No. 854,550. PATENTED MAY 21, 1907.

H. E. ZASTROW & J. H. KOEPP.

REVERSING GEAR FOR GASOLENE ENGINES.

APPLICATION FILED JAN. 10, 1907.

3 SHEETS—SHEET 1.

Fig. 1.

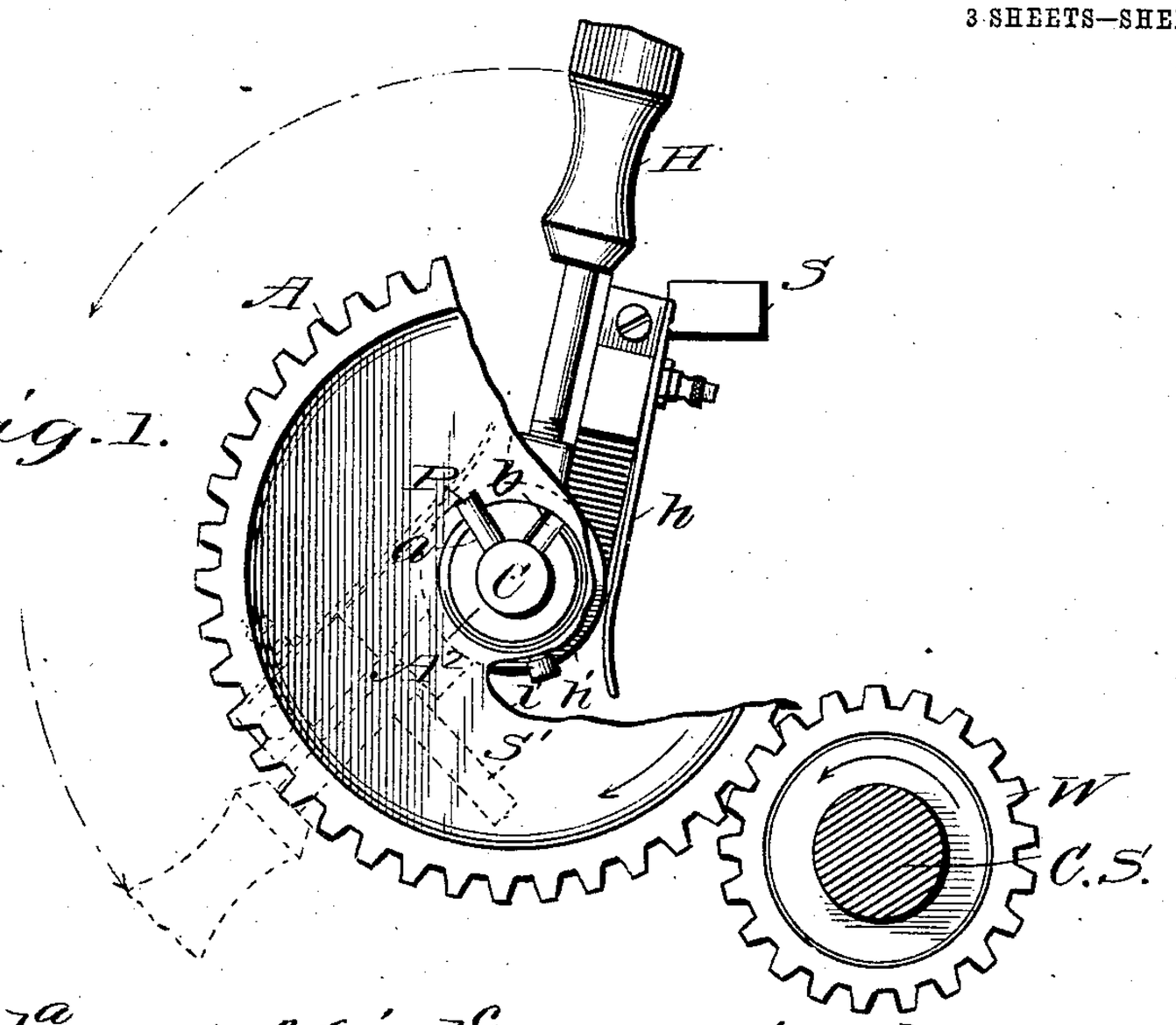


Fig. 1a.

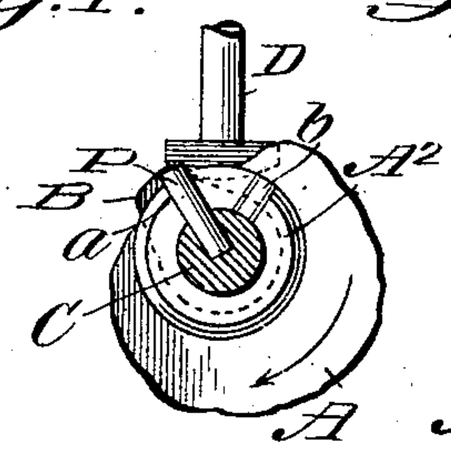


Fig. 1c.

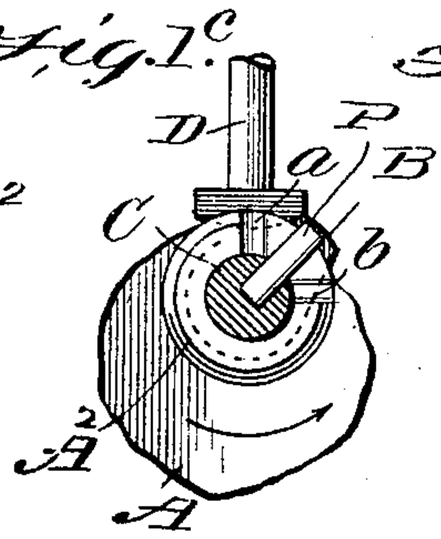


Fig. 1d.

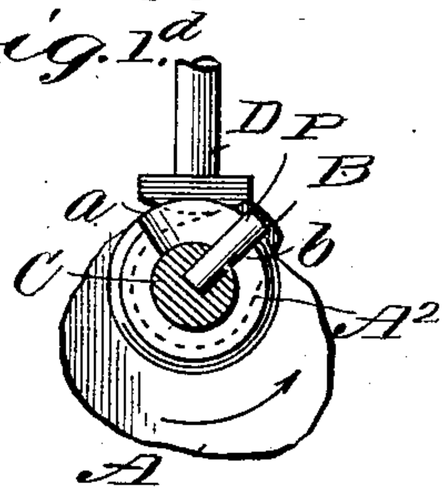


Fig. 1b.

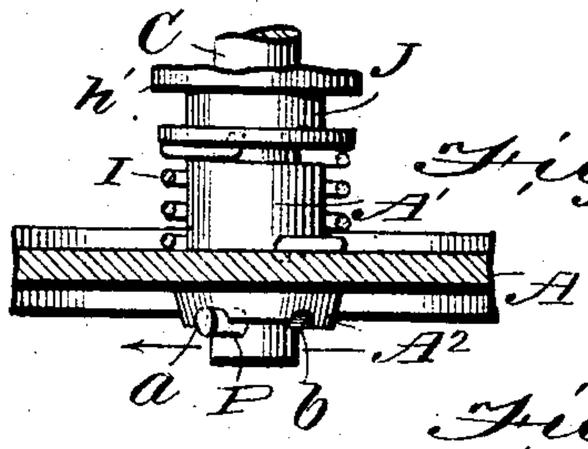


Fig. 1e.

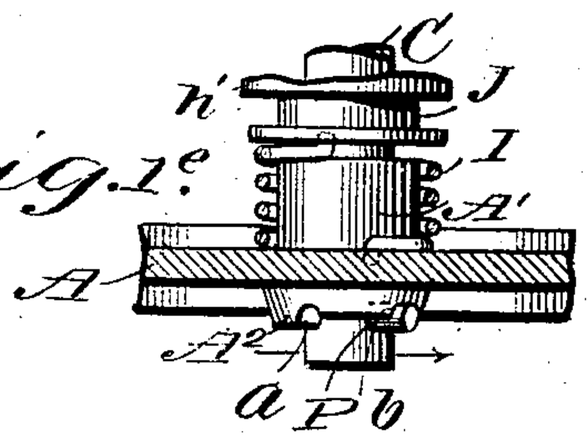
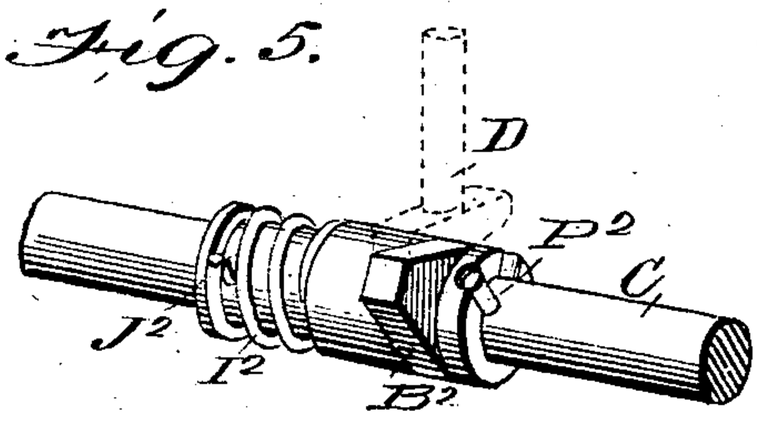


Fig. 5.



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3 SHEETS—SHEET 2.

Fig. 2.

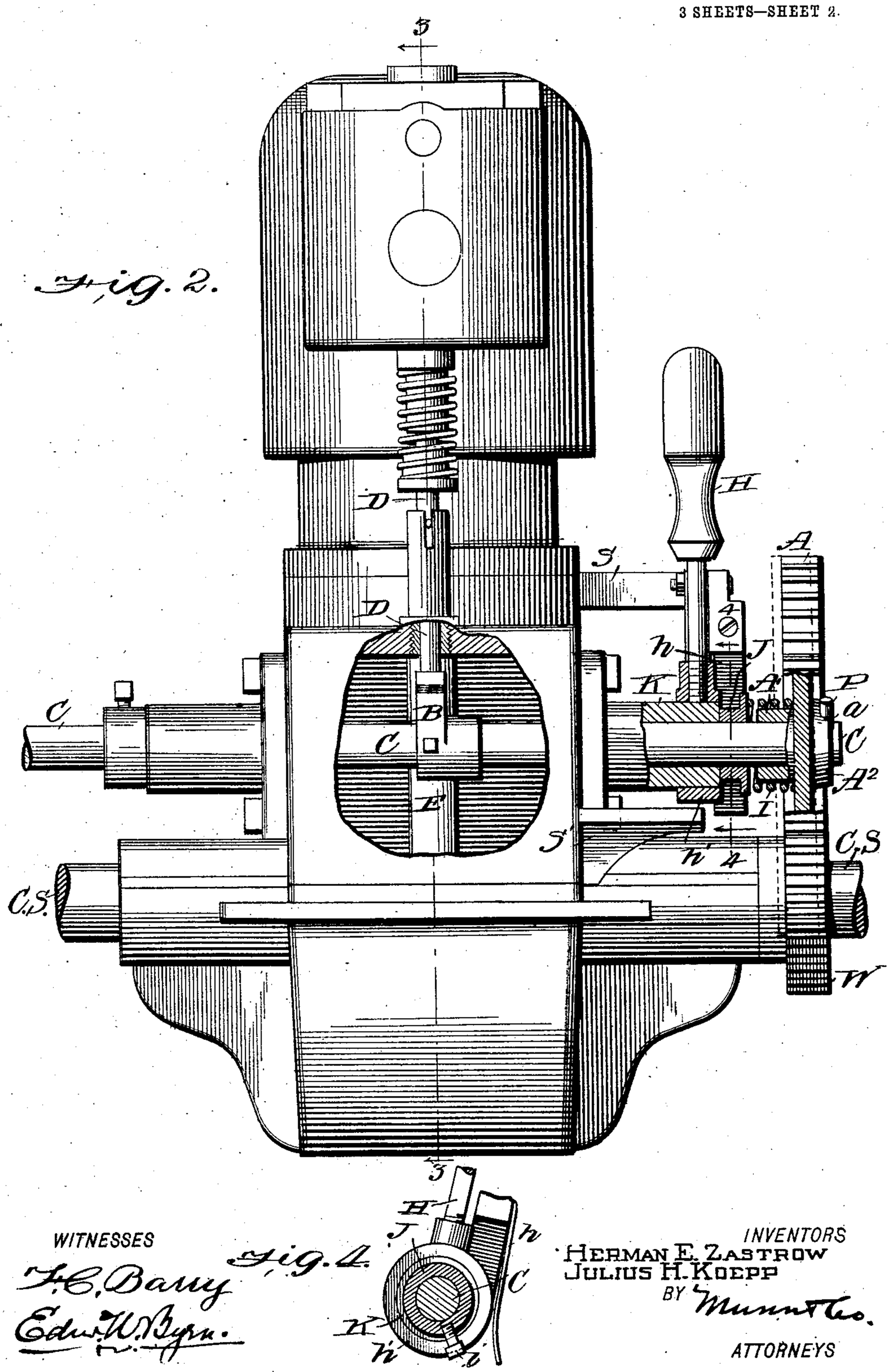

Fig. 4.

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3 SHEETS—SHEET 3.

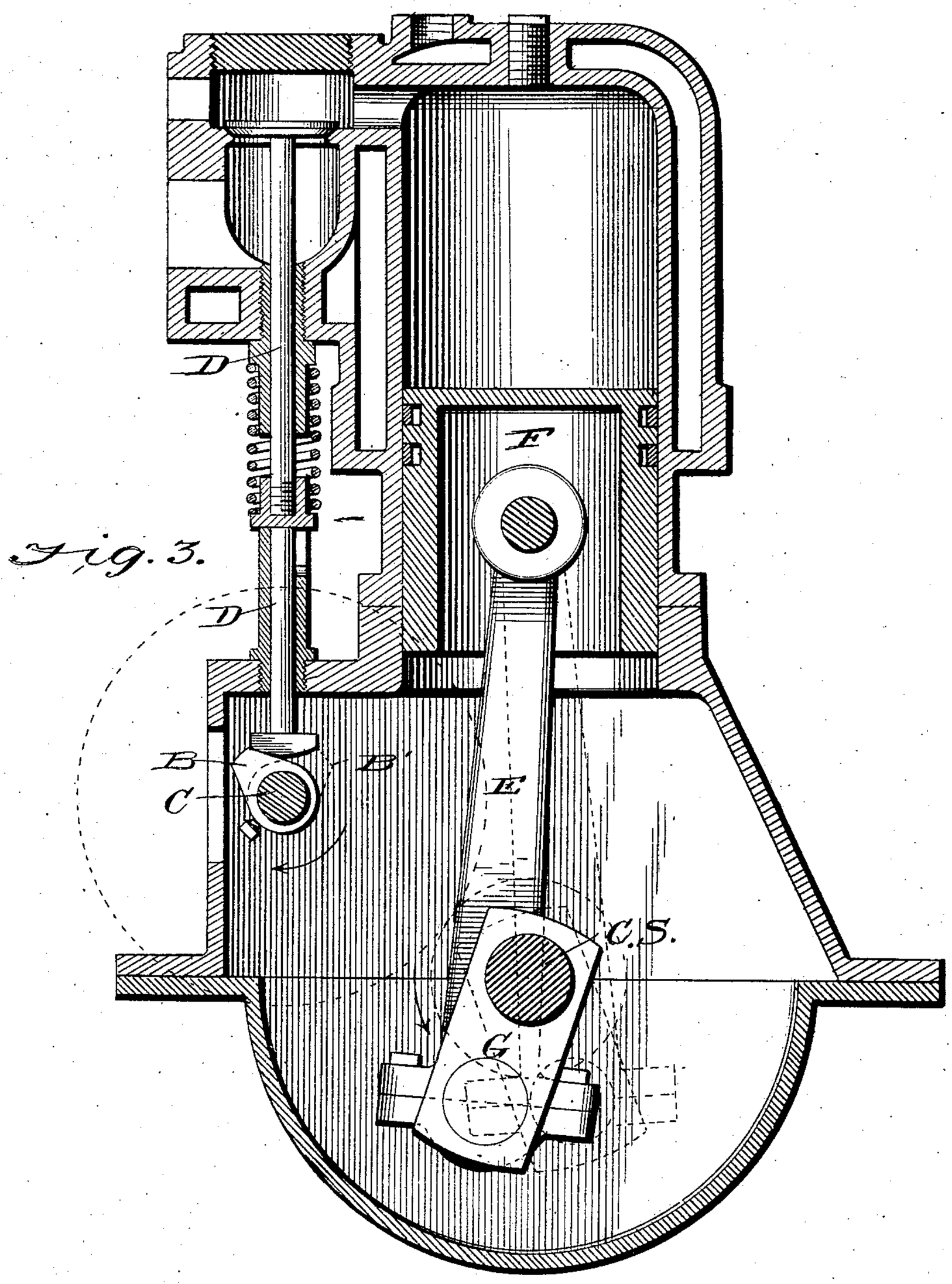

Fig. 3.

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UNITED STATES PATENT OFFICE.

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REVERSING-GEAR FOR GASOLENE-ENGINES.

No. 854,550. Specification of Letters Patent. Patented May 21, 1907.

Application filed January 10, 1907. Serial No. 351,644.

To all whom it may concern:

Be it known that we, HERMAN EDWARD ZASTROW and JULIUS HERMAN KOEPP, citizens of the United States, residing at Portage, in the county of Columbia and State of Wisconsin, have invented a new and useful Improvement in Reversing Gear for Gasolene-Engines, of which the following is a specification.

Our invention is in the nature of a reversing gear attachment for gas and gasolene engines.

Four cycle engines, as ordinarily made, can only be run in one direction, but they can be made to reverse by two adjustments, one of the lifter cam for the exhaust valve, and the other of the spark circuit controller; that is to say, by altering the time of explosion and exhaust in relation to the position of the crank and piston.

Our invention consists in a simple and practical means for reversing without having to gain access to the interior of the engine, and it comprehends as its most distinctive feature a peculiar construction of slip clutch between the timing wheel and its shaft so that the timing wheel may turn a given distance on the shaft independently of the shaft and then take up against and turn rigidly with it, in connection with an adjustable circuit controller, as hereinafter fully described with reference to the drawings, in which

Figure 1 is a broken side view of the drag connection between the timing wheel A and shaft C which carries the lifter cam and showing also the circuit controller H and the main crank shaft C S with the gear W meshing with the timing wheel. Figs. 1^a 1^b 1^c 1^d 1^e are detail views showing different positions of the timing wheel and its shaft. Figs. 1^a and 1^b are side and top views showing the relative position of the timing wheel and its shaft when the timing wheel is revolving in the direction of the arrow in Figs. 1^a and 1^b. Fig. 1^c shows the shifting or transition movement of the timing wheel in relation to the shaft C, and Figs. 1^d and 1^e show the position of the same parts when the transition movement of Fig. 1^c has been completed. Figs. 1^d and 1^e showing the position of parts for running in the reverse direction to Figs. 1^a and 1^b. Fig. 2 is a side view of a four cycle gasolene engine, partly broken away, showing our reversing attachment applied. Fig. 3 is a vertical section on line 3—3 of Fig. 2. Fig. 4 is a section through the circuit controller taken on line 4—4 of Fig. 2 and Fig. 5 shows in perspective view a modification of the invention.

Referring to Figs. 2 and 3, C S is the main crank shaft, G the crank, E the piston rod, F the piston, and C the cam shaft bearing the lifter cam B for the exhaust valve plunger D. The main crank shaft has a small gear W which meshes into and drives the larger gear A on the shaft C, as seen in Fig. 1. This is the ordinary construction of the four cycle engine, the gear A having double the number of teeth as W, and said gear A being rigid on its shaft and known as the timing wheel for giving the spark at every second revolution of the crank shaft. Our invention is directed chiefly to the relation of this timing wheel to its shaft whereby it runs rigid with that shaft in one direction, but when turned in the opposite direction will turn loose on that shaft a given distance, far enough to alter the time action of the exhaust cam, and then take up against and continue to rotate rigidly with that shaft in a direction opposite to that in which it formerly ran. To accomplish this result, the time wheel A, see Figs. 1 to 1^e, is rotarily adjustable on its shaft through an arc of about $76\frac{1}{2}°$. On the outside of the wheel is cast an enlargement A^2 formed with a curved recess *a b* extending through an arc of $76\frac{1}{2}°$. This recess at its ends *a* and *b* has deep seats adapted to receive a round pin P rigidly fastened to the shaft C outside the wheel and this pin P is designed to drop into either one of the end seats *a* or *b* of this recess and to shift from one to the other according to the direction of revolution.

Inside of the time wheel A, see Figs. 1^b 1^e and 2, the wheel is cast with a hub A′ which is surrounded by a coil spring I. This spring is locked at one of its ends to the wheel A and at its other end is locked to a washer J. This washer abuts against the stationary bearing K, Fig. 2, projecting from the engine case, but may be dispensed with.

The hub A′ of the wheel A does not extend all the way up to the washer, but is spaced some distance away, so that the wheel A may move inwardly on its shaft against spring I, as in dotted lines Fig. 2, far enough to allow the locking seats *a* or *b* on the outside

to move away from locking engagement with the pin P on the shaft and thus allow the wheel to turn on the shaft, the distance of the arc between seats *a* and *b*, being about 76½°, which is the distance required to give the changed relation between the crank and exhaust cam for running in the opposite direction.

On the stationary sleeve bearing K, see Fig. 2, is swiveled the ring *h'* of a handle H bearing a brush *h* and forming the spark circuit controller. This brush forms a terminal for one wire of the battery and as the shaft C rotates, a rigid pin *i*, see Figs. 1 and 4, comes into contact with the brush *h* to close the circuit. By swinging the circuit controller around the shaft C, the time of contact between the pin *i* and brush *h* may be changed. Two lugs S and S', Fig. 2, are fixed rigidly to the side of the engine case and furnish stop points for the circuit controller handle to stop against, as seen in Fig. 1, to limit and define the sweep of the circuit controller and the time of the spark.

The operation of the attachment in reversing, is as follows: In Figs. 1, 2 and 3, the engine is set for the fly wheel on its shaft C S to turn to the left, which turns wheel A in the direction of the arrow in Figs. 1[a] and 1[b] and 3. To reverse, the engine is brought to rest. The circuit controller handle is then thrown down, as in dotted line Fig. 1, to properly time the spark for reverse explosions. The fly wheel is then turned to the right by hand, or reverse to the arrows shown in Fig. 3. The gear on the fly wheel shaft turns the time wheel A in the direction indicated by arrow in Fig. 1[c] and cam B, Fig. 3, is turned away from plunger D in direction opposite to that indicated by the arrow in Fig. 3 and there being no resistance, the pressure or friction of pin P in its seat, caused by the coil spring, is sufficient to hold the pin and rotate shaft C until cam B comes into contact with exhaust plunger D on the opposite side, as seen at B' in dotted lines in Fig. 3, and then the resistance of plunger D is sufficient (the exhaust valve spring operating on plungers D must be strong enough to furnish the required resistance) to arrest the motion of C and release the pin P from its seat, whereupon the wheel A turns loose on the shaft C 76½° until the other seat *b* of the recess engages pin P, as in Fig. 1[d], and carries shaft C around with it in regular revolution and rigid connection for that direction of revolution. To reverse back again, the circuit controller is thrown up, the fly wheel is turned to the left and a similar drag action and alteration of timing takes place.

As a modification of our invention the same result can be attained by causing the slip movement or drag connection to occur between the shaft C and the exhaust valve cam B, instead of between the timing wheel A and shaft C as already described. This modification is shown in Fig. 5 in which the cam B[2] turns on the shaft C by virtue of a recess and the seats of this recess lock with the coupling pin P[2] on the shaft and the cam with its hub is capable of sliding longitudinally on the shaft against the tension of coil spring I[2] and fixed collar J[2] to engage and disengage the coupling pin and locking seats.

We claim:

1. A reversing gear for gas and gasoeine engines, consisting of a shaft bearing a cam and timing wheel and a slip clutch on the shaft arranged with a limited free movement to permit a changed relation of the timing wheel to the cam, said slip clutch being formed of two parts one of which is slidable longitudinally along the shaft and provided with a spring for holding it into yielding engagement with the other part.

2. A reversing gear for gas and gasolene engines, consisting of a shaft bearing a cam and timing wheel, a slip clutch on the shaft arranged with a limited free movement to permit a changed relation of the timing wheel to the cam, said slip clutch having a spring seated portion slidable longitudinally on the shaft and a circuit controller for correspondingly altering the time of the spark arranged beside the clutch and having a rotary adjustment about the same shaft.

3. A reversing gear for gas and gasolene engines, consisting of a shaft bearing a cam, a loose timing wheel on the shaft longitudinally movable on the shaft and having a slip clutch on the outside formed by seats arranged a predetermined distance apart for reversing, a projection on the shaft locking alternately into said seats according to the direction of revolution, and a coil spring arranged on the opposite side of the wheel and having a bearing against which it is held for compression.

4. A reversing gear for gas and gasolene engines, consisting of a shaft bearing a cam, a loose timing wheel on the shaft having a slip clutch on the outside formed by seats arranged a predetermined distance apart for reversing, a projection on the shaft locking alternately into the seats according to the direction of revolution, a coil spring arranged on the shaft behind the timing wheel, a stationary bearing for the shaft, a washer interposed between said stationary bearing and the spring, and a rotary adjustable circuit controller on the stationary bearing.

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