W. G. TIBBELS.

ENGINE.

APPLICATION FILED FEB. 23, 1916.

1,189,312. Patented July 4, 1916.

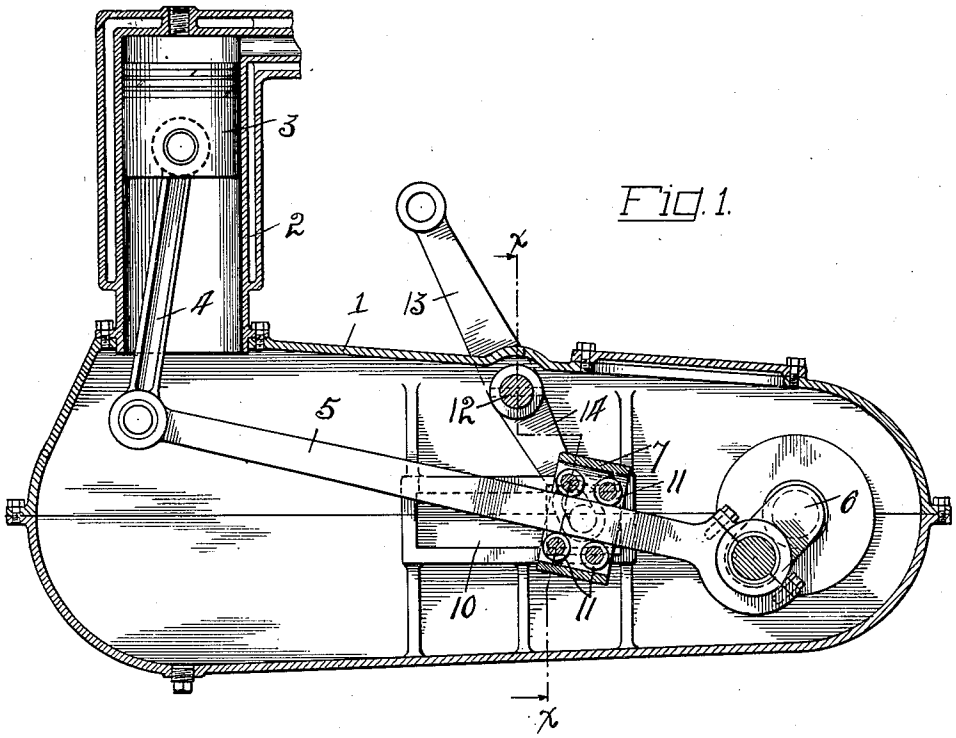


Fig. 1.

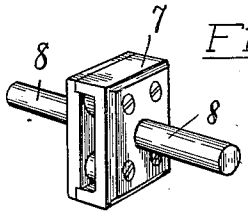


Fig. 3.

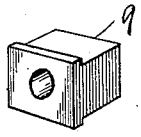
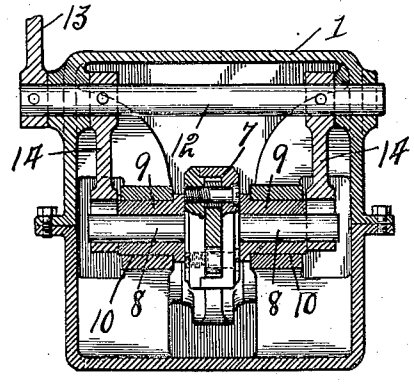


Fig. 4.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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ENGINE.

1,189,312. Specification of Letters Patent. Patented July 4, 1916.

Application filed February 23, 1916. Serial No. 79,949.

To all whom it may concern:

Be it known that I, WILLIAM G. TIBBELS, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Engine; and I 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 is appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to fluid expansion engines, and particularly to those of the internal combustion type.

The object of my invention is the provision, in engines of the class described, of an improved connection between the piston and crank-shaft, which connection is operable to vary the power communicated from the piston to the crank-shaft, and also to cut down the length of stroke of the piston when the engine is running at high speed or under a light load and effect a consequent reduction in the fuel consumption.

The invention is fully described in the following specification, and while, in its broader aspect, it is capable of embodiment in numerous forms, a preferred embodiment thereof is illustrated in the accompanying drawings, in which—

Figure 1 is a central vertical section of an engine of the internal combustion type embodying the invention. Fig. 2 is a cross-section on the line x—x in Fig. 1; and Figs. 3 and 4 are perspective views of different parts of the shiftable fulcrum means for the power lever.

Referring to the drawings, 1 designates the crank-case of an engine embodying the invention, said crank-case being transversely broadened and having one or more engine cylinders 2 mounted thereon near one side edge thereof. A piston 3 is mounted in each cylinder for reciprocatory movements therein, as is well understood in the art, and has a pitman or connecting rod 4 pivotally projecting therefrom through its inner end and into the crank-case. The crank-case end of the connecting rod 4 is pivoted to one end of a lever member 5, which extends longitudinally of the crank-case and is connected at its opposite end to a respective crank of a crank-shaft 6 that is mounted in the crank-case lengthwise thereof and adjacent to its edge portion opposed to that on which the cylinders 2 are mounted. The lever member 5 slidingly projects through a fulcrum-block 7, which has trunnions 8 projecting in axially alined relation from opposite sides thereof and journaled in respective bearing blocks 9, which are mounted for sliding movements longitudinally of the crank-case 1 in respective guideways 10 provided therein. The fulcrum-block 7 is provided interiorly thereof with anti-friction rollers 11 above and below the lever 5 to facilitate a shifting of the fulcrum-block lengthwise of the lever. A rock-shaft 12 is mounted in the crank-case over the guideways 10 transversely of the lever 5 and has a control arm 13 projecting upward therefrom, in the present instance, and a rocker-arm 14 projecting downward therefrom for each trunnion 8 and having its free end longitudinally slotted and receiving the outer end of the respective trunnion.

It is evident that a rocking of the shaft 12 will shift the fulcrum-block 7 lengthwise of the lever and effect a consequent change in the power distributed to the crank-shaft from the down or power-stroke of the piston. It is also evident that, inasmuch as the path of movement of the crank-shaft end of the lever 5 is constant, a shifting of the fulcrum-block to vary the length of the lever arms will cause a variance of the stroke of the power arm of the lever and also of the piston, the piston stroke being shortened in proportion to the shortening of the power arm of the lever.

It will be understood in the use of my invention that when it is desired to communicate considerable power to the crank-shaft, as in case of starting or heavy loads, the fulcrum-block 7 is advanced to lengthen the power arm and correspondingly shorten the load arm of the lever, thereby permitting the lever to have a full length stroke and to communicate a power to the crank-shaft. When, however, the engine is running at high speed or under a light load, the fulcrum-block may be retracted to lengthen the load arm of the lever and to correspondingly shorten the piston stroke. The shortening of the piston stroke reduces the fuel consumption, as less fuel is drawn into the cylinder during a down stroke of the piston.

It is evident that interposing a leverage connection between the piston connecting-rod 4 and the crank-shaft 6 materially increases the horse-power if the load arm of the lever is shorter than the power arm. It is also evident that when the engine is running the lever 5 has reciprocatory movements through the fulcrum-block, due to the shifting of the crank-shaft wrist-pin from one side to the other of its axis of revolution.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, or to use in an engine having any particular number of cylinders, as it is capable of numerous modifications without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an engine of the class described, a piston and crank-shaft in transversely offset relation, a connecting rod projecting from the piston, a lever member directly connected at one end to said connecting rod and directly connected at its other end to a crank of said shaft, and a fulcrum block for said lever member, said block permitting reciprocatory movements of the lever therethrough.

2. In an engine of the class described, a cylinder, a crank-case extending transversely from said cylinder and in communication therewith, a piston movable in the cylinder, a crank-shaft mounted in the crank-case at one side of the cylinder, a connecting rod projecting from the piston into the crank-case, a lever directly connected at one end to said connecting rod and directly connected at its other end to a crank of said shaft, a fulcrum block reciprocally receiving said lever and mounted in the crank-case for shifting movements toward and away from the crank-shaft, and a lever connected to said fulcrum block and operable from without the crank-case to shift the block lengthwise of said first lever.

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

WILLIAM G. TIBBELS.