March 30, 1926. 1,578,581

C. J. CASNA

INTERNAL COMBUSTION ENGINE

Filed April 29, 1922 3 Sheets-Sheet 1

Fig.1.

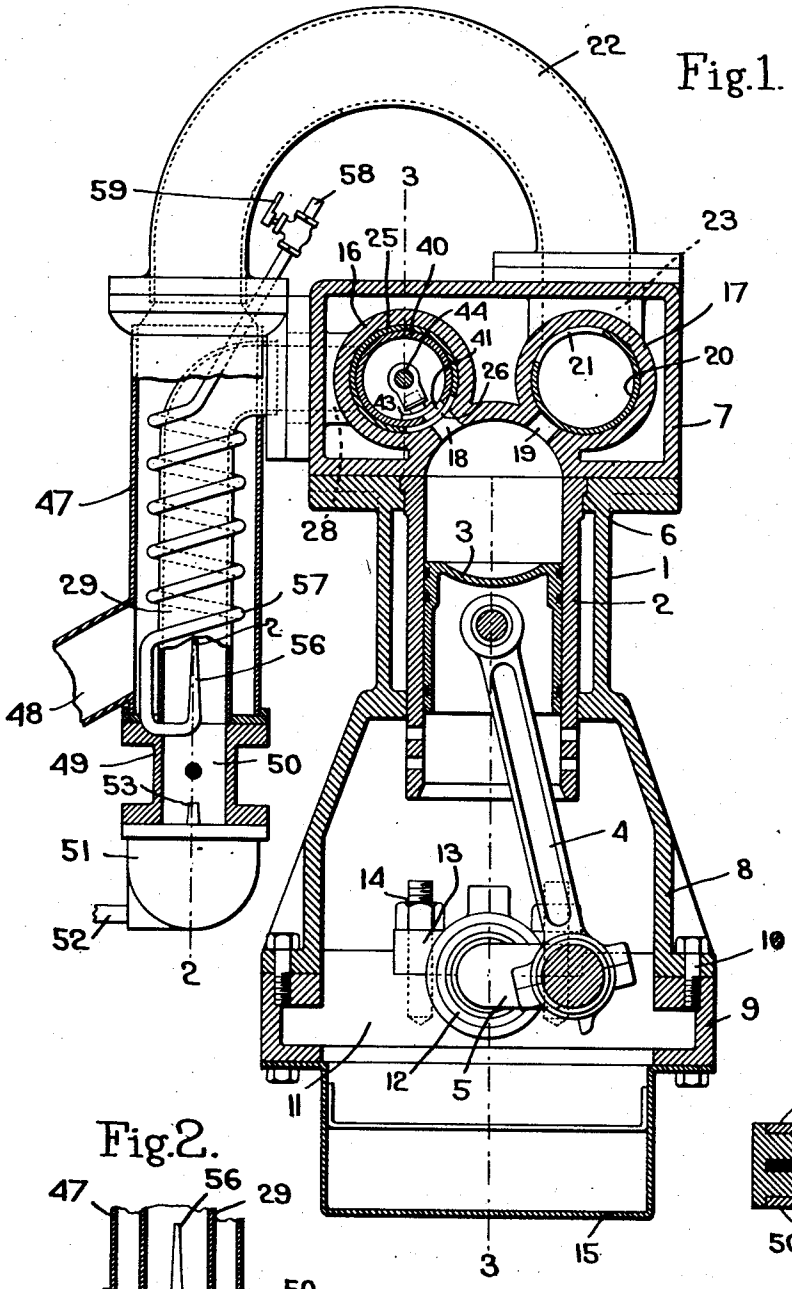


Fig.2.

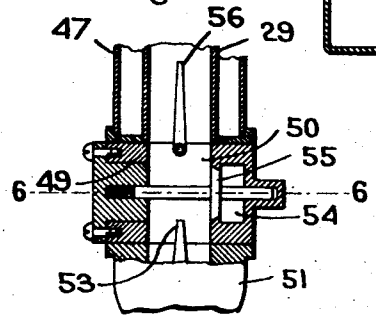
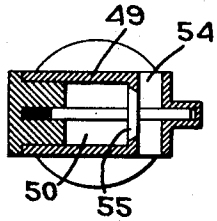


Fig.6.



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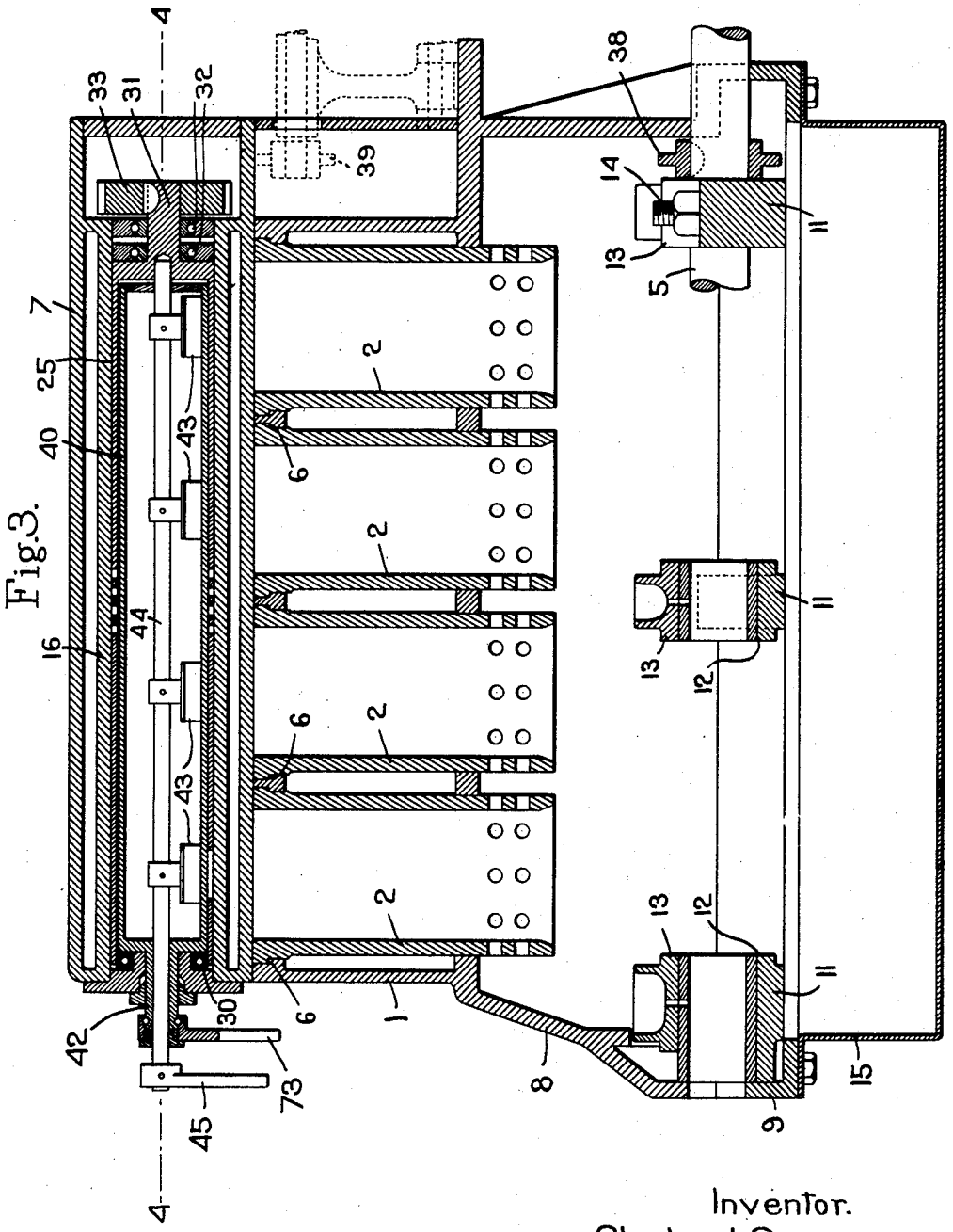


Fig. 3.

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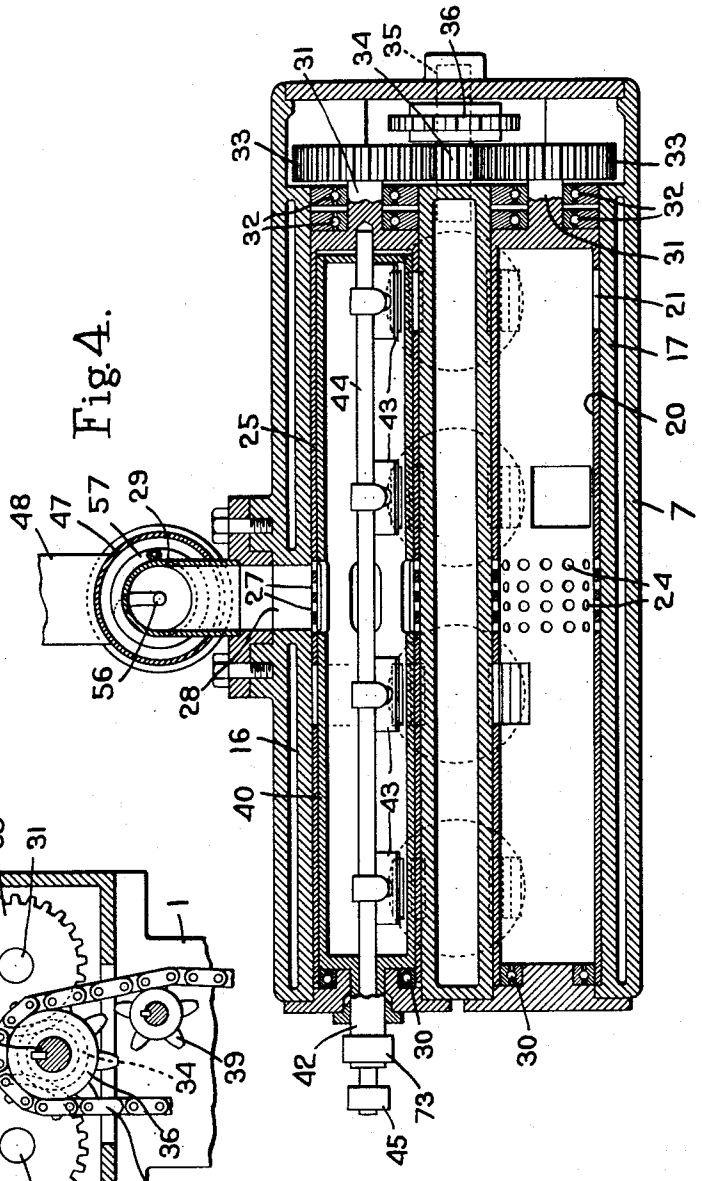


Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

CHARLES J. CASNA, OF QUINCY, MASSACHUSETTS, ASSIGNOR OF ONE-FOURTH TO ALFRED P. J. PINEL AND ONE-FOURTH TO ALFRED PINEL, BOTH OF QUINCY, MASSACHUSETTS.

INTERNAL-COMBUSTION ENGINE.

Application filed April 29, 1922. Serial No. 557,460.

To all whom it may concern:

Be it known that I, CHARLES J. CASNA, a citizen of the United States, and resident of Quincy, county of Norfolk, State of Massachusetts, have invented an Improvement in Internal-Combustion Engines, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to internal combustion engines and has for one of its objects to provide an internal combustion engine with a novel arrangement of rotary valves and with a novel throttle device associated with the rotary inlet valve for controlling the amount of combustible fuel admitted at each opening of the valve.

Another object of the invention is to provide an internal combustion engine in which the caps for the crank shaft bearings are arranged on top of the crank shaft rather than underneath the same.

Other objects of the invention are to improve generally internal combustion engines in various other features all as will be more fully hereinafter set forth.

In order to give an understanding of the invention I have illustrated in the drawings a selected embodiment thereof which will now be described after which the novel features will be pointed out in the appended claims.

Fig. 1 is a vertical sectional view through an internal combustion engine embodying my invention.

Fig. 2 is a section on the line 2—2, Fig. 1.

Fig. 3 is a vertical sectional view taken on substantially the line 3—3, Fig. 1 but omitting the pistons and the crank shaft.

Fig. 4 is a horizontal section taken on substantially the line 4—4, Fig. 3.

Fig. 5 is a detail of the gear mechanism for operating the valves.

Fig. 6 is a section on the line 6—6, Fig. 2.

I have illustrated my invention herein as embodied in a four cylinder engine but I wish to state that the invention can equally well be embodied in an engine having any number of cylinders.

In the drawings the cylinder block is indicated at 1 and it has within it a plurality of cylinders 2 in which the pistons 3 operate, the latter being connected by the usual connecting rods 4 to the crank shaft 5.

The cylinders 2 are separate from the cylinder block and can be removed therefrom to be reground or to be replaced as circumstances require. Each cylinder is formed at its upper end with an external shoulder 6 resting on a corresponding shoulder of the cylinder block and the cylinders are held in place by the removable cylinder head 7. The lower end of the cylinder block 1 is enlarged to form the crank case portion 8.

One feature of my invention relates to the construction of the bearing for the crank shaft 5. In the engine shown there are three bearings for the crank shaft one at each end of the crank case and one in the middle. Each bearing is formed so that the portion thereof underneath the crank shaft and on which the latter rests forms part of the crank case while the upper part of each bearing is in the form of a cap which is detachably secured to the under part. The advantage of this structure is that the downward thrust on the crank shaft resulting from each explosion stroke is taken by a portion of the bearing formed on the crank case instead of by the removable cap as is usually the case.

The crank case portion of the engine block is provided with separate member 9 which is firmly secured to the portion 8 by means of bolts 10 and this portion 9 is formed with three transverse portions or bridge members 11, each of which is formed with the lower half 12 of one of the bearings for the crank shaft. Associated with each bridge member 11 is a cap 13 which forms the upper half of each crank shaft bearing, each cap 13 being secured in place by suitable stud bolts 14. The oil pan 15 for the crank case is secured directly to the crank case section 9.

With this arrangement the portions of the crank shaft bearing beneath the latter form part of the crank casing and the caps are on the upper side of the crank shaft and are not subjected to the strain incident to the downward thrust generated during the power strokes. When the oil pan 15 is removed access to the stud bolts 14 is readily had through the bottom of the crank case member 9 and on either side of the crank shaft.

Another feature of my invention relates to the construction of the inlet and exhaust valves, both of which are of the rotary type. The cylinder head 7 is formed with two valve housings 16 and 17 which are situated within it and each of which has a port leading to each cylinder. In this embodiment of the invention the valve housing 16 is the one which accommodates the inlet valve and it has a port 18 leading to each cylinder while the valve 17 is for the exhaust valve and it has an exhaust port 19 leading to each cylinder. The exhaust valve is shown at 20 and is in the form of a cylinder rotating in the valve housing 17 and provided with an exhaust port 21 for each cylinder, these exhaust ports being so arranged relative to each other that when the exhaust valve 20 is rotated the exhaust ports 19 of the various cylinders will be opened in the proper order. The exhaust valve 20 constitutes an exhaust manifold into which each cylinder exhausts and this exhaust valve-manifold delivers the exhaust gases to an exhaust pipe 22. The cylinder head 7 is provided with a port 23 communicating with the exhaust pipe 22 and leading to the interior of the valve housing and the exhaust valve 20 is formed with a plurality of openings 24 in its periphery situated in line with the port 23 so that there is always communication between the interior of the exhaust valve and the exhaust port 22.

Situated within the inlet valve housing 16 is an inlet valve 25 also shown as a cylinder which is provided with inlet ports 26, one for each cylinder, said ports being so arranged that as the valve 25 rotates the inlet ports will be brought into communication with the cylinders in proper order. The inlet valve 25 is provided with a plurality of openings 27 extending completely about it and situated in line with an inlet port 28 that leads to an inlet pipe 29 into which the gaseous charge is introduced. Communication between the interior of the inlet valve 25 and the pipe 29 is, therefore, provided at all times and at all positions of the valve. The two valves 20 and 25 are provided at one end with ball bearings 30 by which they are supported and at the other end they are provided with journals 31 which are supported in ball bearings 32 carried by the end of the cylinder head. Both valves are thus supported in ball bearings and as the valve housings 16, 17 are both water jacketed, the valves will be kept cool and will thus be prevented from sticking.

The valves may be rotated in any suitable way. As herein shown the journal 31 of each valve has a gear 33 thereon situated outside of the water jacket and the cylinder head, and these gears 33 mesh with and are driven by a gear 34 on a stud shaft 35. Said shaft 35 has a sprocket wheel 36 thereon which is driven by a sprocket chain 37 that passes over and is driven by a sprocket wheel 38 carried by the crank shaft 5. The valves will thus be driven in proper timed relation with the rotation of the crank shaft.

39 indicates a pulley over which the sprocket chain 34 passes and which is adapted to operate as a chain tightener and also may be used for driving the fan for the engine.

Associated with the inlet valve is a controlling device in the form of a sleeve or cylinder 40 that is situated within the inlet valve and is provided with a port 41 for each cylinder. This controller 40 is normally stationary but can be adjusted by hand so as to vary the time of cut off. The controller 40 is shown as having a hub 42 at one end which extends through the wall of the cylinder head and is provided with a suitable arm 73 which may be actuated in any appropriate way.

The inlet valve also has a throttle associated therewith. This throttle comprises a plurality of throttle valves 43 which are secured on a shaft 44 situated within and extending longitudinally of the inlet valve. One end of this shaft 44 is shown as having a bearing in the journal 31 of the inlet valve and the other end extends through the hub 42 and is provided on its projecting end with an arm 45 to which may be attached some manually-controlled connection, such for instance as the accelerator that is commonly used for controlling the throttle of an automobile engine. When the throttles are in the position shown in Fig. 1 they close the inlet ports to a considerable extent but allow sufficient fuel charge to pass through to keep the engine going. When the throttle valves are moved clockwise Fig. 1 so as to entirely uncover the inlet ports then the throttle will be wide open. These throttle valves may be placed in any intermediate position by proper operation of the manually-controlled means.

With my invention, therefore, the throttle which controls the speed of the engine is located within the inlet valve and this throttle together with the controller 40 provides means for insuring a very sensitive control of the engine.

In order to prevent any binding of the parts I will preferably make the exterior diameter of the control member 40 slightly less than the interior diameter of the inlet valve 25 and I will arrange the control member so that it will be slightly eccentric and so that the portion thereof adjacent the ports 18 will be in contact with the interior of the inlet valve while the opposite side is slightly separated. This is conducive to freedom of movement.

I have shown herein an arrangement of inlet and exhaust pipes by which the heat

of the exhaust gases may be made use of to heat the incoming charge. The inlet pipe 29 leads to a fitting 49 having a passageway 50 therethrough. Secured to the fitting 49 is a bowl 51 constructed similarly to the float chamber of a carbureter and to which gasolene or other liquid fuel is supplied through the inlet pipe 52. This bowl is provided with the nozzle 53 which communicates with the float chamber and which projects into the passageway 50 so that when suction is created in the inlet pipe by the operation of the engine the fuel will be drawn from said nozzle 53. The fitting 50 is provided with an air inlet port 54 that is controlled by a spring-pressed inlet valve 55. This valve will be opened by the suction thus admitting air to the passageway 50 which will mix with the fuel charge thus vaporizing the latter and providing an explosive charge. Such explosive charge will be heated in passing through the pipe 29 and will be delivered to the cylinder in a condition to produce most effective results.

56 indicates a nozzle situated within the pipe 29 and connected to a coil 57 that surrounds the pipe 29 and is situated within the portion 47 of the exhaust pipe, said coil having communication through a pipe 58 with any suitable source of water supply. The pipe 58 has a control valve 59 by which it may be opened and closed. When the valve 59 is opened water will enter the coil 57 and be converted into steam therein and this steam will be delivered to the pipe 29 through the nozzle 56 thus increasing the efficiency of the engine.

The arrangement of inlet and exhaust pipes which I have herein shown, together with the arrangement of inlet valves is highly advantageous. It will be noted that the inlet valve is water jacketed and, therefore, after the engine has been running for a short time the heated water in the water jacket will keep this inlet valve hot. The inlet valve acts also as a manifold so that the gaseous mixture which is in the manifold is kept in a heated condition. The arrangement of the exhaust pipe encircling the portion 29 of the intake manifold serves also to heat the incoming gas and as a result the mixture of gas and steam which is taken into the inlet pipe 29 is kept in a heated condition until it is delivered to the engine cylinders. There is, therefore, no opportunity for the steam issuing from the nozzle 56 to condense before it is delivered to the cylinder.

I have found from experience that the above-named features result in increasing very materially the efficiency of the engine and also result in reducing the gasolene consumption.

The construction herein shown for generating steam and introducing it into the inlet pipe is capable of general use on internal combustion engines which may not have the other features herein illustrated and it is my intention not to be limited in the use of this device to any particular form of engine.

I claim:

1. In an internal combustion engine, the combination with a cylinder having a piston therein and also having an inlet port, of a rotary tubular valve controlling said port, a tubular control member within said valve, a shaft extending axially of the valve and having a radial arm, a throttle member carried by said arm and engaging the inner wall of the control member, said control member being turnable about its axis and co-operating with the throttle member to vary the time of cut off.

2. In an internal combustion engine, the combination with a plurality of cylinders, each having an inlet port, of a piston operating in each cylinder, a rotary tubular valve common to all the cylinders and controlling the inlet ports of each cylinder, a tubular control member situated within the valve, a rod or shaft extending axially of the valve, and a plurality of throttle devices, one for each inlet port carried by said shaft.

In testimony whereof, I have signed my name to this specification.

CHARLES J. CASNA.