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H. L. PARR & C. E. LUCKE.

REVERSING MECHANISM FOR ENGINES.

APPLICATION FILED DEC. 9, 1904.

Fig. 1.

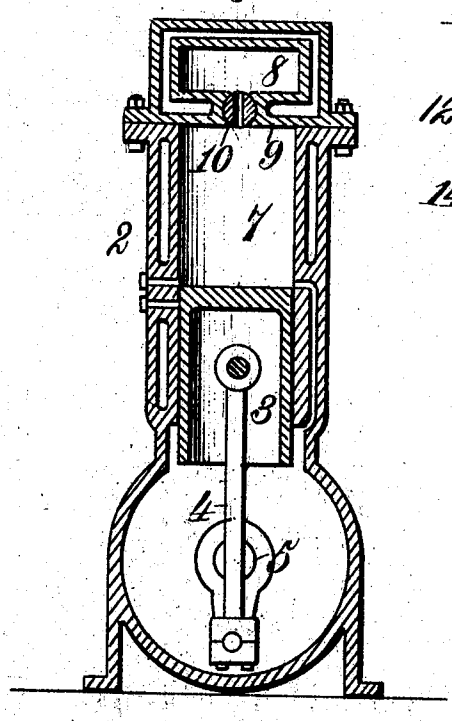


Fig. 6.

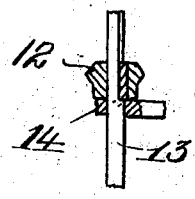


Fig. 2.

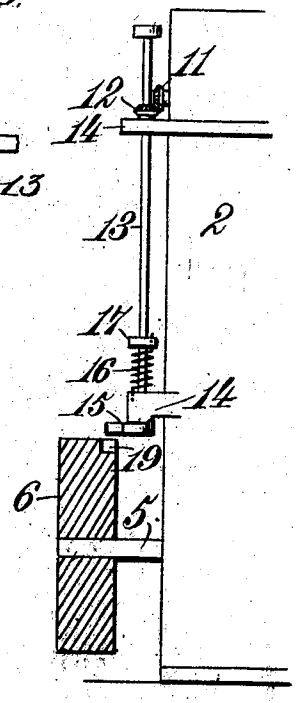


Fig. 3.

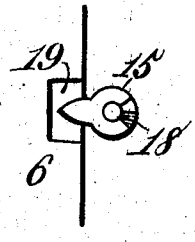


Fig. 4.

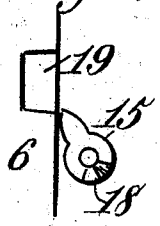
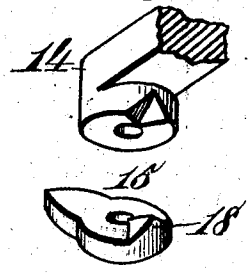


Fig. 5.



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UNITED STATES PATENT OFFICE.

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REVERSING MECHANISM FOR ENGINES.

No. 815,732. Specification of Letters Patent. Patented March 20, 1906.

Application filed December 9, 1904. Serial No. 236,145.

To all whom it may concern:

Be it known that we, HARRY L. PARR, residing at Yonkers, in the county of Westchester, and CHARLES E. LUCKE, residing in the city and county of New York, State of New York, citizens of the United States, have invented new and useful Improvements in Reversing Mechanism for Engines, of which the following is a specification.

This invention relates to reversing mechanism for engines, the object of the invention being to provide a simple and effective means for reversing the motion of the engine.

While we do not limit our invention to the operation of the engine by any particular substance or agent, we find a hydrocarbon fluid quite satisfactory for this purpose.

In the drawings accompanying and forming a part of this specification we have selected for convenience of indicating the advantages of our invention a two-cycle explosive-engine, which we will describe in conjunction with the reversing means represented as embodied therein. It should be understood that the invention, however, is not limited to the reversing means illustrated, for one of a radically different form can be adopted within the scope, of course, of our claims succeeding the following description.

In the description we will employ certain terms; but it should be understood that these are used in their broad or generic senses.

Referring to said drawings, Figure 1 is a longitudinal vertical sectional elevation of a two-cycle explosive-engine embodying reversing means including our invention. Fig. 2 is an elevation of the same. Figs. 3 and 4 are detail views of the fly-wheel shown in Fig. 2 and a coöperating foot or base hereinafter more particularly described. Fig. 5 is a detail in perspective of said base or foot and certain adjacent means. Fig. 6 is a detail sectional view hereinafter more particularly described.

Like characters refer to like parts throughout the different views.

It will be understood from our initial statements that the reversing means constituting the subject of our invention may be employed successfully and advantageously in connection with different types of engines. The engine represented is of the two-cycle explosive type, it having a cylinder, as 2, which, as will hereinafter appear, is of novel construction, and a piston, as 3. The piston-rod is denoted by 4 and is connected with the crank-shaft 5, to the outer end of which is fastened in some suitable way the fly-wheel 6. The cylinder in practice will be provided with the usual inlet and exhaust ports, valve, and sparking or equivalent mechanism associated therewith. We do not deem it necessary to show these features, however, for they form no part of the invention and may be of the ordinary kind as to construction and mode of operation.

The fly-wheel, as will be hereinafter described, is not in the present instance of the ordinary construction, nor is the cylinder 2. In the present case we divide the cylinder 2 into two chambers, as 7 and 8, the chamber 7 constituting a main one and having a working space for the piston and the chamber 8 an auxiliary chamber, the two chambers being divided or separated by a wall, as 9, constituting the inner boundary of said working space and in which is formed a passage to receive the valve 10, the passage in question and the port through the valve being of sufficient area to prevent throttling of the expansive fluid during its flow into and from the auxiliary or compression chamber 8 during or after compression. In the organization shown the valved passage is the sole means of communication between the two chambers. Normally the valve 10, which is of the rocking type, will be open—that is, its port will register with the two chambers 7 and 8. When the valve is closed, its port will be transverse to said passage, so as to shut off communication between said chambers. During the normal operation, however, or when the engine is running the valve will be open, so that the two chambers 7 and 8 can present collectively a charge-receiving space into which the necessary charge to secure the propulsion of the piston is drawn by the latter to be compressed on the inner stroke of the piston in the chamber 8 and subsequently fired to operate the piston.

The operation of the reversing mechanism will, it is believed, be obvious. As has been hereinbefore stated, the valve 10 is normally open, so that the two chambers 7 and 8 present collectively a charge-receiving space into which a charge of hydrocarbon vapor is drawn to be compressed in the chamber 8 and then fired or exploded. It will be as-

sumed that the piston is nearly at its lower dead-center, the valve 10 at this time being open and both chambers 7 and 8 containing fluid which had been drawn thereinto on the outstroke of the piston. Should the valve be closed, when the piston reaches its lower dead-center to shut off communication between the two chambers it will be apparent that the piston as it crosses said dead-center and starts on its inward movement can travel but a short distance or until its further advance is resisted by the highly-compressed fluid within the inner end of the main chamber 7 or working space of the cylinder. As soon at this resistance is encountered by the inwardly-moving piston the latter, owing to the fact that its inertia is not sufficient to overcome the increased pressure or resistance due to a reduction in the effective area of the charge-receiving space of the cylinder, is caused to take a backward or rebounding movement. In other words, it travels outward, the result being that the engine is reversed. During the said backward movement of the piston the valve 10 is opened wide in order to put the two chambers 7 and 8 into communication or to restore the normal conditions.

The valve-actuating mechanism may of course be of any character. We have shown in the drawings one simple mechanism, which we will now describe.

On the stem of the valve is shown as fastened a bevel-gear 11, meshing with a similar bevel-gear 12, through which the rod 13 passes, there being a splined or equivalent non-rotative connection of some suitable kind between the rod and gear 12. The rod extends freely through perforations in the brackets 14, constituting in the present case a part of the framing of the engine, the lower bracket, as will hereinafter appear, coöperating with the base or foot 15, fastened to the lower end of said rod. Around the rod above the lower bracket is a spring 16, which is in the nature of a combined torsional and push spring, its ends being fixedly connected in some desirable way with said lower bracket and with the shoulder 17 on the rod above said lower bracket. The rear end or heel of the base or foot 15 has on its upper side a raised portion 18, shown of bevel form, adapted to normally fit a correspondingly-shaped recess or notch in the under side of said lower bracket, the relation mentioned being maintained by the spring 16.

The fly-wheel 6 coöperates with the base or foot 15 to cause the automatic action of the valve to either put the chambers 7 and 8 into communication or cut them off from each other, and for this purpose it is represented as having in its periphery a recess or cut-out portion of rectangular form, what might be considered the end walls thereof being adapted to alternately engage the toe of the base or foot 15 when the said base or foot is in the range of action of the fly-wheel. When the piston is at its lower dead-center the recess or cut-away portion 19 will be directly opposite the toe or outwardly-projecting end of the base or foot 15. Normally of course the said base or foot is above the periphery or rim of the fly-wheel. When, however, it is desired to reverse the engine, the rod 13 is thrust downward by hand, and any suitable means may be provided for this purpose, so that when the piston is in its lower dead-center the toe of the base or foot 15 can be entered in the recess 19. The downward thrusting of the rod carries the raised portion 18 out of the notch in the lower bracket 14, whereby on the movement of the fly-wheel what would be the lower wall of the slot or recess 19 will strike the toe of the base or foot and will turn the same, and consequently the rod 13. This will of course move the raised portion 18 out of coincidence with the notch of the bracket 14, so that the apex of the raised portion will be against the under flat side of the said lower bracket to prevent the rod from being thrust upward by the spring 16. When the rod was turned by the wall mentioned of the slot or recess 19 striking the toe of the foot 15, the bevel-gears 12 and 11 were operated in order to effect the closing of the valve 10 to throw the chambers 7 and 8 out of communication. When the rod was turned, the spring 16 was tensioned. On the upstroke of the piston after the dead-center position is passed the recess 19 will be carried from opposite the toe of the foot 15, whereby the side of the fly-wheel can maintain the valve closed in order to effect the reversal of the motion of the piston in the manner hereinbefore described. As the piston backs off or rebounds the fly-wheel will correspondingly reverse, so that when the recess 19 comes opposite to the base or foot 15 the spring 16 by untwisting can turn the rod and then elevate it, so as to first cause the valve 10 through the intermediate parts to be opened and the raised portion 18 to be thrust into the notch or seat it normally occupies in the under side of the lower bracket 14. The rod 13, which might be conveniently termed a "valve-actuating" member, can be actuated in a direction to close and open the valve in succession by means other than those hereinbefore described.

From the foregoing description it will be evident that our engine involves a cylinder having a charge-receiving space, a piston arranged to draw a charge of expansible fluid into said space, and means operable at the will of an attendant for decreasing the effective area of the said charge-receiving space, by virtue of which when the said piston in the present case reaches a certain point on its inward stroke the increased pressure offered to the movement of the piston travel-

ing then under inertia will cause the piston to take a backward stroke. We have indicated that we may secure the reduction in the effective area of the charge-receiving space of the cylinder by dividing the charge in the said space into separated bodies, only one of which opposes the inward motion of the piston. In other words, we divide the effective volume of the charge.

We have stated hereinbefore that the chambers 7 and 8 present collectively a charge-receiving space. It should be understood that the charge when compressed during the normal action of the engine does not occupy the chamber 7, but fills the chamber 8, the piston at this time abutting against the wall 9, or practically so, which, as has heretofore been pointed out, constitutes the inner boundary of the working space of the piston.

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

1. An engine having a cylinder, a piston arranged to operate in said cylinder, the latter having a charge-receiving space, and means operable at the will of an attendant for decreasing the effective area of said charge-receiving space, thereby interposing a resistance, greater than the normal one, to the piston when the latter reaches a predetermined point on its inward stroke, for causing a reversal of the motion of the piston, said means being constructed to be automatically returned to normal relation when reversal takes place thereby for restoring the charge-receiving space to its original relation.

2. An engine having a cylinder, a piston arranged to operate in said cylinder, the latter having a charge-receiving space, into which the normal charge is drawn by the piston, and means to divide the normal charge of motive substance in the charge-receiving space into a plurality of separated bodies, to secure a resistance by only one of them to the full inward stroke of the piston when the same reaches a predetermined point on said stroke, said means being constructed to be automatically returned to normal relation when reversal takes place thereby permitting the said separated bodies to commingle.

3. An engine including a cylinder having a plurality of chambers, a passage connecting said chambers and constituting the sole means of communication between the same, a piston arranged to draw a charge of compressible fluid into said space and to compress the same in one of said chambers, a valve in said passage, adapted, when open, to put the chambers into communication, to cause them to present collectively a normal charge-receiving space and mechanism arranged to cause the closing of the valve after the piston has crossed the dead-center on the outstroke thereof to reverse the piston and for subsequently and automatically opening said valve when reversal takes place to put the two chambers into communication.

4. An engine including a cylinder having a plurality of chambers, a passage connecting said chambers and constituting the sole means of communication between the same, a piston arranged to draw a charge of compressible fluid into said space and to compress the same in one of said chambers, a valve in said passage, adapted, when open, to put the chambers into communication, to cause them to present collectively a normal charge-receiving space and mechanism arranged for operation by a movable part of the engine for causing the closure of the valve to put the two chambers out of communication after the piston has crossed the dead-center on the outstroke thereof to reverse said piston and for subsequently automatically opening said valve after reversal takes place to put the two chambers in communication.

5. An engine including a cylinder having a plurality of chambers, a passage connecting said chambers and constituting the sole means of communication between the same, a piston arranged to draw a charge of expansible fluid into said space and to compress the same in one of said chambers, a valve in said passage, adapted, when open, to put the chambers into communication, to cause them to present collectively a normal charge-receiving space, a valve-actuating rod having a turning movement to open and close the valve, and means arranged to operate against the said rod after the piston has crossed the outer dead-center to close the valve and secure a reversal in motion of the piston and for subsequently automatically opening the valve on the reversal of motion of the piston.

6. An engine including a cylinder, having a plurality of communicating chambers presenting together a charge-receiving space, a piston arranged to draw a charge of expansible fluid into said space and to compress the same in one of said chambers, a valve between the chambers, a rod mounted for endwise and turning movement and operatively connected with the valve and serving, when turned, either to open or close the valve, a combined push and torsional spring acting against the rod, a base-piece connected with the rod, having a raised portion and a toe, the framing of the machine having a recess to normally receive said raised portion, and a fly-wheel connected with the piston and provided with a notch to receive the toe.

7. A cylinder and its piston, the cylinder having a working space for the piston, and a chamber in communication with said working space, and into which a body of gaseous fluid is compressed by the piston, a valve operable at the will of an attendant for shutting off communication between said chamber and the working space, whereby when the piston moves inward it will be caused to be reversed

at a predetermined point, and automatic mechanism for actuating the valve after the reversal of the piston to put said chamber and working space into communication.

8. A cylinder and its piston, the cylinder having a working space for the piston, and a chamber in communication with said working space and into which a body of gaseous fluid is compressed by the piston, a valve normally open to permit the charging, by the piston into the chamber and the working space, of a normal charge, said valve being operable at the will of an attendant for shutting off communication between the chamber and the working space to cause the reversal of the piston during its inward stroke, and automatically-operative means for causing the opening movement of the valve on the reversal of the piston, to put the chamber and working space into communication and permit the gaseous fluid in the former to pass into the latter.

9. A cylinder having a working space and a clearance-space communicating with said working space, a piston to traverse the working space and to compress a predetermined charge in the clearance-space, a valve controlling communication beween the working space and the clearance-space, and mechanism to secure the closing of the valve at the will of an attendant, said mechanism being constructed automatically when reversal takes place to bring about an opening of the valve and the communication of the working space and clearance-space.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

HARRY L. PARR.
CHARLES E. LUCKE.

Witnesses:
HOWARD I. MORRIS,
CLIFFORD T. SWART.