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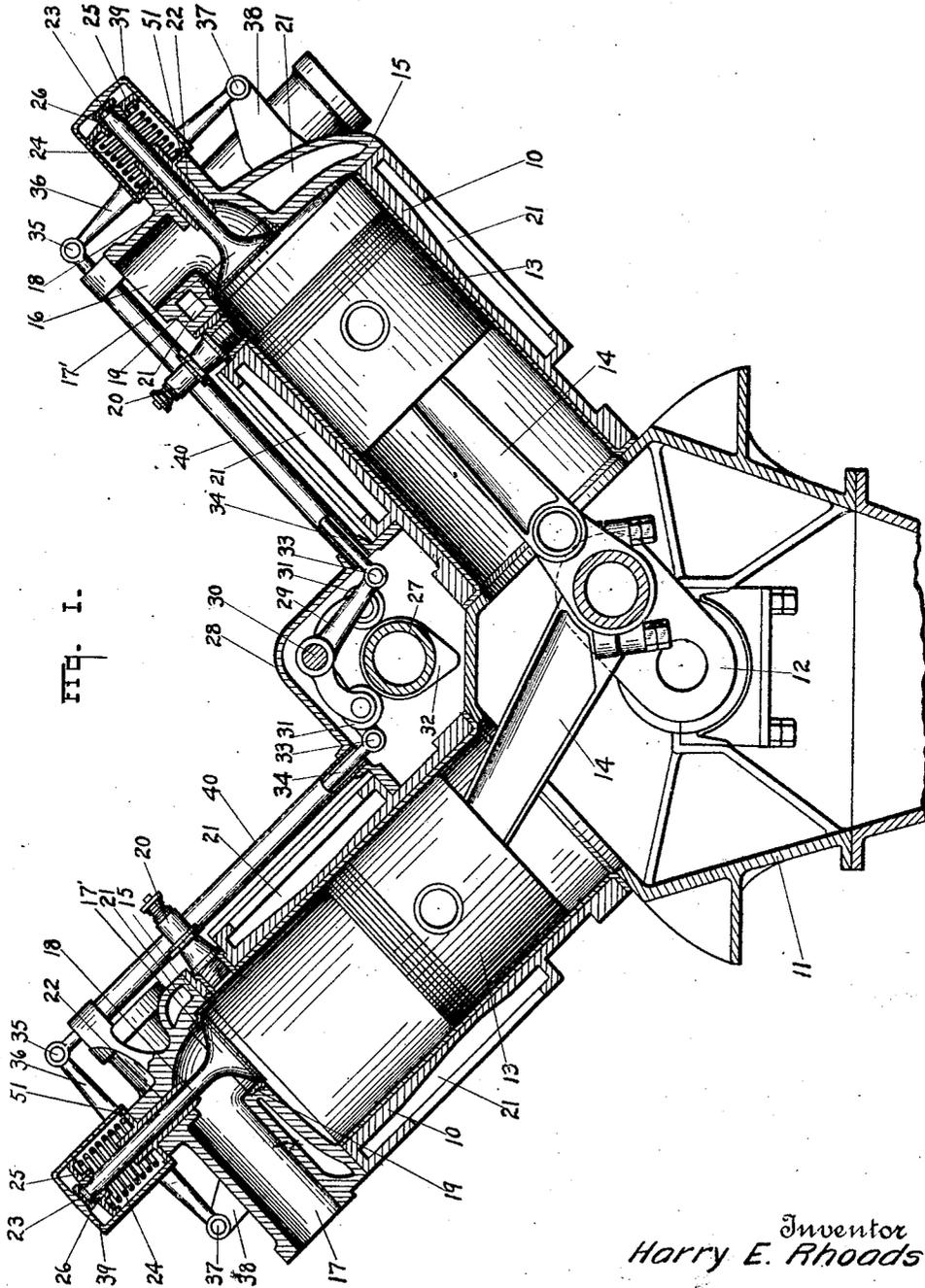
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H. E. RHOADS

VALVE OPERATING MECHANISM

Filed Feb. 6, 1919

2 Sheets-Sheet 1



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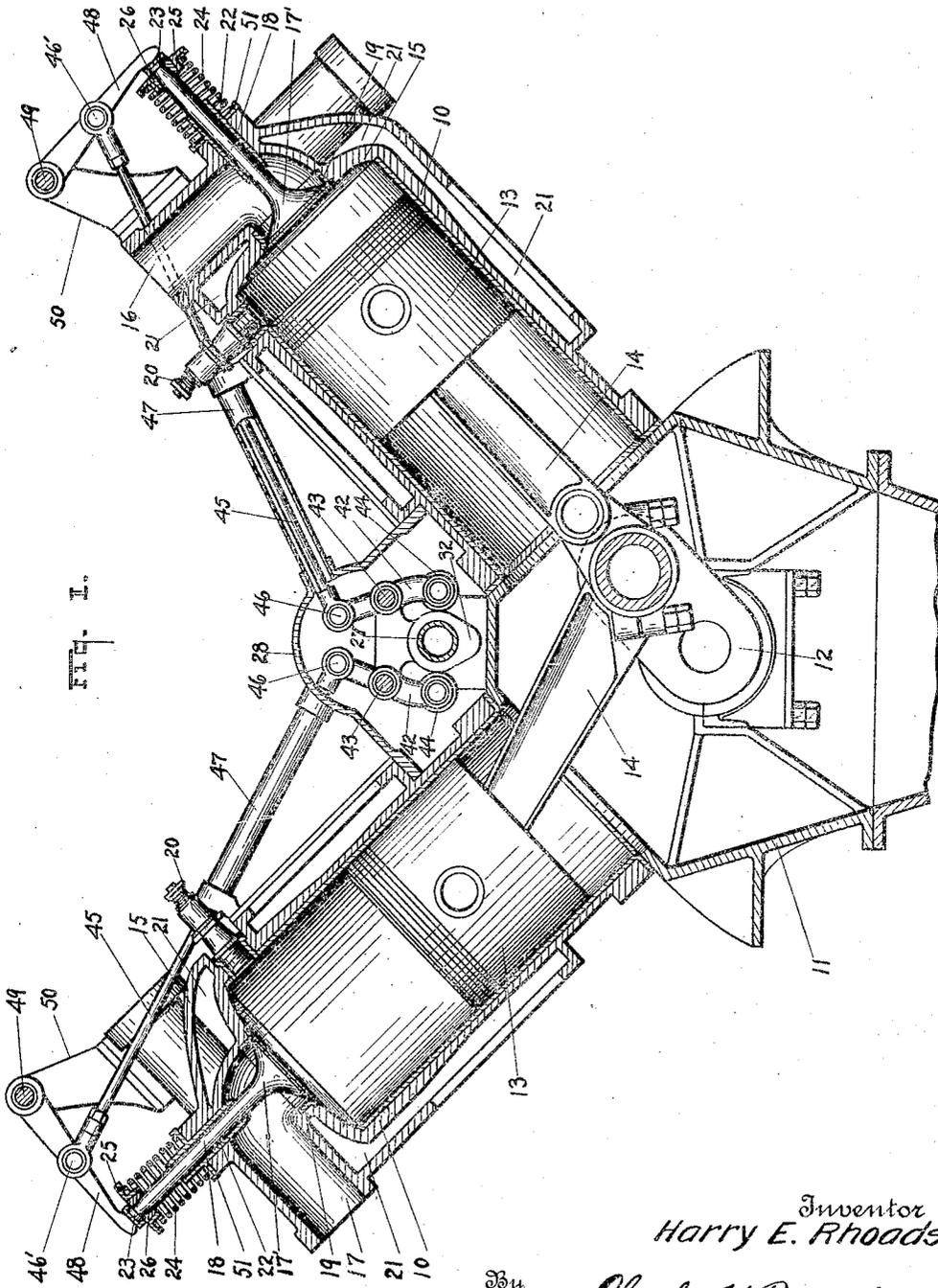
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

HARRY E. RHOADS, OF TOLEDO, OHIO, ASSIGNOR TO THE WILLYS-OVERLAND COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO.

VALVE-OPERATING MECHANISM.

Application filed February 6, 1919. Serial No. 275,465.

To all whom it may concern:

Be it known that I, HARRY E. RHOADS, a citizen of the United States, residing at Toledo, county of Lucas, and State of Ohio, have invented certain new and useful Improvements in Valve-Operating Mechanism, of which I declare the following to be a full, clear, and exact description.

This invention relates to an internal combustion engine, and particularly to a form of valve operating mechanism therefor, which in the embodiment illustrated herewith is shown in connection with an engine of the V-type.

One object of this invention is to provide a valve operating mechanism capable of use with internal combustion engines, whereby each of the several valves will be positively operated by a pivoted lever arm suitably positioned with respect to the corresponding valve stem for exerting pressure thereon in a direction axially thereof.

A further object of the invention is to provide mechanism of this character, wherein the parts are so constructed as to prevent injury to the valve operating mechanism from any exterior source.

A further object of the invention is the provision of pull rods instead of the customary push rods usually employed for operating the valve mechanism.

A further object of the invention relates to the construction and arrangement of the cam shaft and rocker arms so as to provide a simple and convenient means for actuating the valve control levers.

Further objects of the invention relate to economies of manufacture and details of construction, as will hereinafter appear from the detailed description to follow:

The objects of the invention are accomplished in one instance by the devices and means described in the following specification, but it is evident that the same may be varied widely without departing from the scope of the invention, as pointed out in the appended claims.

A structure constituting one embodiment of the invention, which may be the preferred, is illustrated in the accompanying drawings forming a part hereof, in which:

Figure I is a vertical sectional view of an internal combustion engine of the V-type, showing the relative position of the various

parts of the valve operating mechanism as applied thereto.

Figure II is a vertical-sectional view of an internal combustion engine of the V-type, showing a modified form of valve operating mechanism. This application represents an improvement upon the structure shown, described and claimed in my co-pending application Serial Number 275,466 filed February 6, 1919.

Referring to the numbered parts of the drawing, the engine comprises cylinders 10 mounted upon the crank case 11, in which is journaled the crank shaft 12 of the usual construction. The cylinders 10 may be arranged in rows or series wherein the cylinders of each row are outwardly inclined with respect to those of the other row or series. While the valve operating mechanism is shown herewith as applied to an internal combustion engine of the V-type, it is not to be understood as limited in its application to that type of engine, but is capable of being employed with equal facility in connection with engines of the upright type. The pistons 13 operating in the cylinders 10 are connected to the crank shaft 12 by connecting rods 14.

Cylinder heads 15 are firmly secured to the upper portion of the cylinders in any well known manner, said cylinder heads being provided with inlet ports 16 and exhaust ports 17.

Each of the several inlet and exhaust ports is provided with a valve 17' having a valve stem 18 and adapted to seat against a valve seat 19, properly secured in position within the cylinder heads at the point where the corresponding passage communicates with the upper end of the cylinder. Secured in the upper portions of the cylinder casing in any well known manner are the usual spark plugs 20, while spaces 21 are provided in the cylinder casings to form a water cooling jacket for the cylinders. Valve sleeves 22 are suitably positioned within the cylinder head casing for the reception of the valve stems 18, and within which the several valve stems are slidably mounted. Each valve stem 18 is provided with a head 23 and is surrounded by a coiled compression spring 24, said spring bearing at one end against an outwardly extending flange 51 carried by each sleeve, and at its

other end against a washer 25, secured to the upper portion of the stem by means of a split ring 26. By reason of this construction the spring constantly exerts tension upon the valve stems for the purpose of seating the valves.

The cam shaft 27 is positioned between the oppositely inclined rows or series of cylinders, and extends in a direction parallel to the direction of the crank shaft, and in substantially the same vertical plane therewith, the cam shaft and mechanism operated thereby is enclosed by a casing 28, which is secured to the main casing portion of the engine in any suitable manner. A plurality of valve actuating elbow rocker arms 29, one for each valve to be operated, are positioned within the casing 28, being mounted for pivotal movement at a point 30 above and in substantially the same vertical plane as the axis of the cam shaft. One of the angularly extending arms of each of the elbow levers is provided with a roller 31, adapted to rest upon and bear against one of the cam elements 32 carried by the cam shaft 27. The other angular arm of each of the elbow levers is pivotally connected at 33 to a pull rod 34, which is in turn pivotally connected at its opposite end at 35 to a valve operating lever arm 36; the lever arm 36 being pivoted at 37 to a bracket 38 carried by the head portion of the casing. The lever arm 36 pivoted at one end 37 to the bracket 38 is provided with a cup-shaped member 39 at a point intermediate its ends, so positioned as to form a closure for the upper portion of the valve stem and the various parts carried thereby, and adapted to normally bear against the head portion of the valve stem for the purpose of actuating the valve when the lever arm is depressed. An elongated hollow casing member 40 has one end secured in the casing 28, and its opposite end attached to the cylinder head casing in such a manner as to form a sleeve for the reception of the pull rod 34, so arranged that the pull rod is capable of moving freely in a longitudinal direction therein.

In the modified form of valve operating mechanism, illustrated in Figure II, a pair of similarly constructed rocker arms 42 are each pivotally mounted at 43 on opposite sides of and above the cam shaft 27. Each of these rocker arms is provided at its lower end with a roller 44, which is adapted to rest upon and be moved by the cam elements 32 carried by the cam shaft. A pull rod 45 is pivotally connected to each of the rocker arms at 46, each of said pull rods being partially enclosed by a cylindrical casing portion 47, the upper extremity of each pull rod 45 being pivotally connected at 46' to a pivoted valve operating arm 48. Each pivoted lever arm 48

is pivoted as at 49 to a bracket 50 carried by a portion of the head casing, and has the point of pivotal connection between itself and the pull rod located intermediate its ends. Each of the pivoted lever arms 48 is adapted to bear at the end opposite its fulcrum upon the upper end of the valve stem for the purpose of operating the same upon movement of the pull rod.

Both the cup-shaped member 39 and the lever 48 are shown as provided with a rounded portion which is adapted to bear against the head portion of one of the valve stems in such a manner as to maintain the pressure exerted upon the head portion of each valve stem in a direction substantially longitudinally of the direction of movement of the valve stem.

Upon rotation of the crank shaft of the engine, rotation will be communicated to the cam shaft in any suitable manner to cause the same to rotate at a speed proportionate to the speed of the crank shaft, whereupon the several rocker arms will be oscillated at regular and pre-determined intervals by means of the cam elements contacting with the rollers positioned upon the ends of the rocker arms. As the several rocker arms oscillate about their pivotal points, motion is communicated to the pivoted lever arms 36 and 48 by means of the pull rods 34 and 45, thus causing the valves to be opened at proper intervals by means of the pivoted arms bearing against the upper portions of each valve stem. The springs 24 serve to return the arms and valves to their proper position when the pressure exerted upon the valve stems by the pivoted arms is released. In that form of the device illustrated in Figure I, the housing 39 secured to the pivoted arm 36 is adapted to enclose the upper portion of the valve stem and the spring 24 surrounding the same in such a manner as to prevent injury to the valve stem and its associated parts yet permitting the same to operate freely upon the release of the pressure exerted there-against by the pivoted arm.

The housings 40 and 47 for the pull rods are so arranged as to fit within the timing gear housing 28 and form therewith a complete housing for the cam shaft and pull rods so as to prevent injury to the same or the admission of dust or other foreign matter thereto while permitting the various operating parts to move freely therein.

The cup-shaped members 39 serve as housings for the upper portions of the corresponding valve stems and the operating mechanism carried thereby, the said cup-shaped members being adapted to telescope over the flange 51 and bear against the periphery thereof to form a housing for the purpose of protecting the valve mechanism from injury.

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The pivoted arms 36 and 48 are so constructed that the point where each of these arms contacts with the head of the corresponding valve stem, is removed a considerable distance from the fulcrum point of the lever, thus resulting in each lever arm exerting pressure upon the corresponding valve stem in a direction substantially longitudinally thereof, and preventing binding or bending of the valve stems. The various parts are so arranged that the force exerted by the pull rods are in a direction substantially parallel to the longitudinal axis of the valve stems, thus facilitating the operation of the parts and insuring certain and prompt movement of the same under the influence of the impulses communicated thereto by the cam shaft.

It will be understood from the above description that a simple and efficient valve operating mechanism is thus provided, which is well adapted for use in connection with internal combustion engines of either the V-type or the upright type, and is adapted to positively operate the inlet and exhaust valves of the cylinders at proper intervals. The various operating parts of the mechanism are compactly arranged and enclosed in housing adapted to protect the same from injury and insure a positive and certain operation of the parts at all times.

While I have shown and described in considerable detail a specific embodiment of my invention, it is to be understood that this showing and description is illustrative only and for the purpose of rendering my invention more clear, and that I do not regard the invention as limited to the details of construction illustrated or described, nor any of them, except in so far as I have included each limitation within the terms of the following claims, in which it is my in-

vention to claim all novelty inherent in my invention broadly as well as specifically.

What I claim as new and desire to secure by Letters Patent is:

1. In an internal combustion engine having a cylinder head provided with a valve, a guide sleeve extending through said head and having a flange bearing against the outer face of said head, an operating lever for said valve having a cup-shaped portion rigid thereon and surrounding the outer portion of said valve stem and the flange of said sleeve, and a valve return spring housed within said cup-shaped portion.

2. In an internal combustion engine, a cylinder head having a valve therein, a stem for said valve, a sleeve in said head for receiving said stem, said sleeve having a flange resting against the outer face of said head, a washer carried by said stem, a compression spring between said washer and said flange for resiliently closing said valve, and a lever for opening said valve provided intermediate its length with an inverted cup-shaped portion, which portion co-operates with said flange to completely house the outer end of said stem, said washer and said spring.

3. A valve mechanism for an internal combustion engine, comprising a valve stem, a cap positioned over the end of the stem, a fixed abutment through which the stem slides, a spring located within the cap surrounding the stem and bearing against said abutment, the side wall of the cap surrounding said abutment and being adapted to slide thereon to provide a complete closure for the spring at all times, and means for moving said cap against the action of said spring.

In testimony whereof, I affix my signature.

HARRY E. RHOADS.