F. D. WARD.

PORTABLE ENGINE.

APPLICATION FILED NOV. 16, 1917.

1,385,289. Patented July 19, 1921.

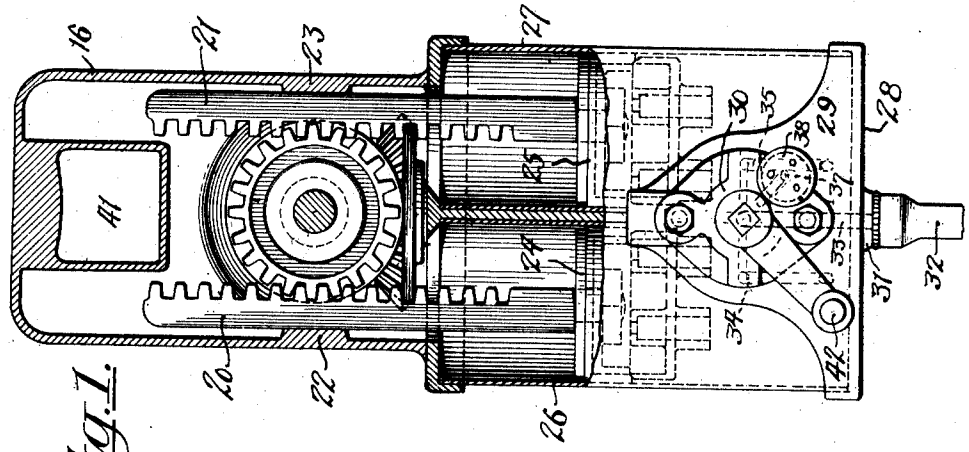

Fig. 1.

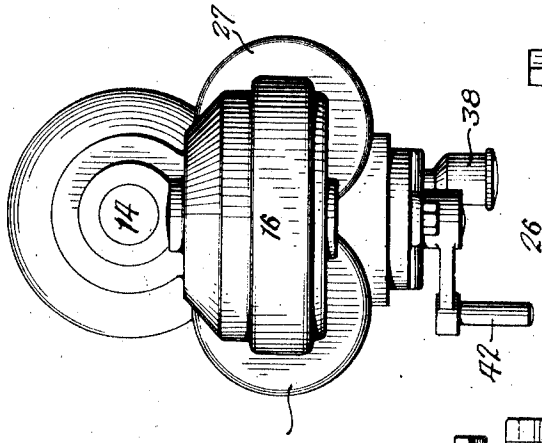

Fig. 3.

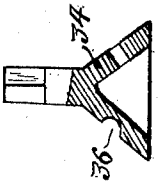

Fig. 5.

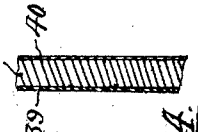

Fig. 4.

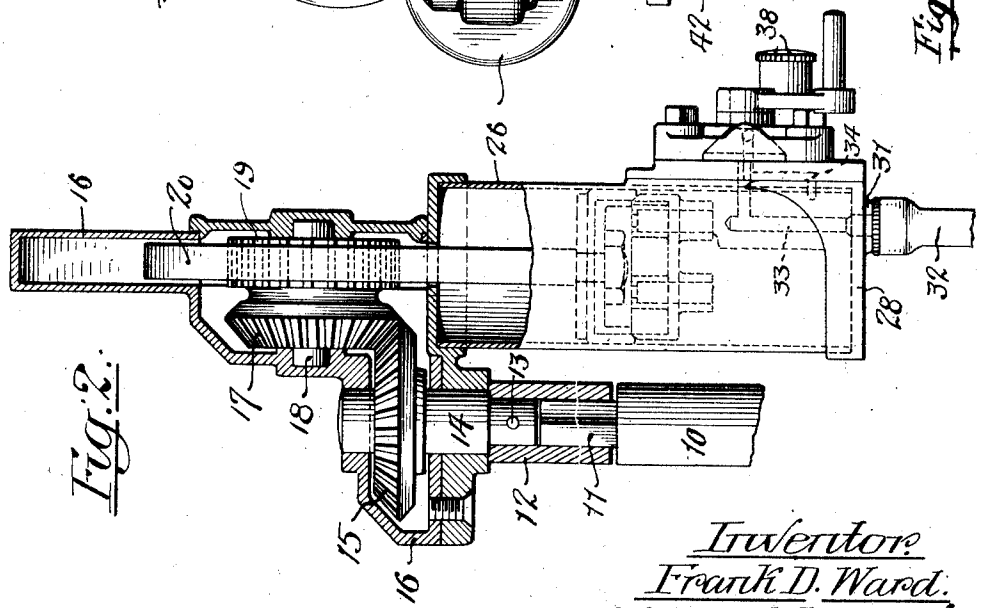

Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANK D. WARD, OF NEW YORK, N. Y.

PORTABLE ENGINE.

1,385,289. Specification of Letters Patent. Patented July 19, 1921.

Application filed November 16, 1917. Serial No. 202,422.

To all whom it may concern:

Be it known that I, FRANK D. WARD, a citizen of the United States of America, residing in the city, county, and State of New York, have invented a certain new and useful Improvement in Portable Engines, of which the following is a specification.

My invention relates to portable engines and particularly to pneumatic engines for operating car doors, or the like, the special object of my invention being to provide a light, handy, pneumatic engine which may be moved from one end of the car to another by a conductor or motorman, and readily connected up to operate the door-opening mechanism.

In the accompanying drawings,

Figure 1 is a front elevation, partially in section, of an engine in which my invention is embodied in one form;

Fig. 2 is a similar view taken from the side of the engine;

Fig. 3 is a plan thereof;

Fig. 4 is a partial section through a cylinder wall; and

Fig. 5 is a broken elevation of the valve.

Referring to the drawings, the door-opening lever-mechanism (not shown) is connected to the vertical shaft 10 having a squared end 11 of a type common where manually-operated handles are used. The present engine is detachably supported thereon and engaged therewith through the sleeve 12, secured by cross pin 13 to the spindle 14, fast with the bevel gear 15. Meshing with the bevel gear 15 and inclosed by and also journaled in the same housing 16 is a second bevel gear 17, mounted on an axis 18. On this axis is secured a gear wheel 19, which may be cast integral with the bevel gear 17. Meshing with the gear 19 and on opposite sides of its axis, are rack bars 20 and 21, supported by slide bearings 22 and 23 formed as bosses on the inner face of the housing 16. At their lower ends, the rack bars are attached to the piston heads 24—25 which work in a pair of parallel cylinders 26—27, at one end of which the housing 16 is mounted. At the opposite end of the cylinders, and forming a common head therefor, is a head plate 28 having at one side a standard 29 extending up between the cylinders. This standard carries the valve mechanism 30. The particular construction of the valve mechanism is not material to the present invention, but is shown of the same type as that indicated in my copending application Serial No. 202,421, filed November 16, 1917. It suffices to point out that at the bottom of the plate 28, a screw nipple 31 is provided for ready detachable connection with the air hose 32 leading to the pressure storage tank (not shown). A passage 33 through the standard leads to the valve proper 34 which controls the admission of air through the passages 34—35 to the corresponding ends of the cylinders 26—27. Both cylinders exhaust through the passages 34—35 to the groove 36 in the outer face of the valve which establishes communication between the passages 34—35 and exhaust port 37. At the outlet of the exhaust passage, a muffler 38 may be provided to prevent the too rapid escape of the air from the exhausting cylinder. This cushions the movement of the engine and prevents a too rapid actuation of the door mechanism.

I have found that the cylinders 26 and 27 are greatly improved in durability and service if their inner faces are provided with a vitrified lining 39. This minimizes the friction of the piston, lessens the necessity for lubrication and protects the metal of the cylinder from danger of rust when the engine is not in operation. It is also desirable to provide the cylinder with a vitrified exterior coating 40; but this is not so necessary as the inner lining. The vitreous coating may be applied in any suitable way, as by dipping the cylinders into a suitable glaze and then subjecting the same to baking heat. I have found that with this type of cylinder it is possible to practically prevent leakage of the air past the piston packing,—particularly if a packing cap of the type shown in my copending application Serial No. 201,056, be used with the piston cup leather.

The manner in which the engine is used is readily understood. The hand hold 41 formed in the upper portion of the casing 16 affords ready means for lifting and carrying the engine, which weighs about ten pounds. The operator places it in position by seating the sleeve 12 on the squared end 11 of shaft 10, and screwing the air pipe 32 onto the nipple 31. A cock in the air line 32 is then turned on, which permits the pressure to pass up through 33 to the valve. The latter is manually controlled by lever 42 and admits pressure to one or the other

of the cylinders 26 or 27. The movement of the pistons 24—25 is transmitted by the rack bars 20—21 to the pinion 19 and thence through bevel gears 17 and 15 to the shaft 14 and sleeve 12 to the shaft 10 which operates the door levers. A bracket (not shown) is arranged in any suitable position to support and hold the engine, and thus relieve the shaft 10 from strain incident to the weight of the engine.

The engine is extremely compact, simple and light but perfectly efficient and well suited to the uses for which it is designed.

Various modifications in detail and arrangement of the construction parts will readily occur to those skilled in the art, without departing from what I claim as my invention.

I claim:

1. A self-contained manually portable engine, comprising a pair of cylinders arranged side by side in parallel, pistons working in said cylinders, a pair of rack bars carried by said pistons and projecting in the same direction therefrom, a pinion interposed between said rack bars and meshing therewith, an oscillating shaft mounted parallel to the axes of the cylinders and to one side thereof, gearing operatively connecting said pinion and shaft to drive the latter, means associated with said shaft for making a quick detachable connection with a driven member, a port adapted to make quick detachable connection with a compressed air pipe, and manually controlled valve means mounted on the opposite side of the cylinders from the oscillating shaft for establishing communication between said port and the respective piston cylinders to drive the pistons simultaneously in opposite directions therein, and thereby impart motion to said shaft.

2. A self-contained manually portable engine, comprising a pair of cylinders arranged side by side in parallel, pistons working in said cylinders, a pair of rack bars carried by said pistons and projecting in the same direction therefrom, a pinion interposed between said rack bars and meshing therewith, an oscillating shaft mounted parallel to the axes of the cylinders and to one side thereof, gearing operatively connecting said pinion and shaft to drive the latter, means associated with said shaft for making a quick detachable connection with a driven member, a port adapted to make quick detachable connection with a compressed air pipe, manually controlled valve means mounted on the opposite side of the cylinders from the oscillating shaft for establishing communication between said port and the respective piston cylinders to drive the pistons simultaneously in opposite directions therein, and thereby impart motion to said shaft, and a casing common to the pair of rack bars and the pinion meshing therewith, said casing being apertured between the bars to afford a hand hold.

3. A self-contained manually portable engine, comprising a pair of cylinders arranged in parallel side by side, a head common to said cylinders and having a standard projecting therebetween to one side thereof, a port in said head for quick detachable connection to a compressed air pipe, a valve carried by said head for controlling admission of compressed air to said cylinders, a manually operated valve stem projecting therefrom at right angles to the axes of the cylinders, a pair of rack bars carried by the piston and projecting in parallel in the same direction from the ends of the cylinders opposite said cylinder head, a pinion interposed between said rack bars and engaged thereby, a shaft parallel to the axes of the cylinders, and an operative connection therefrom to the pinion to cause said shaft to oscillate on the reciprocation of the rack bars.

4. For driving a shaft fixed in vertical position, a portable engine having a vertical rotor adapted to make a quick detachable joint with the end of said shaft, gearing operatively connected to said rotor, and a pair of cylinders arranged side by side on axes parallel to that of the rotor, piston means for driving said gearing, a manually operated valve mechanism carried by the cylinders and projecting from the opposite side thereof from the rotor for controlling the admission of a pressure medium to the cylinders, and a port leading to the valve and having means for establishing quick detachable connection to a compressed air pipe.

5. For driving a shaft fixed in vertical position, a portable engine having a vertical rotor adapted to make a quick detachable joint with the end of said shaft, gearing operatively connected to said rotor, and a pair of cylinders arranged side by side on axes parallel to that of the rotor, piston means for driving said gearing, a manually operated valve mechanism carried by the cylinders and projecting from the opposite side thereof from the rotor for controlling the admission of a pressure medium to the cylinders, a port leading to the valve and having means for establishing quick detachable connection to a compressed air pipe, and an exhaust passage controlled by said valve and opened to one of said cylinders when pressure is admitted to the other through said valve.

6. A portable engine comprising a pair of cylinders arranged side by side, a pair of racks driven simultaneously in opposite directions by the pistons in said cylinders and projecting from the same ends thereof, a pinion meshing with said racks, a rotor ar-

ranged on an axis parallel to the axes of the cylinders and arranged to one side thereof in a plane passing between the cylinders, an operative connection between said rotor and pinion transmitting an oscillating motion to the rotor, a manually operated valve projecting from the opposite side of said cylinders, means associated therewith for admitting compressed air to one of said cylinders and simultaneously exhausting the other cylinder, a port for admission of compressed air to said valve, an exhaust port also communicating with said valve, means for establishing a quick detachable connection between the air inlet port and the compressed air pipe, and means for making a quick detachable connection between the rotor and the shaft driven thereby.

7. In a self-contained manually portable engine, a pair of cylinders arranged in parallel, racks connected to their pistons and arranged in extension of said cylinders, drive gearing operated by said racks, a casing inclosing said gearing but apertured between the racks to afford a hand hold for carrying the engine.

In testimony whereof I have signed my name to this specification.

FRANK D. WARD.