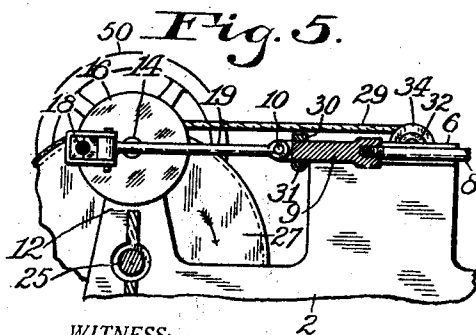
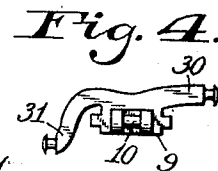
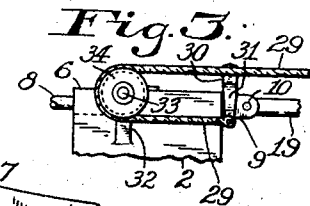
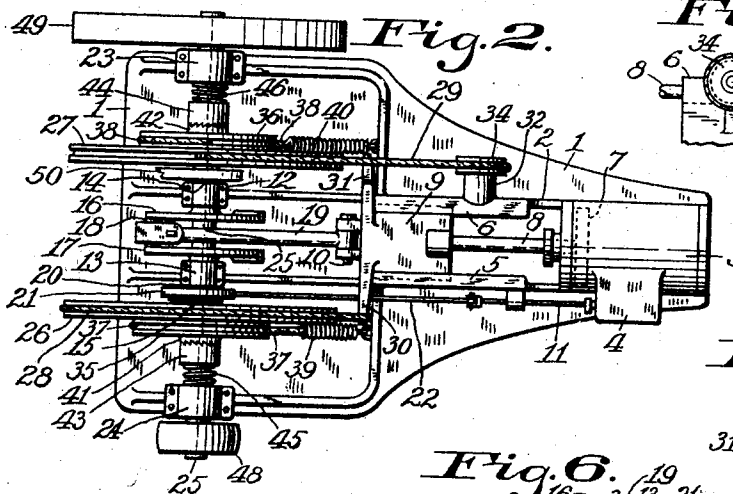
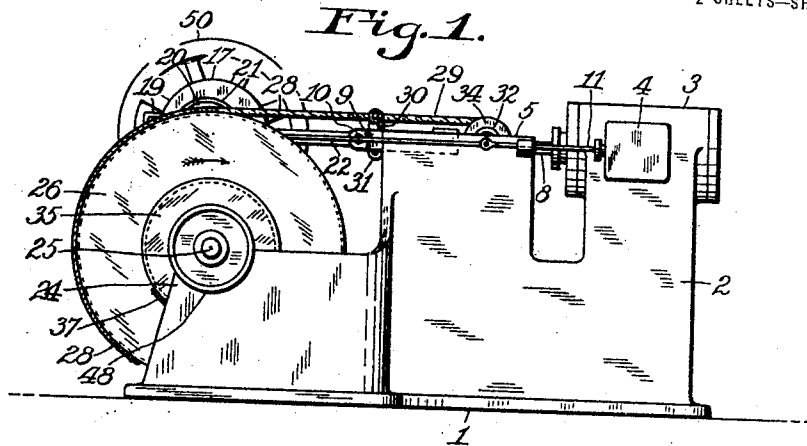


J. R. ETTER.  
ENGINE POWER MECHANISM.  
APPLICATION FILED AUG. 21, 1920.

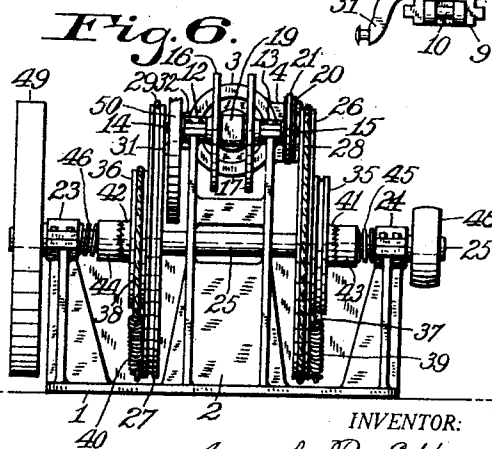
1,404,017.

Patented Jan. 17, 1922.  
2 SHEETS—SHEET 1.



WITNESS:

D. W. Voorhies  
R. A. Sample.



INVENTOR:

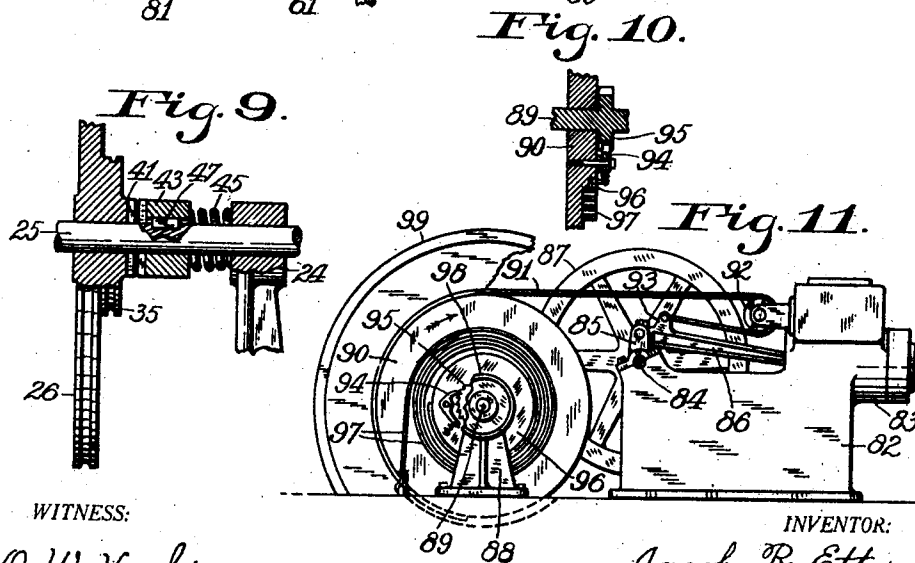
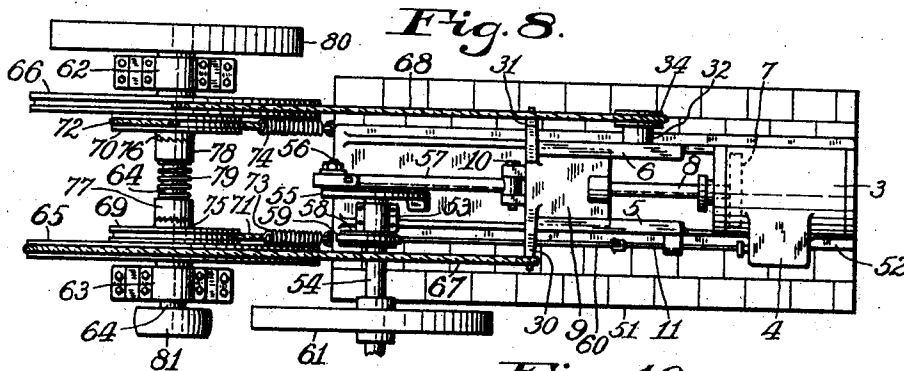
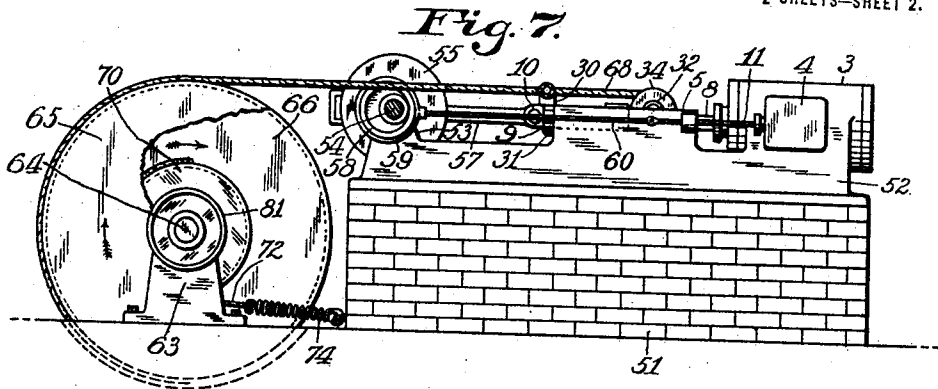
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2 SHEETS—SHEET 2.



WITNESS:

D. W. Vorkies  
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# UNITED STATES PATENT OFFICE.

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## ENGINE POWER MECHANISM.

1,404,017.

Specification of Letters Patent.

Patented Jan. 17, 1922.

Application filed August 21, 1920. Serial No. 405,168.

*To all whom it may concern:*

Be it known that I, JACOB R. ETTER, a citizen of the United States, residing at Crawfordsville, in the county of Montgomery and State of Indiana, have invented a new and useful Engine Power Mechanism, of which the following is a specification, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

This invention relates to mechanism which is designed to be connected with a reciprocating engine, whether of the steam engine or the explosion engine type, for transmitting the motion developed by the engine, the invention having reference more particularly to mechanism whereby greater power may be obtained from the engine than commonly from an engine without increasing the dimensions of the engine cylinder or cylinders and the general structure of the engine.

An object of the invention is to provide power mechanism of such construction as to be adaptable either to new engines or to engines already in use and whereby increased power may be transmitted over and above that usually transmitted by the engine.

Another object is to provide reciprocating engines with improved power mechanism of simple construction which shall not be costly to produce and install, and which will be durable and economical in use.

With the above-mentioned and other objects in view, the invention consists in power mechanism which is adapted to be a constituent of a reciprocating engine or one having a reciprocating power element, whether originally built in with the engine structure or subsequently mounted in connection with the engine structure; and, the invention consists also further in the novel parts or features, and in the combinations and arrangements of parts, as hereinafter particularly described and further defined in the appended claims.

Referring to the drawings,—Figure 1 is a side elevation of a single cylinder steam-engine provided with the power mechanism and built in permanently with the engine structure, features of the engine not necessary to an understanding of the invention being omitted, and the balance-wheel on the crank shaft of the engine being fragmentary; Fig 2 is a top plan of Fig. 1, the bal-

ance-wheel being broken away; Fig. 3 is a fragmentary side elevation showing features on the opposite side to that seen in Fig. 1; Fig. 4 is an end view of an engine cross-head provided with parts of the invention; Fig. 5 is a fragmentary longitudinal central section of the engine; Fig. 6 is an end elevation of the engine; Fig. 7 is a side elevation of one of the larger types of steam-engines illustrating the manner of applying the power mechanism thereto after the engine is set for use, features of the engine not necessary to an understanding of the invention being omitted; Fig. 8 is a top plan of Fig. 7; Fig. 9 is a sectional detail showing features on an enlarged scale whereby motion from an oscillatory wheel is imparted to a rotary shaft; Fig. 10 is a fragmentary sectional detail of a modified form of apparatus whereby motion from an oscillatory wheel is given to a rotary shaft; and, Fig. 11 is a side elevation of an engine of the well-known explosion type and the power mechanism applied thereto.

Similar reference characters in the various figures of the drawings indicate corresponding or like elements or features of construction herein referred to in detail.

The steam-engine with which the power mechanism may be constructed so as to be completed in a factory and conveniently shipped as a unit, comprises a suitable base on which is a frame or bed, which may be variously constructed, and which supports a power cylinder with which a valve chest is connected, crosshead guides and a piston suitably supported by the frame, and a piston in the cylinder having a piston rod which is secured to a crosshead movably supported by the guides, the crosshead being provided with a wrist pin. The admission of steam to the cylinder is controlled by means of a valve stem connected with a valve (not shown) in the valve chest, as will be understood. The engine frame or bed supports pillow blocks in which two sections of a crank shaft are respectively mounted, the sections being provided with crank disks and respectively to which a crank pin is connected, a connecting rod or pitman being connected with the crank pin and also with the wrist pin. In some cases the crank disks may be sufficiently large and heavy to constitute fly-wheels. One section of the crank shaft

has an eccentric 20 thereon provided with an eccentric strap 21 to which a rod 22 is secured which is connected with the valve stem 11. As thus constructed there is a limitation to the power that may be generated with a given length and diameter of the cylinder, as is well-known.

The base or frame of the engine is provided with a pair of pillow blocks 23 and 24 which rotatably support a power shaft 25 at a suitable distance below the crank shaft of the engine. A grooved power wheel 26 is mounted to rotate on the shaft 25 and preferably a similar wheel 27 is likewise mounted on the shaft, two power wheels being preferable, and they are of suitable diameter so that the uppermost portion of the periphery shall be approximately as high or slightly higher than the crosshead of the engine. Cables 28 and 29 are secured to the power wheels and extend from the uppermost portions thereof, one of the cables being connected to an arm 30 and the other cable to an arm 31 with which the crosshead is provided, said arms being rigid on the crosshead, and one of the arms enables the crosshead to directly pull the cable 28 and unwind it from the power wheel 26 whereby to rotate the wheel in one direction. A suitable bracket 32 is fixed on the engine frame and has a stub shaft 33 on which a pulley 34 is mounted, and the cable 29 extends from the power wheel 27 over the pulley 34 and back to the arm 31 to which the cable is secured, so that when the crosshead is moving away from the cylinder the cable 29 is unwound from the wheel 27 to cause rotation of the wheel in one direction. For the purpose of rotating the power wheels in the reverse direction and winding the cables thereon, the power wheels are provided with pulleys 35 and 36 fixed thereto respectively and on which cables 37 and 38 are respectively wrapped and secured thereto, suitable springs 39 and 40 being connected with the cables 37 and 38 respectively and suitably anchored to the engine frame whereby to retract the power wheels.

Suitable ratchet clutches are provided whereby the power wheels oscillating or turning in one direction shall rotate the power shaft 25 in the same direction intermittently, and permit the power wheels to turn backward or in a reverse direction on the power shaft, and preferably the hubs of the pulleys 35 and 36 are provided with ratchet-toothed clutch members 41 and 42 respectively that are fixed to the pulleys, ratchet-toothed clutch sleeves 43 and 44 are slidably arranged on the shaft 25 and yieldingly held to the clutch members by means of springs 45 and 46 arranged on the shaft between the clutch sleeves and the pillow blocks 24 and 23 respectively, each clutch sleeve being enabled to turn the shaft by

means of a spline 47, shown clearly in Fig. 9, the teeth on the co-operating clutch devices having inclined backs so that the clutch sleeves shall be forced out of engagement with the teeth on the clutch members when the power wheels are turned backwards. The power shaft 25 has a suitable wheel or pulley 48 secured thereto whereby to transmit the developed power and motion; and preferably the power shaft is provided with a fly-wheel 49 to cause continuous rotation of the shaft when desired. In some cases it may be desirable to provide the crank shaft of the engine with a fly-wheel 50, which being a well-known element is incompletely shown in the drawings.

The engine illustrated in Figs. 7 and 8 may have a brick foundation 51 supporting an engine bed or frame 52 which supports the cylinder 3 and other elements as above described, and the bed has a pillow block 53 thereon which supports a crank shaft 54 which may be supported by another pillow block (not shown), the crank shaft having a crank disk 55 thereon provided with a crank pin 56 to which a pitman 57 is connected which is connected also with the wrist pin of the crosshead 9, the crosshead being provided with the lateral arms 30 and 31 as above described. The crank shaft has an eccentric 58 thereon provided with an eccentric strap 59 to which an eccentric rod 60 is connected, which is connected with the valve stem 11 for controlling the steam-valve of the engine. The crank shaft preferably has a fly-wheel 61 secured thereto. A pair of pillow blocks 62 and 63 are suitably supported beyond the foundation of the engine, or on an extended foundation as may be desired and a power shaft 64 is rotatably supported thereon, being on a level considerably lower than that of the crank shaft 54. Two power wheels 65 and 66 are rotatably mounted on the power shaft and have cables 67 and 68 connected to the periphery thereof respectively, one cable leading directly to and being connected to the arm 30 on the crosshead, the other cable extending directly to and over the pulley 34 mounted on the engine frame and back to the arm 31 to which the cable is connected. The power wheels have pulleys 69 and 70 fixed thereon respectively and to which cables 71 and 72 are respectively connected, the cables being connected with retracting springs 73 and 74 respectively that are suitably anchored, for retracting the power wheels. The pulleys 69 and 70 are provided with ratchet-toothed clutch members 75 and 76 respectively that are adapted to engage ratchet-toothed clutch sleeves 77 and 78 respectively that are splined on the shaft 64 and yieldingly forced to the clutch members by means of a spring 79 arranged on the shaft between the clutch sleeves. The power shaft has a fly-wheel 130

80 secured thereto and is provided also with a wheel or pulley 81 for transmitting motion power from the power shaft.

In Fig. 11 so much of an internal combustion engine is shown as will be sufficient to an understanding of the application of the power mechanism thereto, the engine comprising a bed or frame 82 supporting an explosion cylinder 83 and a crank shaft 84 provided with a crank 85 with which a connecting rod 86 is connected to be actuated in a well-known manner by the engine piston, the crank shaft having a fly-wheel 87 thereon. Pillow blocks 88 are suitably supported and support a power shaft 89 on which a power wheel 90 is rotatably mounted, the power shaft being considerably lower than the crank shaft, so that a large power wheel is permissible. A suitable belt 91 is secured to the power wheel and extends partially about the periphery thereof and thence to and over a pulley 92 suitably supported on the engine frame, and thence to a lug 93 fixed on the connecting rod 86 adjacent to the crank 85. The power wheel 90 is provided with a pawl 94 which operates in connection with a ratchet wheel 95 suitably secured to the power shaft 89 to enable the power wheel moving in one direction to intermittently rotate the shaft, and permit the power wheel to turn in the reverse direction on the shaft. One side of the power wheel has a hublike extension 96 on which a spring 97 is wrapped and secured at one end, the opposite end of the spring being suitably anchored to the ground or to a convenient anchorage, the spring being designed to retract or turn back the power wheel, being a modification of the retracting springs above described. The power shaft 89 has a wheel or pulley 98 secured thereto for transmitting power from the shaft, and the shaft is provided also with a fly-wheel 99.

It is to be understood that the structures illustrated and described are to broadly disclose the principle, function, and mode of operation of the invention rather than arbitrary structures which may be variously modified as may be desired.

In practical use, in the operation of a steam-engine, as the crosshead moves toward the power cylinder the cable 28 is drawn from the uppermost portion of the power wheel 26 which affords great leverage to turn the power shaft 25, the retracting spring 40 at the same time causing the power wheel 27 and the cable 29 to be moved backward. As the crosshead moves away from the cylinder the cable 29 is pulled around the pulley 34 and unwrapped from the power cylinder 27, resulting in the power shaft being forcibly turned while the retracting spring 39 reverses the motion of the power wheel 26 and wraps the cable 28

thereon, resulting in the oscillation of the power wheels intermittently turning the power shaft, the rotary motion of which may be continued by stored energy in the fly-wheel 49. During the operation the crank shaft is not depended on for transmitting motion but performs its usual other functions. The results above described follow the operation of the mechanism illustrated in Figs. 7 and 8.

In the operation of explosion engines each outward stroke of the connecting rod 86 causes the band or strap 91 to be drawn about the pulley 92 and off from the periphery of the power wheel 90 which transmits rotary motion to the power shaft 89, the inward or opposite stroke of the connecting rod permitting the retracting spring 97 to reverse the motion of the power wheel and to wrap the band 91 thereon. The actuating motions being rapid, it follows that the balance-wheel 99 must turn rapidly and store energy to continue rotation of the power shaft during reverse movement of the power wheel.

Having thus described the invention, what is claimed as new is—

1. Engine power mechanism having a crank shaft and a power shaft and also a reciprocatory power-driven element, the crank shaft being operatively connected with the reciprocatory element and provided with a fly-wheel, means connecting the power shaft with the reciprocatory element to intermittently rotate the shaft, and a fly-wheel secured to the power shaft.

2. Engine power mechanism having a controlling shaft and a power shaft and also a power-driven reciprocatory element having a lateral lug arm thereon, the extent of movement of the reciprocatory element being controlled by the controlling shaft, a large power wheel on the power shaft to intermittently rotate the shaft, and a cable connected with the lug arm of the reciprocatory element and the periphery of the power wheel.

3. Engine power mechanism including a reciprocatory power-driven element, a rotary power shaft, a power wheel rotatable on the power shaft and provided with means to clutch it to the shaft for forward motion, a cable on the periphery of the power wheel connected with the reciprocatory element to intermittently rotate the wheel, a rotary shaft operatively connected with the reciprocatory element and provided with a fly-wheel, and means to reversely rotate the power wheel.

4. Engine power mechanism including a power cylinder, a crank shaft, a reciprocatory element having connection with the crank shaft and co-related to the cylinder to be actuated by force in the cylinder, a rotary power shaft, a power wheel rotatable

on the power shaft, means connecting the periphery of the power wheel with the reciprocatory element to enable the reciprocatory element to rotate the power wheel in one direction, co-operating means enabling the power wheel when rotated to rotate the power shaft, and means to rotate the power wheel on the shaft in the opposite direction.

5 5. Engine power mechanism including a crank shaft and a power shaft and also a reciprocatory power-driven element, the power shaft having a device thereon to transmit power from the shaft, the crank shaft being operatively connected with the reciprocatory element, a power wheel rotatable on the power shaft and provided with means to clutch it to the shaft, a cable connected with the reciprocatory element and the periphery of the power wheel to rotate the wheel intermittently in one direction, and means to rotate the power wheel intermittently in the reverse direction.

6. Engine power mechanism including a crank shaft and a power shaft and also a reciprocatory power-driven element, two power wheels to alternately rotate the power shaft, a supported pulley, a cable connected with the reciprocatory element and extending directly to and connected with the periphery of one of the power wheels, a cable connected with the reciprocatory element and extending about the pulley and to the periphery of the remaining one of the power wheels and connected thereto, and means controlled by the crank shaft to control the extent of movements of the reciprocatory element.

7. Engine power mechanism including a reciprocatory power-driven element, a crank shaft having connection with the reciprocatory element to limit the extent of the movements thereof, a rotary power shaft provided with a clutch device and also a

device to transmit motion from the shaft, a power wheel rotative on the power shaft and provided with a clutch member co-operating with the clutch device to intermittently rotate the shaft, a cable connected with the reciprocatory element and also with the periphery of the power wheel to rotate the wheel in one direction, and means to rotate the power wheel in the reverse direction.

8. Engine power mechanism comprising a power cylinder, a reciprocatory piston rod actuated in and extending from the cylinder, a crosshead secured to the piston rod and provided with two lateral arms, a pulley supported in proximity to the power cylinder, a crank shaft rotatably supported, a pitman connected with the crosshead and the crank shaft, a fly-wheel connected with the crank shaft, a rotatably-supported power shaft, two power wheels rotatable on the power shaft and provided each with a clutch device, two clutch elements on the power shaft to be engaged by the clutch devices to rotate the shaft forwardly, a cable connected to and extending from the periphery of one of the power wheels directly to one of the arms of the crosshead and connected thereto, a cable connected to and extending from the other of the two power wheels and about the pulley and back to and connected with the remaining one of the arms of the crosshead, the cables rotating the wheels alternately, two anchored springs having connection with the power wheels respectively to reversely rotate the wheels, and a fly-wheel and also a drive wheel secured to the power shaft.

In testimony whereof, I affix my signature in presence of two witnesses.

JACOB R. ETTER.

Witnesses:

ROBERT W. MARTIN,  
O. P. EVERSON.