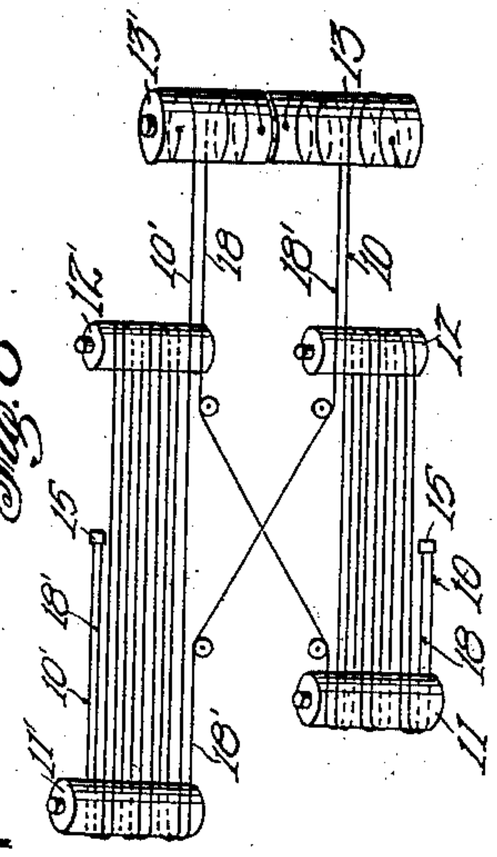
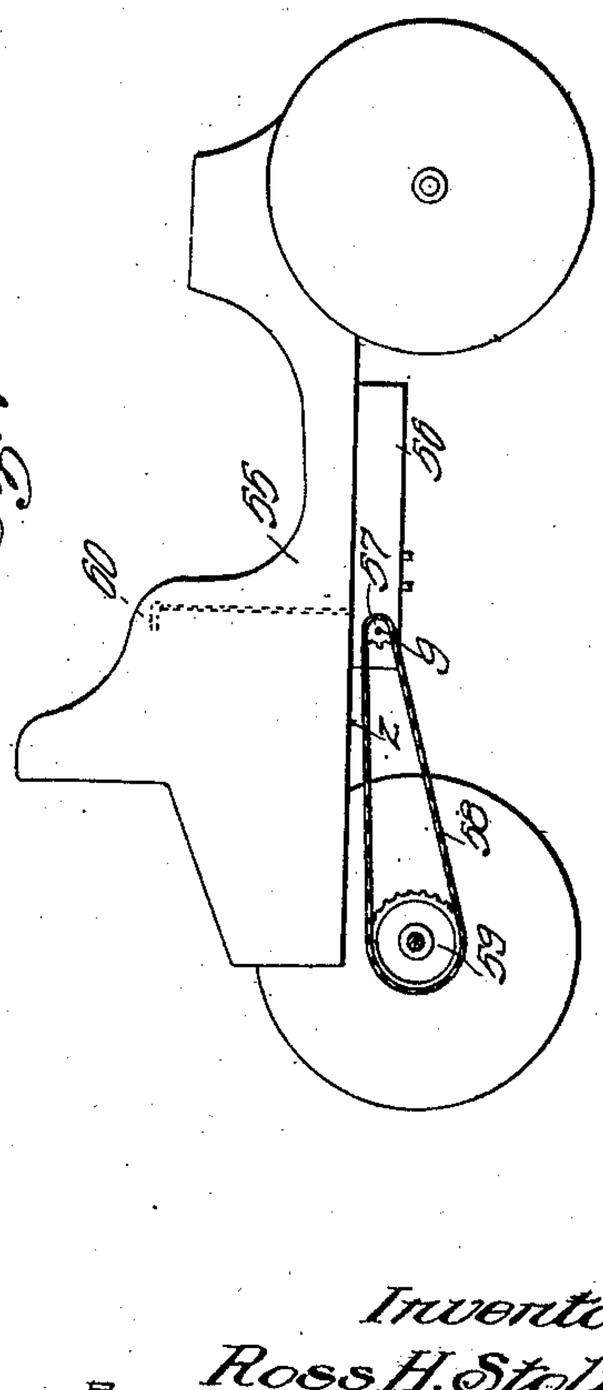


Fig. 7



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2 SHEETS—SHEET 2.

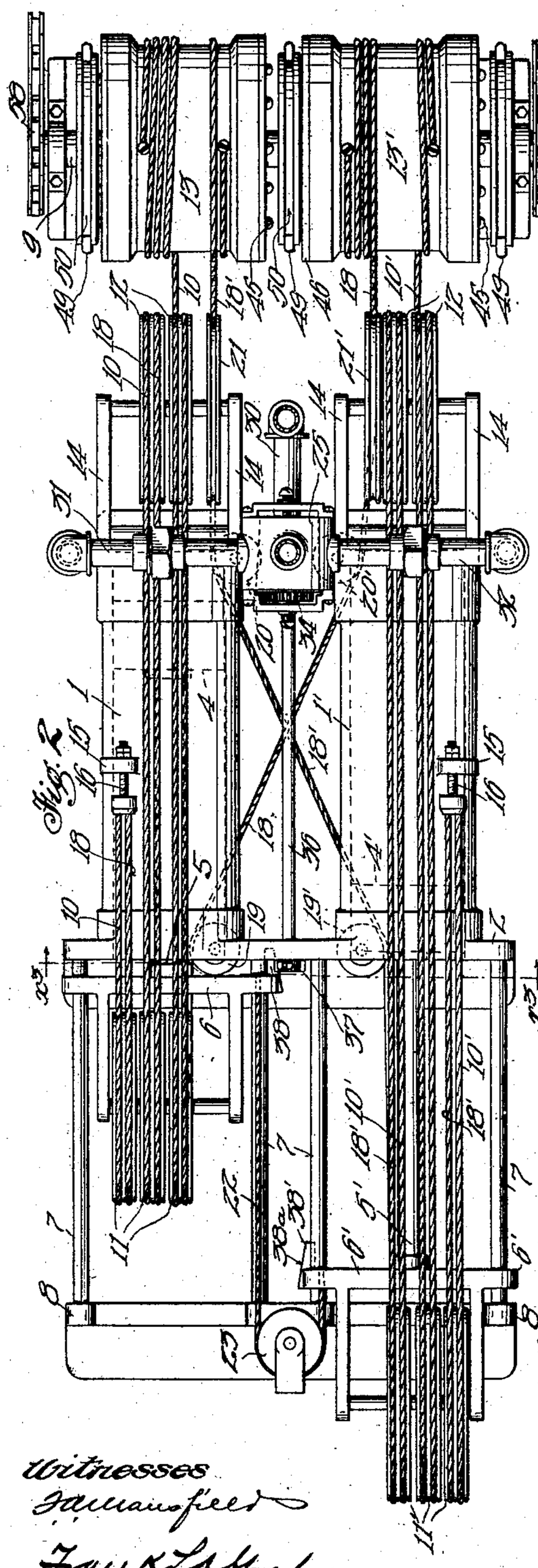

Fig. 2.

Fig. 6.

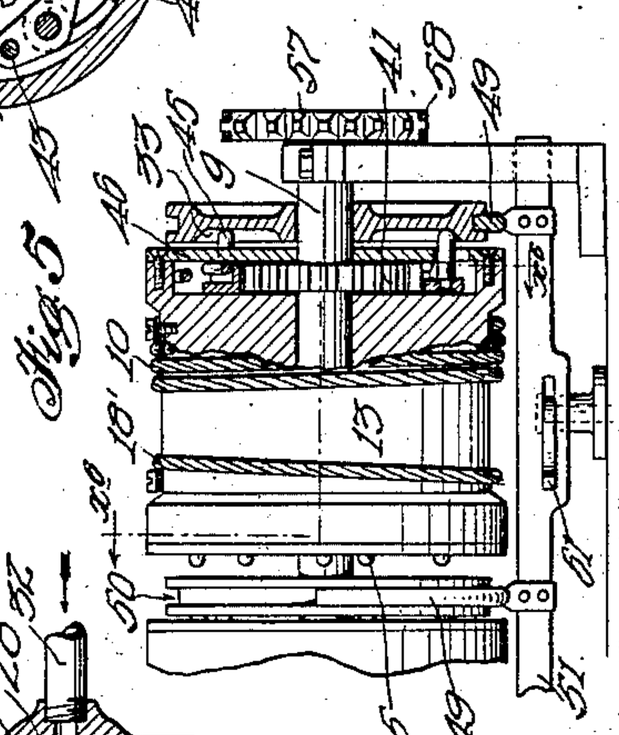

Fig. 5.

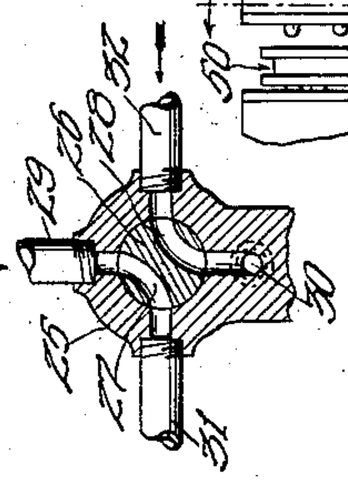

Fig. 4.

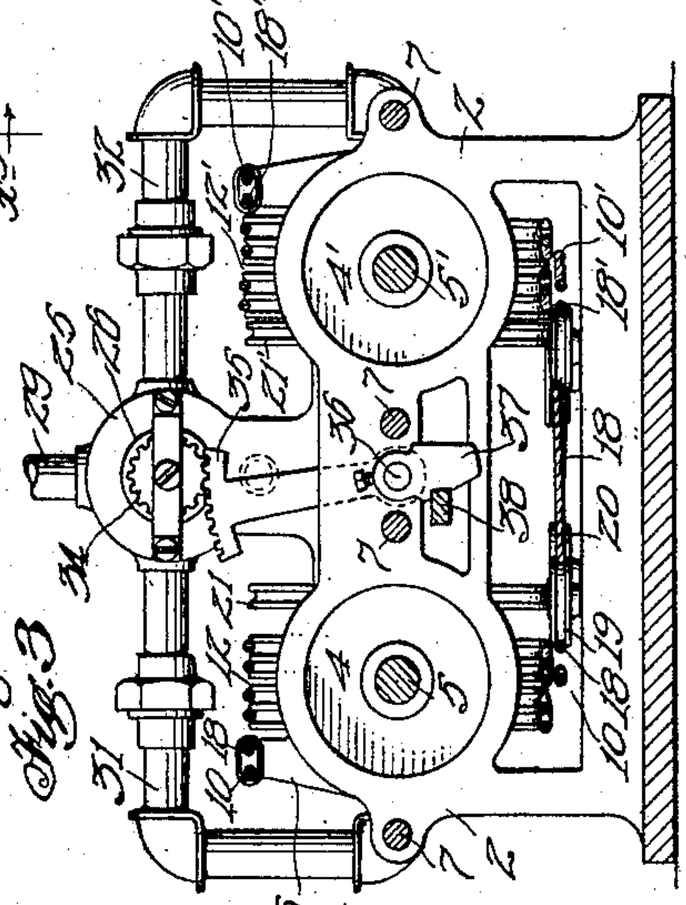

Fig. 3.

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UNITED STATES PATENT OFFICE.

ROSS H. STOLLAR, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF THREE-FOURTHS TO FLOYD C. FOOTE, OF LONGBEACH, CALIFORNIA.

FLUID-PRESSURE ENGINE.

No. 840,394. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed July 21, 1905. Serial No. 270,623.

To all whom it may concern:

Be it known that I, Ross H. STOLLAR, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Fluid-Pressure Engines, of which the following is a specification.

The main object of this invention is to provide a piston-operated engine which will give a high speed of the driven part with a comparatively low speed of the piston and without the use of gears.

A further object of the invention is to provide a fluid-pressure engine which will give a continuous direct action on the driven part and dispense with the use of a fly-wheel or similar means for carrying the mechanism over dead-centers or periods where there is no power being applied.

Another object of the invention is to provide a fluid-pressure engine in which the action will be smooth and continuous without any substantial or appreciable vibration.

A further object of the invention is to dispense with the usual crank mechanism for the conversion of the reciprocating into rotary motion and to substitute therefor a direct-acting means whereby the reciprocating action is converted into rotary motion of relatively high speed.

Another object of the invention is to provide an engine of this character with alternately-acting pistons brought successively into action and interconnected to give a continuous operation of the different parts.

The invention comprises a piston and a part connected and operated thereby in a reciprocating path and a driven part directly connected to or engaging the aforesaid part in such manner as to be driven thereby at a relatively high rate of speed—that is to say, to make a plurality of revolutions for each stroke of the driving part.

This invention further comprises two alternately-working pistons which operate with the driving means, connected by a common driven means, as aforesaid, and provided with controlling means for operating the pistons alternately, each piston being connected to return the other in the idle stroke thereof.

The invention may be carried out in various ways, and in particular the speed-multiplying connection from the piston to the driven part may be variously constructed. Two embodiments thereof are herein shown, one based on the use of multiplying cables and pulleys and the other based on the use of a spiral cam or screw.

The accompanying drawings illustrate the invention.

Figure 1 is a side elevation of the engine embodying the cable and pulley construction. Fig. 2 is an inverted plan of Fig. 1. Fig. 3 is a vertical section on line x^3 x^3, Fig. 2. Fig. 4 is a detail section of the reversing and controlling valve. Fig. 5 is a partly-sectional side elevation of one of the power-transmitting drums on the driven shaft. Fig. 6 is a vertical section thereof on the line x^6 x^6, Fig. 5. Fig. 7 is a more or less diagrammatic representation of the application of the invention to an automobile. Fig. 8 is a diagram showing the pulley and cable connections.

The invention is herein embodied in a double-cylinder construction, the two cylinders working alternately.

Referring to Figs. 1, 2, and 3, 1 1′ designate the respective cylinders mounted by standards 2 on a suitable support 3 and provided with pistons 4 4′, whose rods 5 5′ carry cross-heads 6 6′, working on guide rails or bars 7, which are supported by standards 2 and 8.

9 designates a driven shaft, the object of the invention being to drive said shaft at a releatively high rate of speed by the reciprocation of the pistons 4 4′. For this purpose direct-acting multiplying transmission means are provided, consisting in the form shown in Figs. 1, 2, and 3 of cables 10 10′ for the respective cylinders, pulleys 11, 11′, 12, and 12′, over which said cables pass, and drums 13 13′, connected to said cables and having operating connections with the shaft 9. There may be any desired number of pulleys 11 and 12, &c., according to the ratio of speed multiplication desired. In this case there are three pulleys 11 and two pulleys 12. The pulleys 11 11′ are carried by and pivotally mounted on the piston cross-heads 6 6′, respectively, and the pulleys 12 12′ are pivotally mounted on bearing-frames 14 at the rear end of the cylinder.

The connection of the cables 10 and 10′ with their respective pulleys and drums are identical, each cable being secured at one end to an abutment, anchor, or support 15, as by

means of a tightening-screw connection 16, and passing therefrom over one of the pulleys 11 on the piston cross-head, then rearwardly along the cylinder to a pulley 12 at the rear end of the cylinder, around said pulley, and then forwardly to the next pulley 11, and so on until the last pulley 11 is reached, from which said cable extends directly to and around the drum 13, being attached at its end to said drum. Alongside of each cable 10 10′ passes another cable 18 18′, secured to the same support or anchor 15, cable 18 extending from said support parallel to the cable 10 around the respective pulleys 11 12 until the last pulley 11 is reached, from which the said cable crosses over to the other side of the machine and winds around the drum 13′ in the reverse direction to the winding of the cable 10 on the drum 13.

19 20 21 designate sheaves over which the cable 18 passes in crossing from one side of the machine to the other and in turning down to pass around the drum 13′. 19′ 20′ 21′ are similar sheaves for the corresponding cross-cable 18′ from the other side of the machine, said cross-cable winding over the drum 13 in reverse direction to the cable 18. As each piston moves outwardly the other piston is moved in reverse direction by operation of the cross-connected cable 18 or 18′ from the other piston. In order that the cable may be held taut on the pulleys during this retrograde movement, a tension-cable 22 is provided, connected to the respective cross-heads 6 6′ and passing over a sheave 23, so that as each cross-head moves back its movement is restrained by said cable in accordance with the movement of the cross-head on the other piston, and there can be no slackening or loosening of the cables on the pulleys.

As each piston reaches the inner end of its stroke under the action of the return of the cross-connected cable above referred to the action is reversed under control of a valve 25, which admits steam back of this piston and simultaneously connects the cylinder of the other piston to exhaust, said other piston being at this moment at its point of greatest extension. Valve 25 may be of any suitable construction, consisting, for example, of a casing inclosing a plug or cylinder 26, provided with ports 27 28, which coöperate with a port leading to steam-supply pipe 29, an exhaust-port leading to exhaust-pipe 30, and ports communicating with pipes 31 32, leading to the respective cylinders. The plug 26 of said valve carries a gear 34, engaged by a segment-gear 35 on the rock-shaft 36, pivotally mounted on the standards or frame-bars of the engine and carrying a heel or arm 37, engaged on opposite sides thereof by tappets 38 38′ on the respective cross-heads 6 6′, said tappets having inclined operating-faces 38ª to engage the said arm 37, and by a cam action thereon forces the said arm to one side or the other, with the result that the segment-gear 35, valve-gear 34, the valve-plug 26 are correspondingly operated This action takes place on the part of each cam device 38 or 38′ when it reaches the inner end of its stroke, thereby admitting steam behind the corresponding piston and causing the piston to move outwardly. The valve being thus operated at the inner end of each stroke of each piston causes the propelling power to be communicated or applied to said piston. Each drum 13 13′ has therefore an intermittent rotary movement in opposite directions and each of said drums is connected to the driven shaft 9 in such manner that the movement of the drum in one direction will communicate motion to the shaft, whereas movement in the opposite direction will be without effect on the shaft. Means are also provided for reversing this connection, so as to reverse the motion of the driven shaft. For this purpose shaft 9 is provided with ratchet means, such as ratchet-wheels 40 41, inside of each drum 13 13′, and each of said drums is provided with pawl means 42 43 at its respective ends and within the drum, engaging with the respective ratchet-wheels 40 41, said ratchet-wheel 40 and pawls 42 being oppositely directed to ratchet-wheel 41 and pawls 43 and means being provided for bringing one or the other of said ratchet-and-pawl devices to an operative position. For this purpose pins 45 may be provided on the respective pawls 42 43, extending through the end walls 46 of the respective drums and engaged by conical cam-rings 33, slidably mounted on the shaft 9 in such manner that as said rings are pressed toward the respective pins they will cause inward movement of the pins toward the shaft 9 and simultaneous outward movement of the connected pawls from the ratchet-wheels. Said cam-rings are all operated simultaneously by yokes 49, engaging in annular grooves 50 in the said cam-rings and connected to a common operating-bar. Two of the cam-rings 33 will be moved toward the pins of the pawls at one end of the respective drums 13 13′, thereby disengaging said pawls, and at the same time the other two cam-rings will be moved away from the pawl-pins at the other ends of the respective drums, so as to allow the corresponding pawls to fall into engagement with their ratchets and couple up the mechanism for one direction of rotation. On reverse endwise movement of the slide 51 the rings 33 will be reversely operated to couple up the shaft and drums for reverse direction of rotation.

The reversely-arranged pawls and ratchets and their coupling means above described constitute reversible clutch means between the respective drums and the driven shaft.

It will be understood that the ratchet

means is not necessarily of the form shown, and the engine above described is capable of numerous applications.

In Fig. 7 the device is shown applied in connection with an automobile, the support 3 being in this case the bed or floor of the automobile frame or body 55, and the mechanism above described being inclosed in a suitable case 56, through which extends the driven shaft 9 above described, with its sprocket-wheels 57 connected by chains 58 and sprockets 59 to the rear axle of the vehicle.

60 designates an operating-handle connected by bell-crank 61 to operate the reversing-slide 51 aforesaid.

What I claim is—

1. Two cylinders with their pistons, stationary pulleys 12 and 21 for one cylinder and movable pulleys 11 for said cylinder, stationary pulleys 12′ and 21′ for the other cylinder and movable pulleys 11′ for the latter cylinder, a driven shaft, drums 13 and 13′ on said shaft, a cable 10 having one end fixed and wound over pulleys 11 and 12 and a drum 13, and having its other end fixed to drum 13, a cable 18 having one end fixed and wound on pulleys 11, 12 and 21′ and on drum 13′ and having its other end fixed to the latter drum, a cable 10′ having one end fixed and wound on pulleys 11′ and 12′ and drum 13′ and having its other end fixed to the latter drum, a cable 18′ having one end fixed and wound on pulleys 11′, 12′ and 21 and wound on drum 13 and having its other end fixed to the latter drum, cable 18′ being wound on drum 13 in a reverse direction from cable 10, cable 10′ being wound on drum 13′ in a reverse direction from cable 18, pawl-and-ratchet devices operated by said drums for rotating said driven shaft, means operated by one piston for bodily moving pulleys 11, means operated by the other piston for bodily moving the pulleys 11′ and valve means for the cylinders controlled by the pistons.

2. Two cylinders with their pistons, stationary pulleys 12 and 21 for one cylinder and movable pulleys 11 for said cylinder, stationary pulleys 12′ and 21′ for the other cylinder and movable pulleys 11′ for the latter cylinder, a driven shaft, drums 13 and 13′ on said shaft, a cable 10 having one end fixed and wound over pulleys 11 and 12 and a drum 13, and having its other end fixed to drum 13, a cable 18 having one end fixed and wound on pulleys 11, 12 and 21′ and on drum 13′ and having its other end fixed to the latter drum, a cable 10′ having one end fixed and wound on pulleys 11′ and 12′ and drum 13′ and having its other end fixed to the latter drum, a cable 18′ having one end fixed and wound on pulleys 11′, 12′ and 21 and wound on drum 13 and having its other end fixed to the latter drum, cable 18′ being wound on drum 13 in a reverse direction from cable 10, cable 10′ being wound on drum 13′ in a reverse direction from cable 18, pawl-and-ratchet devices operated by said drums for rotating said driven shaft, a cross-head carrying pulleys 11 and operated by one piston, a cross-head carrying pulleys 11′ and operated by the other piston, a stationary pulley 23 and a cable 22 running over pulley 23 and having its respective ends fixed to the respective cross-heads, and valve means for the cylinders controlled by the pistons.

In testimony whereof I have hereunto set my hand, at Los Angeles, California, this 8th day of July, 1905.

ROSS H. STOLLAR.

In presence of—
ARTHUR P. KNIGHT,
FRANK L. A. GRAHAM.