W. D. KELLY.

VALVE MECHANISM FOR EXPLOSIVE ENGINES.

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1,074,121.

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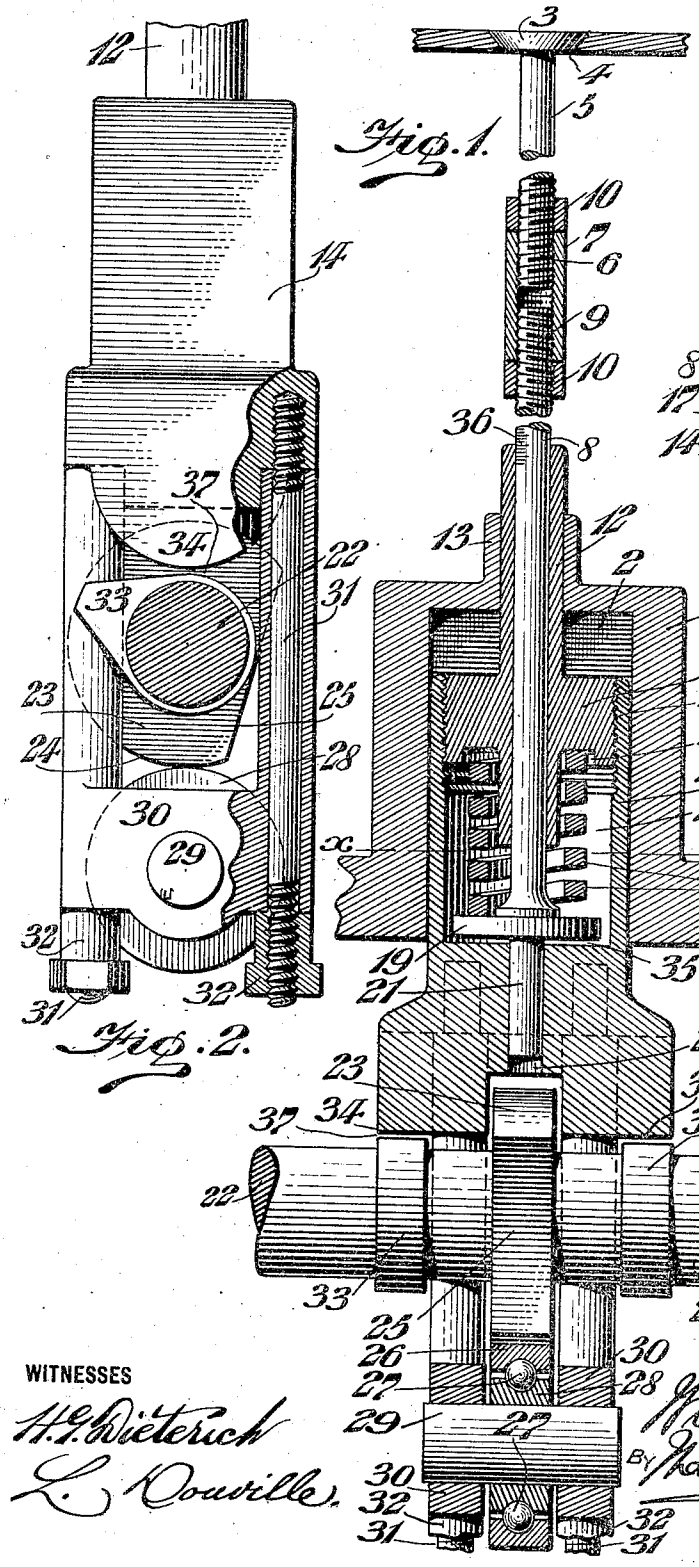


Fig. 1.

Fig. 2.

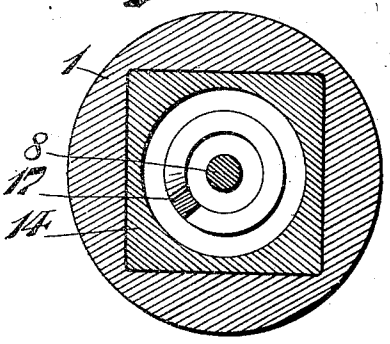


Fig. 3.

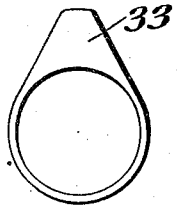


Fig. 4.

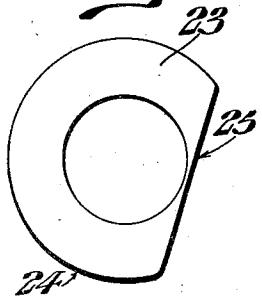


Fig. 5.

WITNESSES

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VALVE MECHANISM FOR EXPLOSIVE-ENGINES.

1,074,121. Specification of Letters Patent. Patented Sept. 30, 1913.

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To all whom it may concern:

Be it known that I, WILLIAM D. KELLY, a citizen of the United States, residing at Beechwood Park, county of Delaware, State of Pennsylvania, have invented a new and useful Valve Mechanism for Explosive-Engines, of which the following is a specification.

This invention relates to puppet valves for explosive engines, and more particularly to mechanically operated inlet and exhaust valves, and has for an object to provide a means for positively and accurately opening and closing a valve at the proper time in the cycle of operations and eliminating the use of a spring for effecting movement in one direction of the valve.

In gas engine valves, as heretofore devised, a spring or springs have been necessary as an adjunct to close the valve after the same has been opened either by suction or by mechanical means, and in practice it has been found at high speeds the action of the spring or springs has not been satisfactory and there is a lag or floating which seriously affects the efficiency of the motor. This lag is apparent even in new springs and gradually increases and becomes more and more a serious factor as the springs weaken through use or the temper of the spring varies through its exposure to the high temperature of the exhaust. Where the spring has become too weak to seat the valve quickly and in its proper relation to the cycle, a part of the charge drawn into the cylinder is forced out again and is frequently the cause of back firing, and this latter defect is equally true through failure of the exhaust valve to seat.

By my present invention I have overcome the foregoing defects and provided a structure wherein the valve, in either of its movements, is mechanically operated thereby making its operation positive and effective for the purpose intended, and by means of which gumming of the valve stem or spindle will have no effect on its proper actuation.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Referring to the drawings:—Figure 1 represents a vertical section of a valve operating mechanism, embodying my invention. Fig. 2 represents a side elevation partly in section of a portion of the mechanism shown in Fig. 1. Fig. 3 represents a section on line *x*—*x*, Fig. 1. Fig. 4 represents a plan of the cam controlling the opening of the valve. Fig. 5 represents a side elevation of one of the cams for controlling the closing movement of the valve.

Similar numerals of reference indicate corresponding parts in the figures.

1 designates a cap adapted to be fixedly secured to the crank case or other suitable part of an engine casing, and the same is preferably provided with a rectangular or other polygonal shaped opening 2 to receive and guide a moving part of the mechanism, and prevent relative rotation of the parts.

3 designates the valve proper and the same is here shown as seated in the opening 4, of the valve chest which controls the admission of gas or exhaust of waste products from the engine. The valve 3 is fixedly carried by the stem 5, which, in the present instance, is provided with a threaded portion 6, upon which an internally threaded sleeve 7 is carried. This sleeve serves to adjustably secure the valve stem 5 to the operating spindle 8, which it will be noted is oppositely threaded with respect to the valve stem 5, as shown at 9, thereby permitting suitable adjustment of the valve by varying the length of its operating adjuncts. Suitable lock nuts 10 are provided at each end of the sleeve 7 to maintain the desired adjustment. The operating spindle 8 passes through and interiorly of a guide member 11 located in the opening 2 and having an extension 12 projecting through an opening in the top of the cap 1, and it will be noted that the said cap is provided with an exterior boss 13 which forms a suitable bearing for the reciprocation of the hollow guide extension 12. The member 11, in the present instance, is threaded into a head 14, and forms a part thereof, as shown

at 15, and the head 14 is connected to a suitable operating mechanism for reciprocation within the cap 1. The head 14 is bored out to a depth greater than the thickness of the member 11, in order to form a chamber 16 within which is located a coiled spring 17, having a bearing at one end against the guide member 11, which has seats 18 for the purpose, and at the other end against a collar or abutment 19, either integral with or fixedly secured to the spindle 8. The head 14 is also drilled to form a guide passage 20 in alinement with the spindle 8 and within which the end 21 of the said spindle is located and serves to maintain the parts in operative position.

22 designates the timing shaft, of an explosive engine, suitably mounted for rotation and connected to its operating parts (not shown) and carries a cam 23. the center of which is preferably alined with the axis of the spindle 8. This cam 23 is provided with an actuating surface 24 and a face 25 which does not engage or contact with the part actuated by the cam or other parts.

26 designates a cam roller suitably mounted on ball or roller bearings 27, carried by a cup 28, fixed in any suitable manner to a pin 29, the latter being connected at each end to a bifurcated or slotted member 30, carried by the head 14 through the medium of threaded studs 31 and nuts 32. These members 30 as will be apparent are slotted in order to straddle the shaft 22 and provide for proper operation of the parts. It will thus be seen as the shaft 22 rotates the cam 23, at certain times, will contact with the roller 26 and move the members 30 in one direction, thereby shifting the head 14 with its attached parts. The head 14, in the present instance is moved in the opposite direction, by means of a pair of cams 33, also carried by the shaft 22, and disposed on opposite sides of the cam 23, each being adapted to contact with a face 34, preferably curved, forming a part of the head 14, and it will thus be obvious as the shaft 22 revolves that the cams 33 will intermittently engage the faces 34 and raise the head 14. This action is transmitted through the spindle 8 to the valve 3, and causes the latter to open at the proper instant in the cycle and to remain open the required time for admitting gas or allowing the exhaust products to be expelled. In connection with the closed position of the valve 3, it will be noted that a clearance 35 is preferably provided between the collar or abutment 19, and the bottom of the chamber 16, the function of which is to permit the spring 17 to come into play, after the valve 3 has been closed and the cam 23 has moved to inoperative position, in order to exert the proper pressure to maintain the valve closed or seated until the required time for opening the same again. It will also be noted that I prefer to provide a plurality of graduations 36, on the spindle 8, adjacent the point where it projects from the guide extension 12 so that a definite or predetermined adjustment of the valve 3 is made possible.

In the operation of the valve mechanism, the timing shaft 22 is of course revolving thus rotating the cams 23 and 33 to alternately shift the valve controlling mechanism. The cams 33 engage the surfaces 34, and shift the head 14 upwardly within the guide cap 1 which causes the collar 19 to be picked up thus transmitting movement to the valve stem 5 and opening the valve 3, while the spring 17 remains in normal position owing to the fact that it also moves with the head 14. As soon as the cams 33 have passed out of engagement with the surfaces 34, the cam 23 rotates into engagement with the ball-bearing cam roller 26 to cause the head to return, this movement being transmitted to the valve which is of course closed, and it will be noted that the design of the cam 23 is such that as soon as the valve 3 is closed the surface 25 comes into juxtaposed relation with the roller 26 but does not contact therewith, so that at this instant the spring 17 comes into play and yieldingly holds the valve 3 to its seat. It will further be noted that I preferably provide a clearance space between the cams and the head, as shown at 37, in order that either set of cams may operate freely and independently thus reducing friction and chance of interference.

It will now be apparent that I have devised an operating mechanism for a gas engine valve, which is simple in construction, efficient in operation and positively controls the movement of the valve in either direction of its movement. The advantage of this construction will be readily apparent to those skilled in the art, since thereby the valve accurately regulates the admission and exhaust of gases, while the engine is running at high speed, and there is therefore no lag or floating of the valve due to springs controlling them and the opening and closing movements positively take place at the proper time in the cycle. A further distinct advantage resides in the fact that there are no springs located in the vicinity of the hot gases, and therefore this cause of defective valve operation is eliminated.

It will now be apparent that I have devised a novel and useful construction of a valve mechanism for explosive engines, which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while I have, in the present instance, shown and described a preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of

modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

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

1. In a device of the character stated, a valve, a timing shaft rotatably mounted in operative relation thereto, a head, means to guide said head, a spindle connected to said valve and freely movable within said head, a plurality of cams fixedly carried by said shaft, means carried by said head and alternately actuated by said cams for moving said head to shift said spindle to open and close said valve, and means coacting with said spindle for maintaining said valve seated after a closing action.

2. In a device of the character stated, a valve, a spindle connected to said valve, a head forming a guide for said spindle, an abutment carried by said spindle and normally out of contact with said head and in the path of movement thereof, a casing forming a guide for said head, a guide member carried by said head, yielding means between said guide member and said abutment, and means to respectively cause said head to move in opposite directions at a predetermined time, to open and close said valve.

3. In a device of the character stated, a valve, a timing shaft rotatably mounted in operative relation thereto, a head, means to guide said head, a spindle connected to said valve and freely movable in said head, means actuated by the movement of said shaft for alternately opening and closing said valve and means independent thereof and coacting with said spindle to maintain said valve seated after a closing movement.

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