E. H. BELDEN.

VALVE OPERATING MECHANISM.

APPLICATION FILED FEB. 24, 1919.

1,434,188. Patented Oct. 31, 1922.

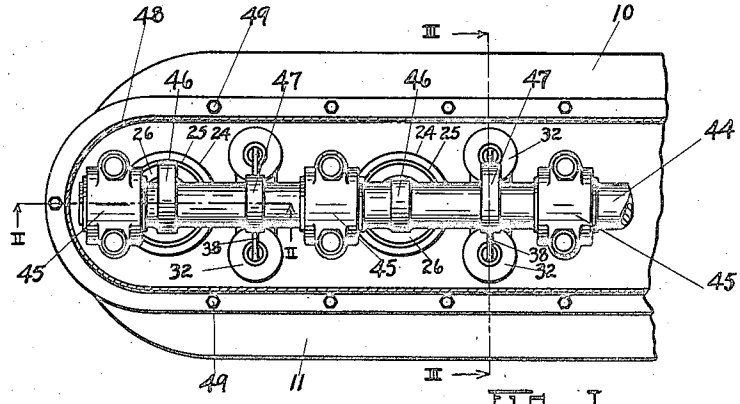


Fig. I.

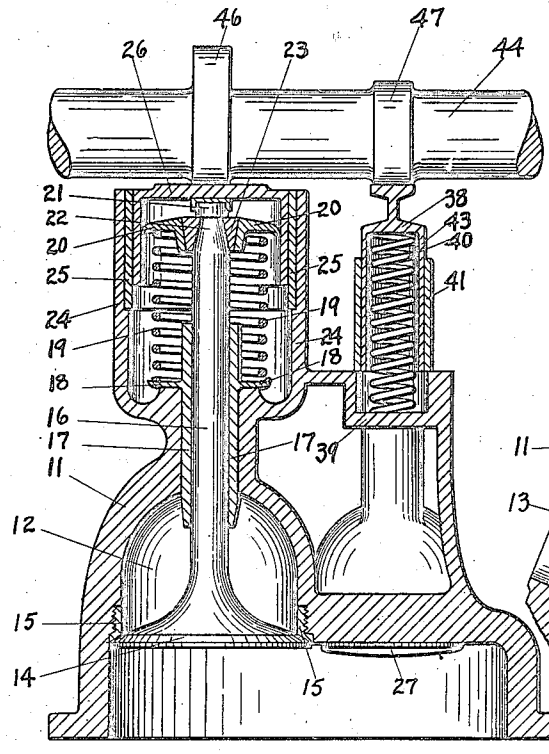


Fig. II.

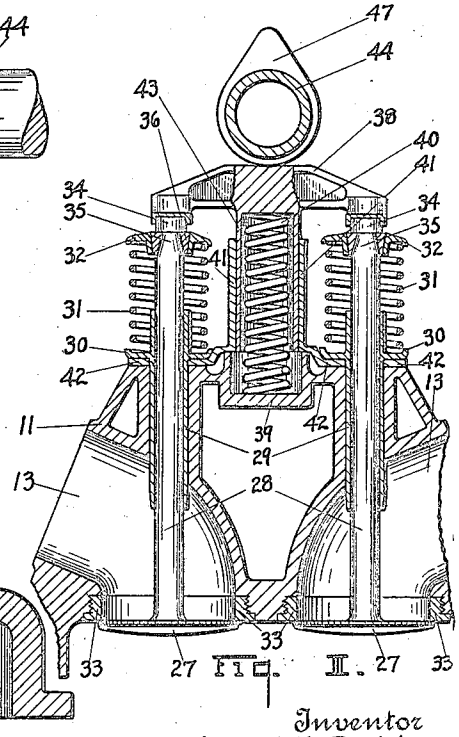


Fig. III.

Inventor
Edward H. Belden

By Chester W Bruceton

Attorney

Patented Oct. 31, 1922.

1,434,188

UNITED STATES PATENT OFFICE.

EDWARD H. BELDEN, OF TOLEDO, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE WILLYS-OVERLAND COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO.

VALVE-OPERATING MECHANISM.

Application filed February 24, 1919. Serial No. 278,738.

To all whom it may concern:

Be it known that I, EDWARD H. BELDEN, a citizen of the United States, residing at Toledo, Lucas County, 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 internal combustion engines, and particularly to valve operating mechanism therefor.

One object of the invention is to provide a device of this character wherein a plurality of valves may be controlled in such a manner as to be operated simultaneously.

Another object of the invention is to provide a device of this character, wherein the several valves may be operated by means acting directly upon the same, and in a direction parallel to the longitudinal axes of the several valves.

Another object of the invention is to provide a mechanism of this character wherein two or more valves may be actuated simultaneously, and the force exerted thereupon be applied in a direction along the longitudinal axis of each valve.

A further object of this invention is to provide mechanism of the character described, employing a pair of exhaust valves for each chamber, and providing means for operating these valves simultaneously.

A further object of the invention is to provide a mechanism of the character described, which is of simple construction and efficient in operation.

Further objects of this 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 drawing forming a part hereof, in which:

Figure I is a top plan view of a portion of an internal combustion engine, showing the cam shaft casing in section, and illustrating the position of the cam shaft and the relative location of the several valves.

Figure II is a vertical-sectional view taken along the line II—II of Figure I, showing the operating mechanism of the intake valve.

Figure III is a vertical sectional view taken along the line III—III of Figure I, illustrating the operating mechanism of the exhaust valves.

Similar reference characters refer to corresponding parts throughout the several views, and the sectional views are taken looking in the direction of the small arrows at the ends of the section lines.

Referring to the numbered parts of the drawing, 10 indicates an internal combustion engine of the usual construction, provided with a series of cylinders spaced from each other in a direction longitudinally of the engine, and having the axes of the several cylinders lying in a common plane. A cylinder head casing 11 is positioned above the several cylinders and forms the upper portion of the internal combustion engine, said cylinder head being provided with a plurality of intake passages 12, and exhaust passages 13. In the form shown herewith a single intake passage 12 is provided for communication with each cylinder, and a pair of exhaust passages 13 are so formed in the head casting as to be in communication with each of the several cylinders.

An intake valve 14 is positioned within each of the intake passages at a point where the intake passage communicates with the corresponding cylinder, each of the intake valves 14 being adapted to seat upon a valve seat 15, secured within the intake passage in any suitable manner. A valve stem 16 is carried by each of the intake valves 14 and extends in an upward direction therefrom, being mounted to slide freely within a valve sleeve 17, positioned within an opening in the cylinder head casing. The valve sleeves 17 are each provided with an outwardly extending annular flange 18, adapted to rest against the upper portion of the cylinder head casing and form a seat for coiled compression spring 19, which surrounds the upper portion of each valve stem and bears at its upper extremity against a cup-shaped washer 20 secured to the upper end of the

valve stem. Each of the valve stems 16 is provided with a head 21 at its upper end, and a reduced portion 22 in proximity to the head. A split washer 23 is adapted to fit around the reduced portion of the valve stem and securely retain the washer 20 from outward movement relative to the valve stem.

A cup-shaped portion 24 is formed in the cylinder head casing which serves as a housing for the upper portion of each intake valve stem and its corresponding compression spring. Positioned within the upper part of each of these cup-shaped portions is a sleeve 25 which serves as a bushing. A bonnet 26 fits closely within the sleeve 25 and has its inner surface bearing against the head portion of the valve stem. The bonnet 26 is slidably mounted within the bushing, which permits it to move readily in a direction longitudinally of the axis of the valve stem, and any downward movement of the bonnet exerts pressure upon the valve stem in a direction axially thereof. Each of the exhaust passages 13 is provided with an exhaust valve 27, positioned at a point near the point of communication of the corresponding exhaust passage with the interior of the cylinder, and the several exhaust valves are each provided with a valve stem 28, which extends upwardly therefrom and is slidably mounted within a valve sleeve 29, positioned within an opening formed in the cylinder head casing. Each of the valve sleeves 29 is provided with an outwardly extending annular flange 30 which serves as a seat for a coiled compression spring 31, the said spring being adapted to bear at its opposite end against a cup-shaped washer 32, secured to the upper portion of each of the valve stems in such a manner that the tension exerted by the spring tends to force each valve into contact with the corresponding seat.

Each of the exhaust passages is provided with a seat 33 positioned therein, and firmly secured in place at a point near the point of communication of the corresponding exhaust passage with the interior of the cylinder. Each of the valve stems 28 is provided with an enlarged head 34 positioned at the upper extremity thereof, and in proximity to a reduced portion 35 formed in the upper portion of the valve stem. A split ring 36 is adapted to fit around the reduced portion 35 of the valve stem, and against the enlarged head 34, thus serving as a means for securing the cup-shaped washer 32 in proper position upon the valve stem to insure proper control of the valve stem by the coiled compression spring.

It will be seen upon reference to Figure III that the exhaust valves of each cylinder are so arranged as to form a pair, and adapted to be simultaneously actuated by means of a head plate 38 positioned above the upper ends of the exhaust valve stems and bearing upon the head portions of the same. A cup-shaped seat 39 is formed integral with the cylinder head casing, and is located between the exhaust valve stems of each cylinder to form a seat for a coiled compression spring 40.

The opposite end of the coiled compression spring 40, is adapted to seat against the central portion of the head 38, at a point intermediate the ends thereof, and exert pressure upon the same at all times to force it in an upward direction. A guide sleeve 41 is adapted to be positioned above the cup-shaped portion 39 of the cylinder head casing, and forms an extension of the cylindrical opening therein. The guide sleeve 41 is provided with a pair of oppositely extending arms 42, which are adapted to rest upon portions of the cylinder head casing, and are provided with openings to receive the valve stem sleeves 29. The sleeves 29 are so positioned with respect to the openings in the arms 42 that the outwardly extending flanged portions 30 of the sleeve seat upon and bear firmly against the upper surfaces of the arms 42, thus serving to firmly secure the guide sleeve 41 in its proper position.

A depending sleeve 43 is preferably formed integral with the head 38 at a point substantially midway between the ends of the head plate, the said depending sleeve portion 43 being adapted to be slidably positioned within the guide sleeve 41, so as to be capable of vertical movement therein. From this construction it will be apparent that any downward pressure exerted from the upper portion of the head member 30 will cause the same to be depressed, its direction of movement being restrained by means of the sleeve 43 co-operating with the guide sleeve 41, in such a manner as to cause it to move in a direction substantially at right angles to its length, and as the opposite ends of the head plate rest upon the head portions of the exhaust valve stems, the two valves will be actuated simultaneously and in substantially the same degree for the purpose of opening the exhaust passages to permit discharge of the combustion products therethrough. The springs 31 serve to return the valves to their original position upon removal of the force exerted against them by the downward pressure upon the head plate, and these springs co-operate with the spring 40 to insure a proper return of the head plate to its original position upon removal of the pressure exerted upon the same. The force exerted by these several springs being applied to the head plate at suitable points longitudinally thereof acts upon the head plate to cause movement of the same in direction substantially at right angles to its length, and thus serves to return the head

plate to its original position without causing any binding action between the sleeve 43 and the guide sleeve 41.

A cam shaft 44 extends in a direction longitudinally of the engine, being mounted in suitable bearings 45 carried by the cylinder head casing, as shown in Figure I. The cam shaft is so positioned as to extend directly above the several intake valve stems 16, and at a point substantially midway of the heads of the valve stems 28 controlling the exhaust passages. The cam shaft 44 is provided with a plurality of cam elements 46, each of which is positioned above and adapted to actuate the corresponding intake valves 14, by exerting pressure upon the bonnets 26 resting upon the corresponding valve stems 16. In a similar manner the cam shaft 44 is provided with a plurality of cam elements 47, each of which is positioned above and substantially midway of each of the head plates 38, in such a manner as to exert pressure upon each of the head plates at suitable intervals for the purpose of properly actuating the exhaust valves.

The cam shaft 44 is adapted to be driven from the main crank shaft of the engine in any suitable manner, so as to give it speed of rotation proportionate to the speed of rotation of the engine crank shaft. A cam shaft housing 48 is secured to the upper portion of the cylinder head casing in any suitable manner as by bolts 49, and is adapted to enclose the cam shaft and the operating mechanism employed for actuating the various valves.

In the operation of the mechanism shown and described, the cam shaft is rotated from the main crank shaft of the engine, or from other suitable rotating part, in such a manner as to have a speed of rotation proportionate to the speed of rotation of the engine crank shaft. The various cam elements 46 and 47 are so positioned as to actuate the intake valve and the exhaust valves of each cylinder in sequence, and to properly operate the corresponding valves of the several cylinders in the necessary order to correspond with the cycles of operation of the cylinders. As the cam elements 46 are rotated, pressure is communicated to the bonnet 26 of each of the inlet valves, by means of which the bonnet is forced downwardly, sliding within the bushing 25, thus causing the valve stem to be depressed and the inlet valve to be opened for admitting fuel to the cylinder. The spring 19 serves to immediately return the valve 14 into contact with the valve seat 15 and the bonnet 26 to its original position upon release of the pressure exerted by the cam elements 46.

The cam elements 47 carried by the cam shaft each contact with one of the several head plates 38, at a point midway of the length of the head plate, and upon rotation of the cam elements each head plate is forced in a downward direction thus causing the exhaust valves 27 to be depressed for the purpose of opening the exhaust passages and permitting the escape of the combustion products from each cylinder. The guiding sleeve serves to restrain the movement of the head plate in such a manner as to cause it to move in a direction substantially at right angles to its length, and thus exert pressure upon the corresponding valve stems of the exhaust valves in a direction axially of their length. Upon release of the pressure exerted upon each of the head plates 38, the springs 31 and 40 serve to return the head plate to its original position together with the valve stems 28, thus causing the exhaust valves to be again seated securely in position upon their respective valve seats.

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 such limitations within the terms of the following claims, in which it is my intention to claim all novelty inherent in my invention broadly as well as specifically.

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

1. In an internal combustion engine having a cylinder head casing, a pair of valve rods extending therethrough, a member overlying said casing having openings to receive said rods, and having a portion forming a guide sleeve, a head for actuating said rods having a cylindrical portion guided by said sleeve, and a coil spring housed within said cylindrical portion for raising said head.

2. In an internal combustion engine, a plurality of valves arranged in pairs, a head plate co-operating with the valves of each pair to operate the same, means for restricting the movement of the head plate to a direction substantially at right angles to its length, comprising a pair of telescoping sleeves one of which is retained in position by the stems of the valve, and means for actuating the head plate.

3. In an internal combustion engine having a cylinder head casing and a pair of valve rods extending therethrough, a bearing sleeve in said head for each of said rods, a spring for each of said rods, each of said sleeves having a flange providing an abutment for each of said springs, a guide member having arms overlying said head and engaged beneath the flanges of said sleeves, a head for actuating said rods having a

tubular portion telescoping with a portion of said guide member, and a coil spring within said tubular portion.

4. In an internal combustion engine, a plurality of cylinders, a cam shaft located above the cylinders and extending longitudinally of the engine, an inlet valve for each cylinder positioned beneath the cam shaft, a pair of exhaust valves for each cylinder located on opposite sides of the cam shaft and means for positively actuating said valves from said cam shaft.

5. In an internal combustion engine, a pair of valves having stems extending upwardly from the engine cylinder, sleeves surrounding said stems and provided with annular flanges, a guide sleeve located between said valves and having portions through which the sleeves surrounding the valve stems project, a reciprocable head for actuating the valves, and means carried by said head and cooperating with the guide sleeve for preventing tilting of the head.

In testimony whereof, I affix my signature.

EDWARD H. BELDEN.