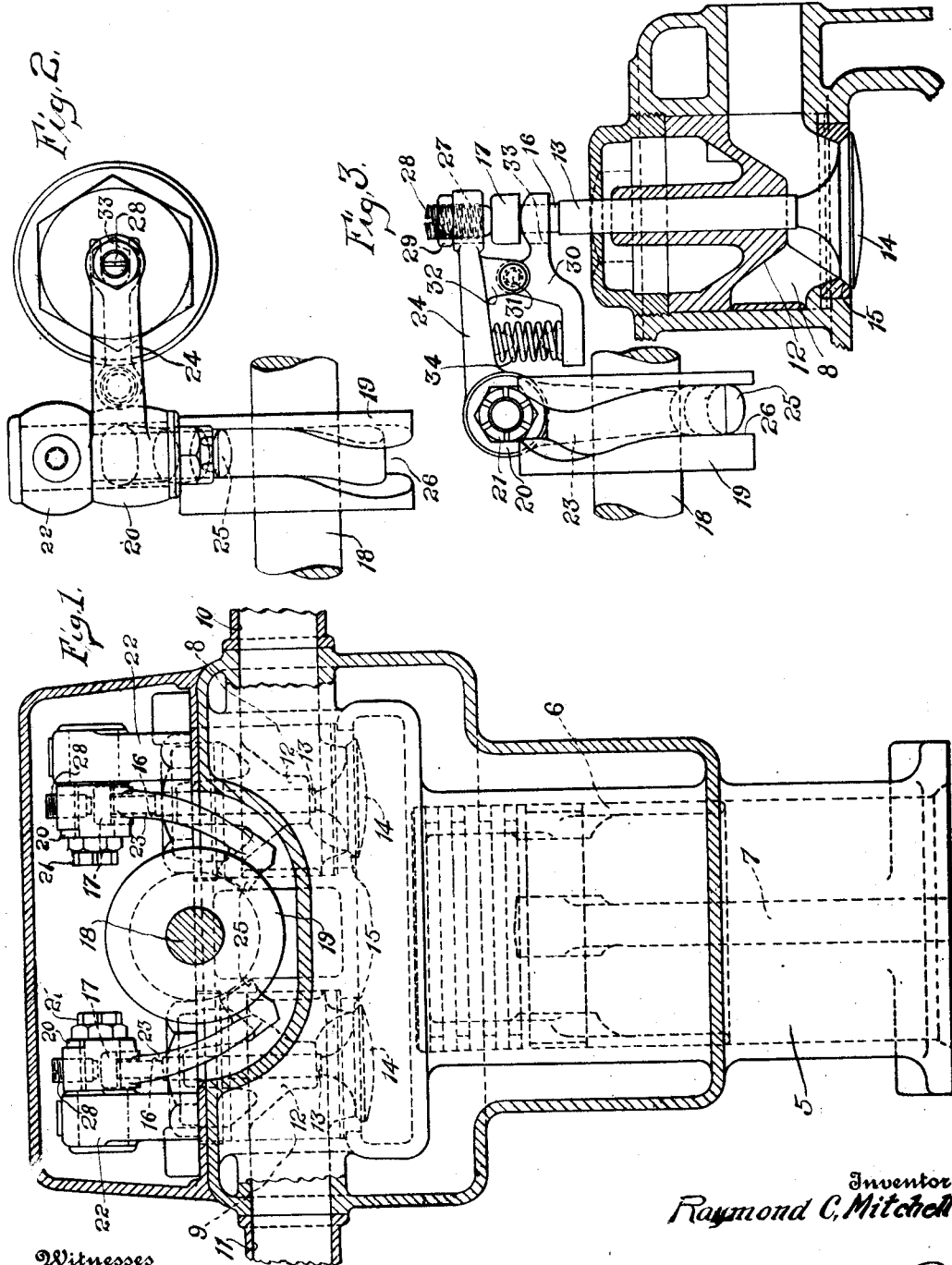


R. C. MITCHELL.
EXPLOSIVE ENGINE.
APPLICATION FILED NOV. 4, 1912.

1,065,619.

Patented June 24, 1913.



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RAYMOND C. MITCHELL, OF SPRINGFIELD, OHIO.

EXPLOSIVE-ENGINE.

1,065,619.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RAYMOND C. MITCHELL, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to explosive engines and more particularly to valve operating mechanism for such engines, and embodies improvements upon a co-pending application filed by Raymond C. Mitchell and Harry M. Neer November 28th, 1910, Serial No. 594,433.

The principal object of this invention is to provide a valve operating mechanism which will positively move both the inlet and exhaust valves toward and away from their seats, and which will effect a proper cushioning of said valves when being seated or unseated, thereby eliminating the possibility of said valves becoming broken.

Another object of the invention is to provide a valve actuating mechanism of the character described which is extremely simple in construction and is, therefore, cheap to manufacture.

In the accompanying drawings, Figure 1 is a transverse sectional view through an engine of the multiple cylinder type, the view being taken between adjacent cylinders and showing in elevation the application of my improved valve-actuating mechanism; Fig. 2 is a detail plan view of such a mechanism; and Fig. 3 is a detail side elevation thereof, the valve cage and chamber being shown in section.

In these drawings I have illustrated one embodiment of my invention and have shown the same as applied to a multiple cylinder automobile engine, the main features of construction of which are well known. Each cylinder is indicated at 5 and operating in each cylinder is a piston 6 which is connected to a suitable crank shaft, not shown, by a piston rod 7. The construction of the several cylinders and of the valve operating mechanism therefor is substantially the same and the description of a single cylinder and its valve operating mechanism is deemed to be sufficient. Each cylinder is formed with an inlet chamber 8 and an exhaust chamber 9 which respectively communicate with supply and ex-

haust pipes 10 and 11. These chambers are preferably arranged on the opposite sides of the vertical center of the cylinder and preferably have their vertical axes arranged parallel to each other and to the vertical axis of the cylinder. Removably mounted in each valve chamber is a valve cage 12 and slidably mounted in each cage is a valve stem 13 which carries a disk-like valve member 14 at its lower end, said member cooperating with a seat 15 formed in the lower end of the cage to close the chamber. The valve stem 13 projects above the cage and is formed adjacent its end with an annular groove 16 and at its end directly above the groove with a head 17.

Suitable means are provided for positively unseating the inlet and exhaust valves at the proper time during the operation of the engine. In the present instance there is provided a cam shaft 18 extending longitudinally to the engine between the respective pairs of cylinders 8 and 9. This cam shaft is connected to the crank shaft of the engine by means not shown, this means being of common construction and forming no part of the present invention.

The valve-actuating device comprises cams 19 rigidly secured to the cam shaft 18. Each cam is operatively connected to a respective pair of inlet and exhaust valves by means of suitable connecting members. In the present instance each cam operates both the inlet valve and the exhaust valve of its particular cylinder. The connecting members comprise bell crank levers 20 which are arranged in pairs on opposite sides of each cam. Each lever is fulcrumed at its angle, as at 21, to a bracket 22 on the engine casing, and each lever consists of a substantially vertical arm 23 and a substantially horizontal arm 24. Each vertical arm 23 is provided with a pin 25 which enters a groove 26 formed in the periphery of the cam 19. The horizontal arm 24 of each lever has its free end disposed over the head 17 of the respective valve stem 13 and is formed with a threaded opening 27 for receiving an adjusting screw 28 which engages the head 17 of a respective valve stem 13, said screw being locked in an adjusted position by means of a lock nut 29.

In order to cushion the valves when being seated, and thereby prevent the same from becoming broken, there is provided a yieldable connection between the horizontal arms

of the crank levers and respective valve stems. In the present instance, each connection consists of an auxiliary lever 30 which is disposed directly below the horizontal arm 24 and is centrally fulcrumed as at 31 to an ear 32 which depends centrally from said arm. One end of the auxiliary lever is forked as at 33 to engage in the groove 16 directly below the head 17 of the respective valve stem, and disposed between the other end of the auxiliary lever and the respective horizontal arm 24 is a cushioning element which in this instance is shown as a coil spring 34.

From the foregoing it will be observed that when the horizontal arm 24 is swung downward by the action of the cam to unseat the valve, movement will be directly transmitted from said arm, through the adjusting screw 28 to the valve stem, and as a result, a positive movement to unseat the valve will be made. The arm 24 is swung upwardly upon its pivot 21, in a very quick manner by the action of the cam, and, as a result, the arm tends to leave the valve stem. This causes the auxiliary lever 30 to swing on its fulcrum 31 to compress the spring 34, so that immediately following the arm reaching its limit of upward movement, the spring will expand and rock the auxiliary lever, and the latter will, by its engagement with the head 17 of the valve stem, reseat the valve, as will be readily understood.

While I have shown and described one embodiment of my invention it will be understood that this has been chosen for the purpose of illustration only and that I do not desire to be limited to the details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

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

1. In a valve operating mechanism, the combination, with a cylinder having a port, and a valve including a stem for closing said port, of a positively operated valve-actuating lever fulcrumed on the cylinder and having one end disposed above and normally in direct contact with the upper end of the valve stem for positively unseating the valve upon the down stroke of said lever, and a connection between the lever and the stem for reseating the valve immediately following the limit of the up stroke of the lever.

2. In a valve operating mechanism, the combination, with a cylinder having a port, and a valve including a stem for closing said

port, of a positively operated valve-actuating lever fulcrumed on the cylinder and having one end disposed above and normally in direct contact with the upper end of the valve stem for positively unseating the valve upon the down stroke of said lever, and a connection including a yieldable element between the lever and the stem, said element being compressed during the up stroke of the lever and expanded to reseat the valve immediately following the limit of upward movement of said lever.

3. In a valve operating mechanism, the combination, with a cylinder having a port, and a valve including a stem for closing said port, of a positively operated valve-actuating lever fulcrumed on the cylinder and having one end disposed above and normally in direct contact with the upper end of the valve stem for positively unseating the valve upon the down stroke of said lever, an auxiliary lever fulcrumed intermediate its ends to the valve-actuating lever and having pivotal connection at one end with the valve stem, and a coil spring interposed between the valve-actuating lever and the other end of the auxiliary lever arranged to be compressed during the up stroke of the valve-actuating lever and to expand immediately following the limit of upward movement thereof to rock the auxiliary lever to reseat the valve.

4. In a valve operating mechanism, the combination, with a cylinder having a port, and a valve including a stem for closing said port, said stem being formed adjacent its end with a groove and at its end with a head, of a positively operated valve-actuating lever fulcrumed on the cylinder and having one end disposed above the head of the stem, an adjusting screw carried by said lever for engagement with said head, an auxiliary lever fulcrumed intermediate its ends to the valve-actuating lever and having one end forked to receive the grooved portion of the stem, and a coil spring interposed between the valve-actuating lever and the other end of the auxiliary lever arranged to be compressed during the up stroke of the valve-actuating lever and to expand immediately following the limit of upward movement thereof to lock the auxiliary lever to reseat the valve.

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

RAYMOND C. MITCHELL.

Witnesses:

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