

Feb: 20, 1923.

1,445,653

C. R. WATSON

INTERNAL COMBUSTION ENGINE

Filed July 24, 1920

3 sheets-sheet 1

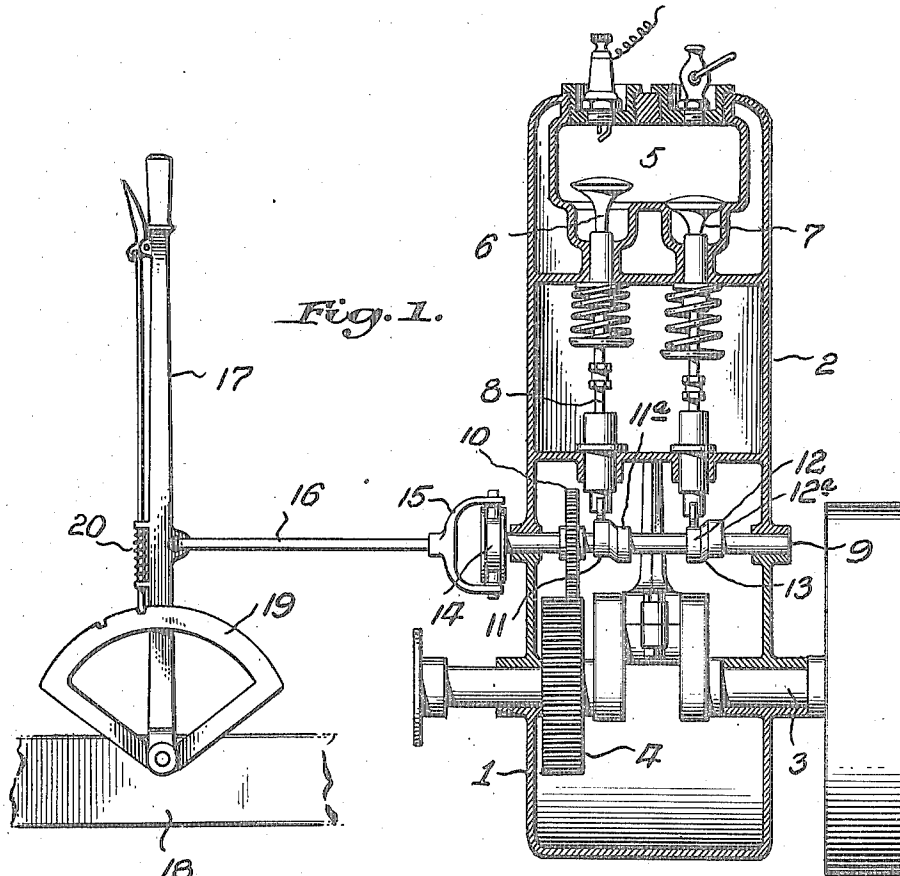
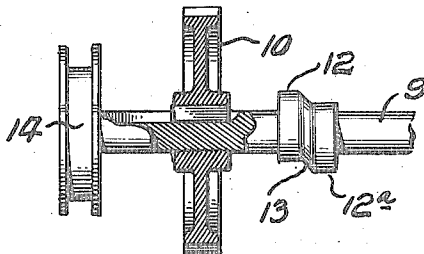


Fig. 2.



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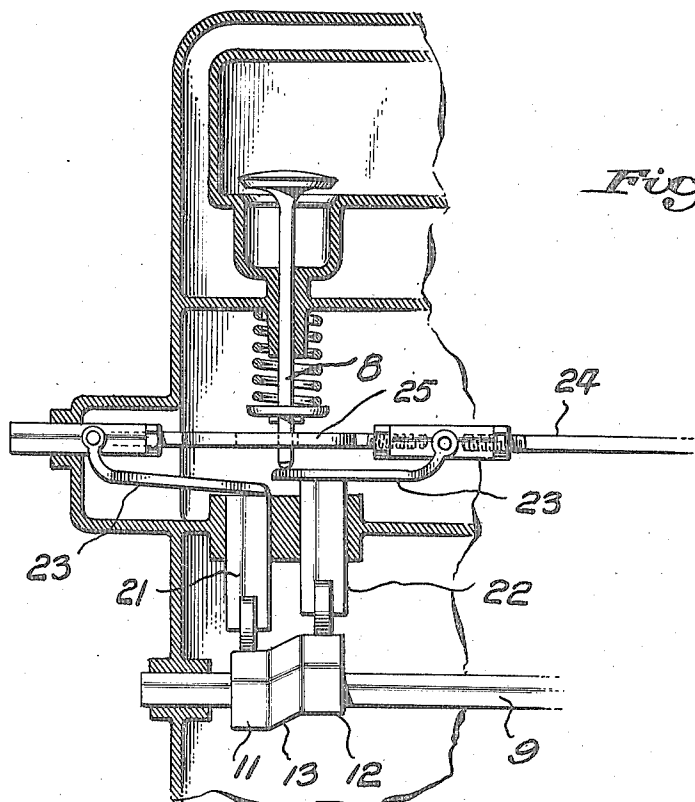
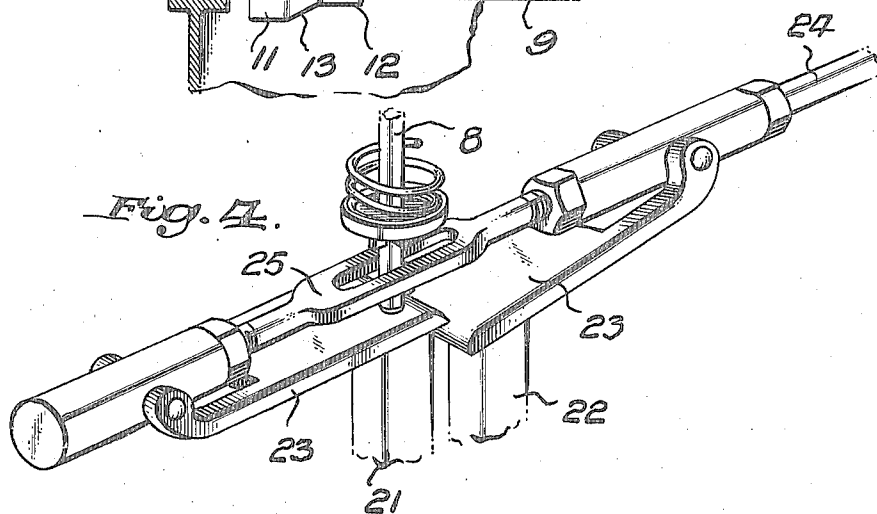
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3 sheets-sheet 2



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3 sheets-sheet 3

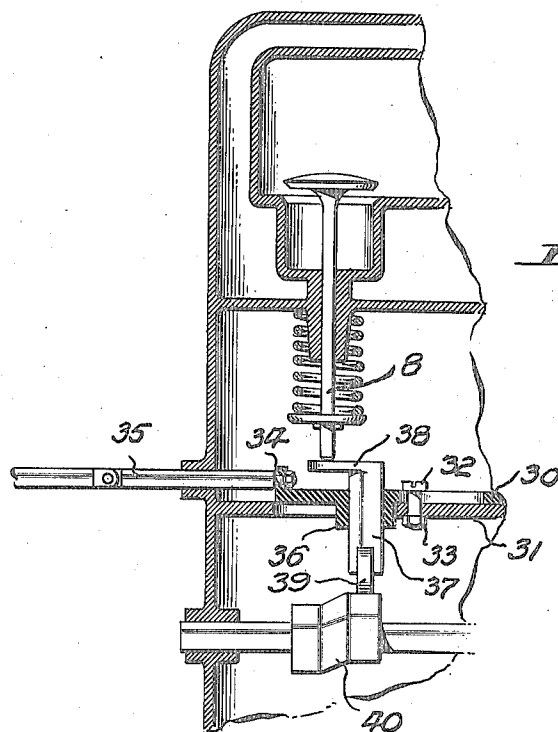


Fig. 5.

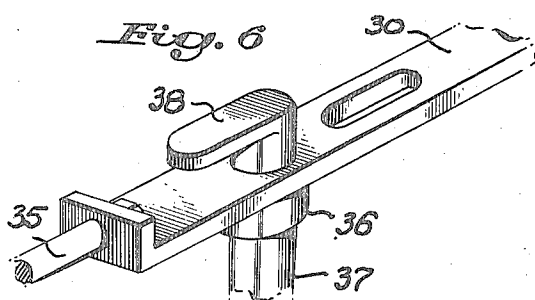


Fig. 6

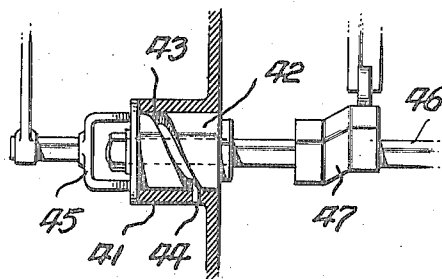


Fig. 7.

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UNITED STATES PATENT OFFICE.

CHESTER ROY WATSON, OF COLUMBUS, OHIO.

INTERNAL-COMBUSTION ENGINE.

Application filed July 24, 1920. Serial No. 398,738.

To all whom it may concern:

Be it known that I, CHESTER ROY WATSON, a citizen of the United States of America, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to four-cycle internal combustion engines of one or more cylinders having various types of overhead valves, and operating mechanism, and my invention aims to provide an engine with positive and reliable means, as hereinafter set forth, for obtaining a maximum power at two or more points in the speed range of the engine and thus increase its scope or performance.

My invention further aims to provide an engine with a shiftable cam shaft having a combination of conventional inlet and exhaust cams in multiple sets thereon which may be selected for defined duties of the engine, and associated with the shiftable cam shaft is an operating mechanism therefor which may be manually or automatically actuated.

My invention still further aims to provide selective mechanisms that may be interposed between valve operating mechanism and multiple sets of cams so that any desired set of conventional inlet and exhaust cams may be utilized in turn to produce a desired operation of an engine constructed in accordance with my invention.

The preferred forms of construction entering into my invention will be hereinafter described and then claimed, and reference will now be had to the drawings, wherein—

Figure 1 is a longitudinal sectional view of a four-cycle engine in accordance with my invention;

Fig. 2 is a detail sectional view of a portion of a cam shaft;

Fig. 3 is a vertical sectional view of a portion of an engine showing another form of valve selector including intermediary levers on a sliding bar;

Fig. 4 is a perspective view of cam selectors forming part of the mechanism shown in Fig. 3;

Fig. 5 is a vertical sectional view of a

portion of an engine showing a slide bar construction carrying the valve tappets from one cam to another;

Fig. 6 is a perspective view of the sliding bar shown in Fig. 5, and

Fig. 7 is a side elevation of another form of cam shifting mechanism.

Considering Figs. 1 and 2, the reference numeral 1 denotes a crank case supporting a cylinder block 2 and journaled in the crank case is a crank shaft 3 provided with a wide gear wheel 4 or other power transmission device.

In the cylinder block 2 is a chamber normally communicating with the cylinder or cylinders of the engine and this chamber is adapted to receive an explosive mixture for the engine cylinders and also permit of burned gases exhausting therefrom, the intake and exhaust to and from the engine cylinders being controlled by valves 6 and 7 having operating mechanism 8 extending into the upper portion of the crank case 1 to be operated from the crank shaft 3 of the engine. The elements 1 to 8 inclusive are of a conventional form found in four-cycle engines and my invention particularly resides in the means of transmitting power from the crank shaft 3 to the valve operating mechanism 8 and such means, in three forms, will now be described.

Reference will first be had to Fig. 1 showing a shiftable cam shaft 9 in the upper portion of the crank case 1 and in the vertical plane of the valve operating mechanism 8. The cam shaft 9 is reciprocable in a plane parallel to the axis of the crank shaft 3 and on said cam shaft is a gear wheel 10 in sliding engagement with the gear wheel 4 and constantly in mesh therewith, the gear wheel 10 being keyed or otherwise mounted on the cam shaft 9, as shown in Fig. 2.

Mounted on the cam shaft 9 are sets of cams 11, 11^a and 12, 12^a, these cams being of a conventional form adapted for operating the inlet and exhaust valves of an engine. The cams of each set are joined or combined by intermediate portions 13 affording an easy path from one cam to the other so that irrespective of the position of the cam it is possible to shift either into operative relation relative to the valve operating mechanism which engages one or the other

of the cams in the usual manner, for instance by a roller or a mushroom tappet contact.

On one end of the cam shaft 9 is a spool or grooved head 14 for a fork or yoke 15 carried by an operating rod 16 which is loosely connected to an operating lever 17 suitably supported adjacent the engine. As shown, the operating lever 17 is pivoted on a support 18 having a rack 19 for a locking device 20 carried by the lever 17, said locking device permitting of the lever being locked in a shifted position to retain either of the cams 11 or 12 in position for actuating the valve operating mechanism in timed relation to the cycle of the engine.

In Fig. 3 each valve operating mechanism 8 is served by two anti-frictional plungers 21 and 22 engaging the cams 11 and 12 respectively and engaging the upper ends of the plungers 21 and 22 are pivoted selector members 23 which are in opposed relation and are supported by an operating rod 24 having a central yoke or slotted portion 25 providing clearance for the valve operating mechanism 8. The rod 24 may be shifted similar to the rod 16 and in this instance the cam shaft 9 is non-reciprocable and the selector members 23 are employed to determine which of the cams 11 or 12 is to be used to impart movement to the valve operating mechanism 8. As shown in Fig. 3 the plunger 22 and the cam 12 will actuate the valve and as shown in Fig. 4 one of the selector members has been shifted over the plunger 21 under the valve operating mechanism 8 to impart movement thereto.

It is well known that for any given motor speed a certain combination of inlet and exhaust valve cam forms will give the maximum power for that speed and a compromise of performances at higher and lower speeds, also certain qualities of silence and durability in the valve operating mechanism. A conventional combination of inlet and exhaust cam forms can be chosen which will give the relative maximum performance, for instance, at 500 R. P. M. motor speed or a combination of cams can be chosen which will give a maximum performance of 3,500 R. P. M. motor speed. The performance at speeds above and below the point where the relative maximum performance ensues are a compromise under their possible maximums. Take for instance, an automobile motor which can have a very poor performance at speeds from zero to forty miles per hour growing in excellency to a maximum performance at ninety miles per hour, or with another set of cams the direct opposite in performance can be obtained. It is the usual practice to employ a cam combination which gives a maximum relative performance at some medium speed and the performances above and below said speed are compromise

results suitable to the consumer. As set forth in the beginning my invention provides two or more combination of cams which are placed in operative relation to a valve operating mechanism, manually or by a governor, to enlarge the performance of an engine by increasing the points of maximum performances and incidentally reducing the compromise between these points. It is therefore evident that my invention, in its broadest aspect, consists in providing a four cycle motor with the effect of two or more conventional cam shafts, all combined in one motor, and selectable either automatically or at the operator's will.

My invention further constitutes an addition to the conventionally designed engine and its application in combination with the variable factors of engine design lie well within the resources of any designer, as the crank case and cylinder block and major parts are not materially changed and the principles of my invention may be embodied in various types of four-cycle engines or motors.

In Figs. 5 and 6 I show a slotted slide bar 30 on a partition or support 31 and retained thereon by a bolt 32 and a nut 22 or other retaining means. One end of the slide bar is connected, as at 34 to an operating rod 35 which may be actuated by hand or any suitable power device.

The slide bar 30 affords a bearing or guide 36 for a tappet 37 which has a head 38 for actuating the valve operating mechanism 8. The lower end of the tappet 37 has a roller contact 39 for a double cam 40 constructed in accordance with my invention. By shifting the slide bar 30 the tappet 37 may be actuated from either of the cam forms.

A further modification of my invention has been shown in Fig. 7 wherein the engine block or crank case has a bearing 41 for a reciprocable sleeve 42 having a spiral groove 43 to receive a pin 44 of the bearing 41, said pin causing the sleeve 42 to reciprocate when rotated. One end of the sleeve supports an operating device 45 and extending from the opposite end of the sleeve is a driven cam shaft 46 having cams 47 in accordance with my invention. The driven cam shaft 46 is held to be shifted by the sleeve 42 but may freely revolve in said sleeve.

Without further explanation it is thought that the utility of my invention will be apparent without further description, and while in the drawings there are illustrated the preferred embodiments of my invention, it is to be understood that the structural elements are susceptible to such variations and modifications as fall within the scope of the appended claim.

What I claim is:—

In an internal combustion engine having a

valve operating mechanism:—means adapted to operate and regulate the action of said valve operating mechanism, said means including a cam shaft having cams, anti-frictional plungers normally engaging the cams of said cam shaft, pivoted selector members normally engaging the upper ends of said plungers, said selector members being in opposed relation and one of said members normally engaging said valve operating mechanism and adapted to be shifted to permit

of the other member engaging said valve operating mechanism, and an operating rod supporting said selector members and having a yoke providing clearance for said valve operating mechanism.

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

CHESTER ROY WATSON.

Witnesses:

LILLIAN TIMMONS,
MATTHEW L. BIGGER.