

F. T. FLINCHBAUGH.
REVERSIBLE INTERNAL COMBUSTION ENGINE.

967,749.

APPLICATION FILED NOV. 30, 1909.

Patented Aug. 16, 1910.

2 SHEETS—SHEET 1.

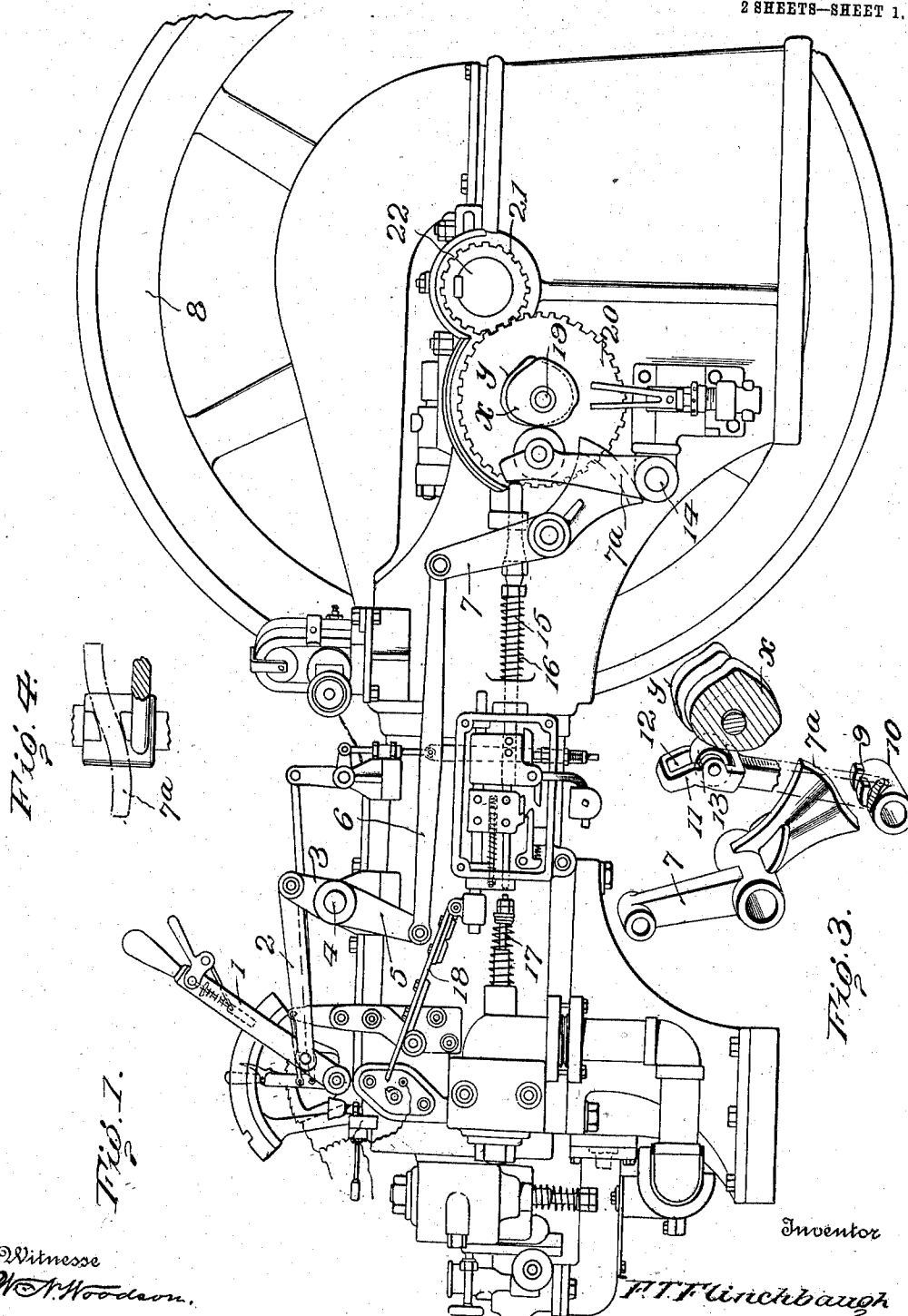


Fig. 4.

Fig. 1.

Fig. 3.

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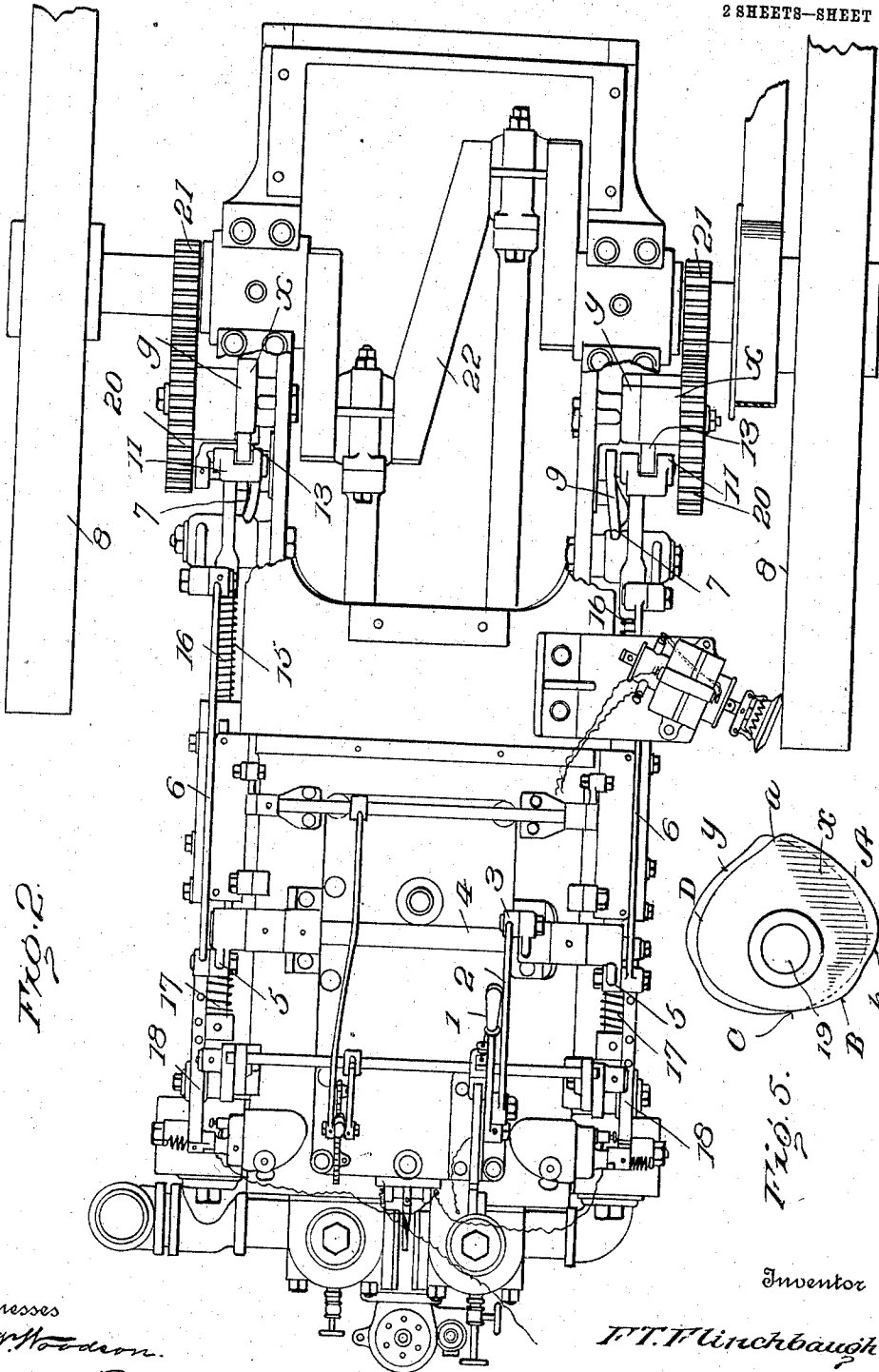


Fig. 2.

Fig. 5.

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UNITED STATES PATENT OFFICE.

FREDERICK T. FLINCHBAUGH, OF YORK, PENNSYLVANIA.

REVERSIBLE INTERNAL-COMBUSTION ENGINE.

967,749.

Specification of Letters Patent.

Patented Aug. 16, 1910.

Application filed November 30, 1909. Serial No. 530,621.

To all whom it may concern:

Be it known that I, FREDERICK T. FLINCHBAUGH, citizen of the United States, residing at York, in the county of York and State of Pennsylvania, have invented certain new and useful Improvements in Reversible Internal-Combustion Engines, of which the following is a specification.

This invention comprehends certain new and useful improvements in internal combustion engines, particularly of the four cycle type, and it has for its primary object a simple and efficient construction and arrangement of parts whereby the engine may be reversed.

More specifically, the present invention has for its aim to simplify and otherwise improve upon the principles which are involved in my prior Letters Patent of the United States #874,177, dated December 17, 1907, such patent disclosing a reversible four cycle internal combustion engine embodying two cams that are designed to be so connected, one at a time, to a reciprocating slide that the engine may operate continuously in one direction or another as one of the cams is acting and may be quickly reversed when the other cam is brought into operation, the reversal being controlled by the explosion of the gaseous charge in the cylinder out of its regular order.

The patented invention also embodies duplicate parts including two rocker arms that are respectively engaged with the cams, link rods connected to the respective rocker arms, and a link so connected to a reciprocating slide that either one of the rocker arms may be actuated or held in a relatively inoperative position to effect the desired result.

In one aspect of the case, the present invention aims to simplify and improve upon the generic principles of the former engine by doing away with a duplication of parts just mentioned, employing a single rocker which may be caused to engage either of the two cams as desired, thereby not only simplifying the construction, but materially reducing the cost of the manufacture of the parts and the labor incidental to the assembling thereof, as well as rendering the engine easier to handle, more positive in its action, more efficient in its operation and more durable and less liable to get out of order.

The invention consists essentially in two cams, one supplemental to the other and both arranged to be preferably continuously operated from some moving part of the engine, as for instance, the driving or fly wheel shaft, a rocker arm so arranged that it can be shifted from engagement with one cam to engagement with the other, and means under control of the operator for effecting this shifting movement of the rocker arm and for holding it in the required position, the said arm being arranged for driving engagement with a longitudinally reciprocating rod or rods, in a governor mechanism adapted to control the cylinder exhaust valve, and the circuit making and breaking device for the sparker. And the invention also consists in certain constructions, arrangements and combinations of the parts that I shall hereinafter fully describe and claim.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings in which:

Figure 1 is a side elevation of an internal combustion engine constructed in accordance with my invention; Fig. 2 is a top plan view thereof; Fig. 3 is a detail perspective view of some of the actuating parts; Fig. 4 is a detail view illustrating the engagement of rocker arm with a shipper lever; and, Fig. 5 is a side elevation of the cams employed.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawings by the same reference characters.

The embodiment of the invention illustrated in the accompanying drawing is a two cylinder engine and the cams and other parts to effect the reverse are duplicated, being arranged on opposite sides of the engine casing, and they are both preferably operated by a single hand lever 1, the same being provided with the usual detent for locking engagement with the usual segment or quadrant. The lever 1 is connected by a link 2 to the upwardly disposed crank 3 of a transversely extending shaft 4, said shaft being provided at opposite sides of the engine bed or casing with downwardly extending cranks 5 connected by the pitmen 6 to the upwardly extending arms of the shipper levers 7, journaled in any desired way

on opposite sides of the engine case between the fly wheels 8. The downwardly extending arm of each shipper lever 7 is formed with a cam edge 7^a engaging in a slot or recess 9 that is formed in the hub portion 10 of a substantially vertically disposed rocker arm 11, each rocker arm being slotted at or near its upper end as indicated at 12, the rollers 13 being journaled in said slots. These rocker arms 11 are mounted to tilt about substantially horizontal axes on studs 14 projecting outwardly from the sides of the engine case or bed, and they are mounted for a laterally sliding movement on said studs, as well as a rocking movement thereon, this lateral movement being effected by the cam edges 7^a of the shipper levers 7.

A rocking movement is imparted to the arms 11 by means of cams that will be hereinafter specifically described and the rocking of the arms causes them to engage rods 15 which form part of a governor mechanism forming the basis of a companion application for Letters Patent of the United States executed and filed of even date herewith. It is to be understood that when the rod 15 is pushed forwardly against the tension of its encircling spring 16, by the adjacent rocker arm 11, it will effect the opening of the exhaust valve 17 of the engine cylinder and at the proper time will also effect the closing of the sparking circuit and the actuation of the sparking device through the instrumentality of the contact bar 18. The details of these parts 15 and 16, 17 and 18 and their concomitant parts are not essential to an understanding of the present invention, and are fully disclosed in the companion application above mentioned, it being only essential in the present case to state as above specified, that the rocking of the arm 11 under the influence of the cams which will now be described will open the exhaust valve and actuate the sparker at the proper intervals in the cycle of operation.

The cams for rocking the arms 11 are arranged in pairs one pair for each cylinder and rocker arm, and are designated X and Y respectively, the same being mounted to turn simultaneously on a stub shaft 19 projecting out from the side of the engine bed or case. Movable with the pair of cams is a gear wheel 20 which meshes with a spur pinion 21 on the crank shaft 22 of the engine, this arrangement admitting of the crank shaft 22 making two revolutions to each revolution of the gear wheel 20 and the cams X and Y.

The cams X and Y are of like formation, but have a different angular formation relatively to each other in order to operate the engine in one direction or the other. Each of the operating cams is formed with the following raised or cam portions, namely, A, B, C and D. The cam portion *a* at one end of

the cam portion A effects the opening of the exhaust which remains open until the cam portion *b* at one end of the part A is reached. From *b* to C the engine is aspirating or drawing in a charge of gaseous fuel, and from the point C to D, the charge is compressed and at D, the sparker is actuated to effect combustion. From D to *a* the exhaust begins to open and is held open by the cam portion A until the cam portion *b* is reached, when the exhaust closes, and the engine again takes a charge. It is to be noted that the cam portion B is about opposite the cam portion D, but when the engine is running in one direction, the part B will not effect the explosion of the charge because the engine at this time, is beginning to aspirate or draw in a charge prior to compressing the same for effective work when combustion takes place. When the cam portion D reaches a position to actuate the rocker arm 11, the charge is properly compressed in the cylinder and the spark is instantly produced to effect the explosion of the charge so as to impart an impetus to the engine to continue this movement in the same direction.

From the foregoing, it will be understood that by the actuation of the reverse lever 1, the shipper lever 7 will be moved to shift the position of the rocker arm and its roller 13 from engagement with one cam to engagement with the other. While this change in the engagement of the cams with the roller 13 is effected, yet the shaft 22 continues to rotate in the same direction and as soon as the cam X that was active prior to operating the reverse lever becomes inactive, the angularly disposed hereinbefore idle cam Y is brought into play. The projection or cam portion B of said cam Y operates the rocker arm 11 through the connecting means before described and operates the contact bar 18 and produces the spark whereby the compressed charge is exploded out of its regular order, thereby giving an initial impetus to the engine after reversing the same. After this initial impetus has been imparted to the engine in the reverse direction, the cam portion D of the cam Y operates the sparker in the regular order so as to drive the engine continuously in such reverse direction.

It is not expedient to operate the reversing mechanism when the engine is running at high speed, and it is preferable to materially reduce the speed to bring the reversing mechanism into play. This may be accomplished by retarding the sparker or in any other manner usually adopted in the art to produce a slowing down of the engine. Upon operating the reversing lever 1 the sparker is actuated so as to utilize the compressed charge in the cylinder to effect a reverse of the engine instead of exploding said charge to continue the direction of the engine in the same direction. The supple-

5 mental portion B comes into play as soon as the reverse lever is operated so as to effect the combustion of the charge in the engine cylinder and drive the piston in the opposite direction.

10 From the foregoing description, in connection with the accompanying drawings, it will be seen that the present invention provides a very simple construction and arrangement of parts that will not be liable to get out of order and that will be efficient and positive in its action, one rocker arm and its correlated parts serving all of the purposes for which a duplication of parts
15 are necessary with the embodiment of my invention disclosed in my prior patent above mentioned.

20 It is of course to be understood that the invention described and claimed, and one embodiment of which is illustrated in the accompanying drawings is adaptable to any type of engine, either stationary, portable, or automobile or marine engines as well as traction engines.

Having thus described the invention, what 25 is claimed as new is:

In an internal combustion engine, the combination of cooperating cams, each having a supplemental raised portion for actuating the sparker of the engine upon the operation of the reverse gear to utilize the compressed charge of the engine and drive the piston in the opposite direction to give an initial impetus in the reverse direction, a laterally shiftable rocker arm designed for engagement with either cam and adapted to actuate the sparker by such engagement, a shipper lever having a cam edge engaging said rocker arm to shift the same, and a hand lever operatively connected to the shipper lever for moving the latter. 30 35 40

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

FREDERICK T. FLINCHBAUGH. [L. s.]

Witnesses:

PHILIP H. LEHN,
E. D. FLINCHBAUGH.