

Oct. 13, 1925.

1,557,016

B. G. BOSWELL

INTERNAL COMBUSTION ENGINE

Filed May 21, 1924

4 Sheets-Sheet 1

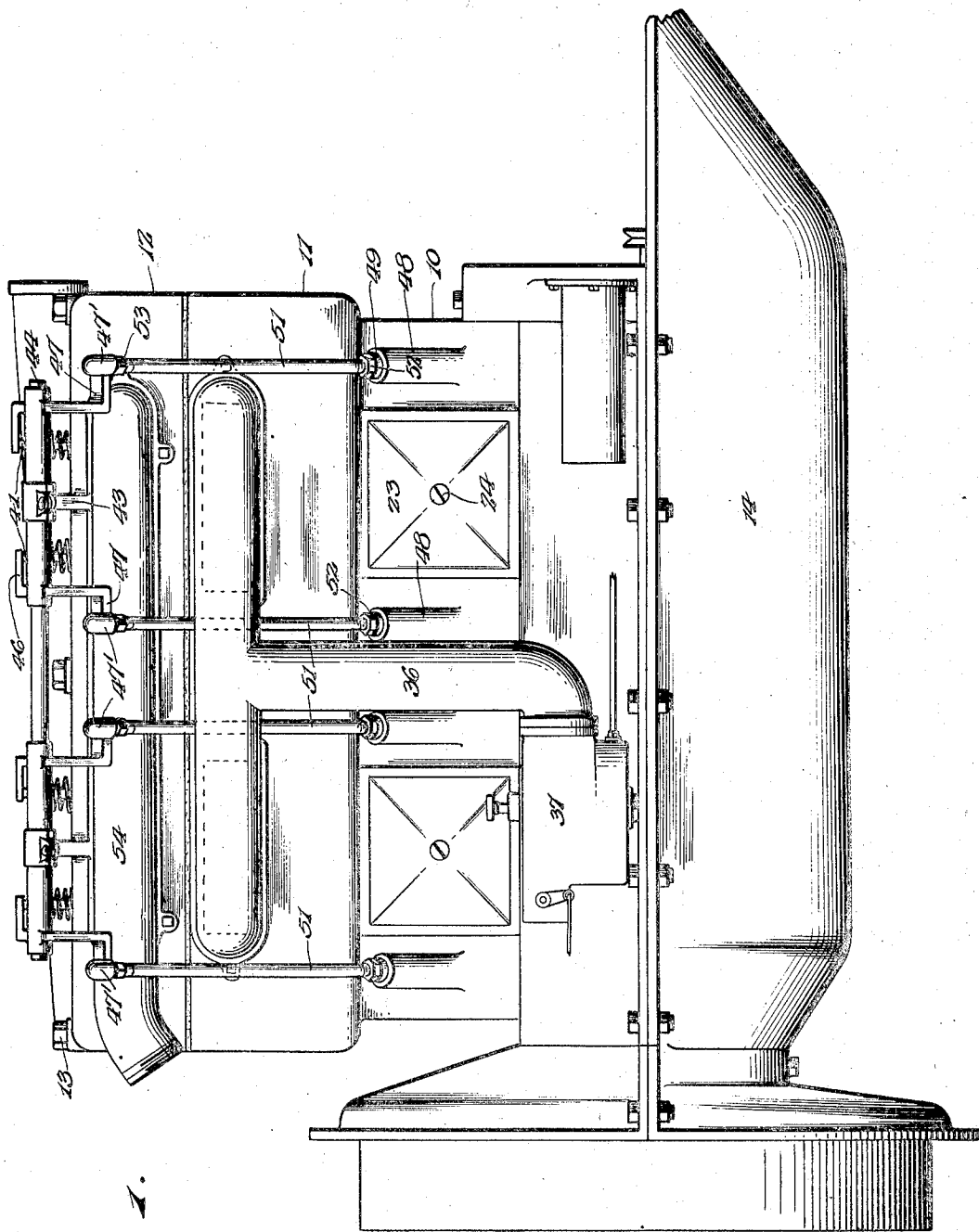


Fig. 1.

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4 Sheets-Sheet 2

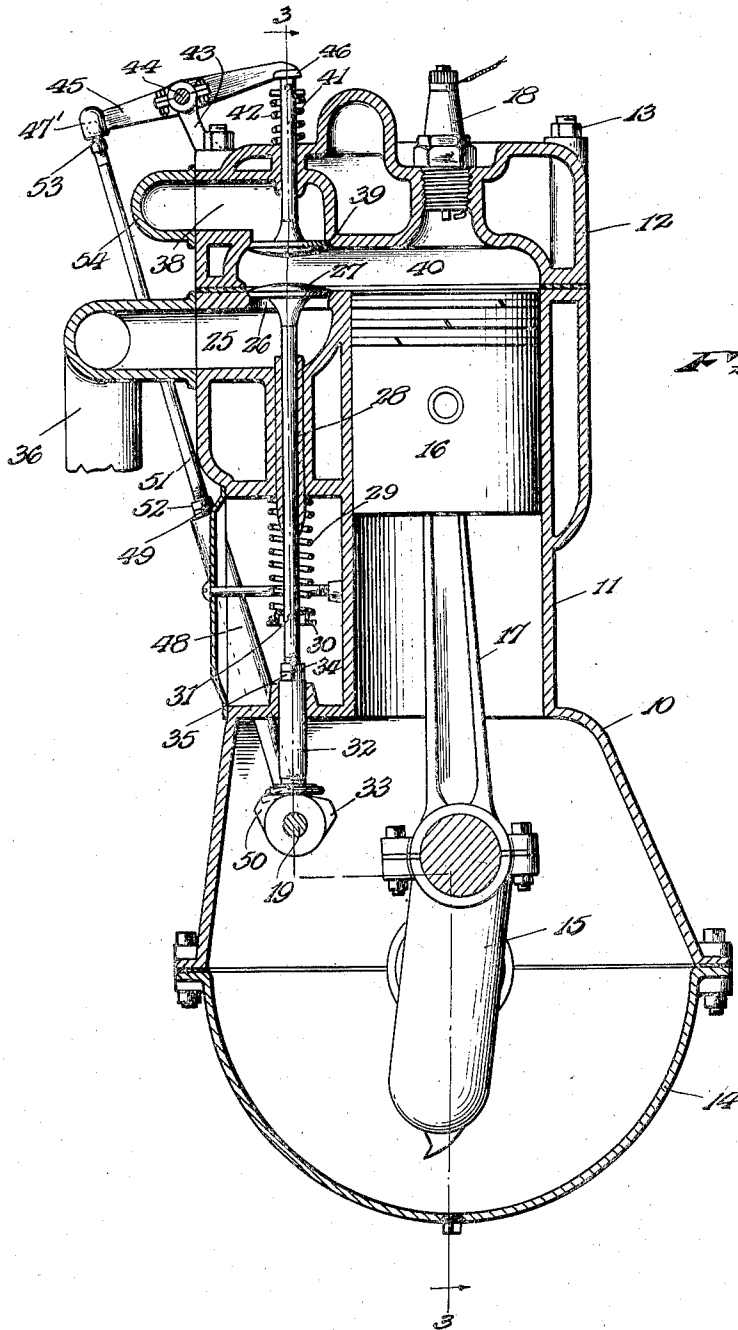


Fig. 2.

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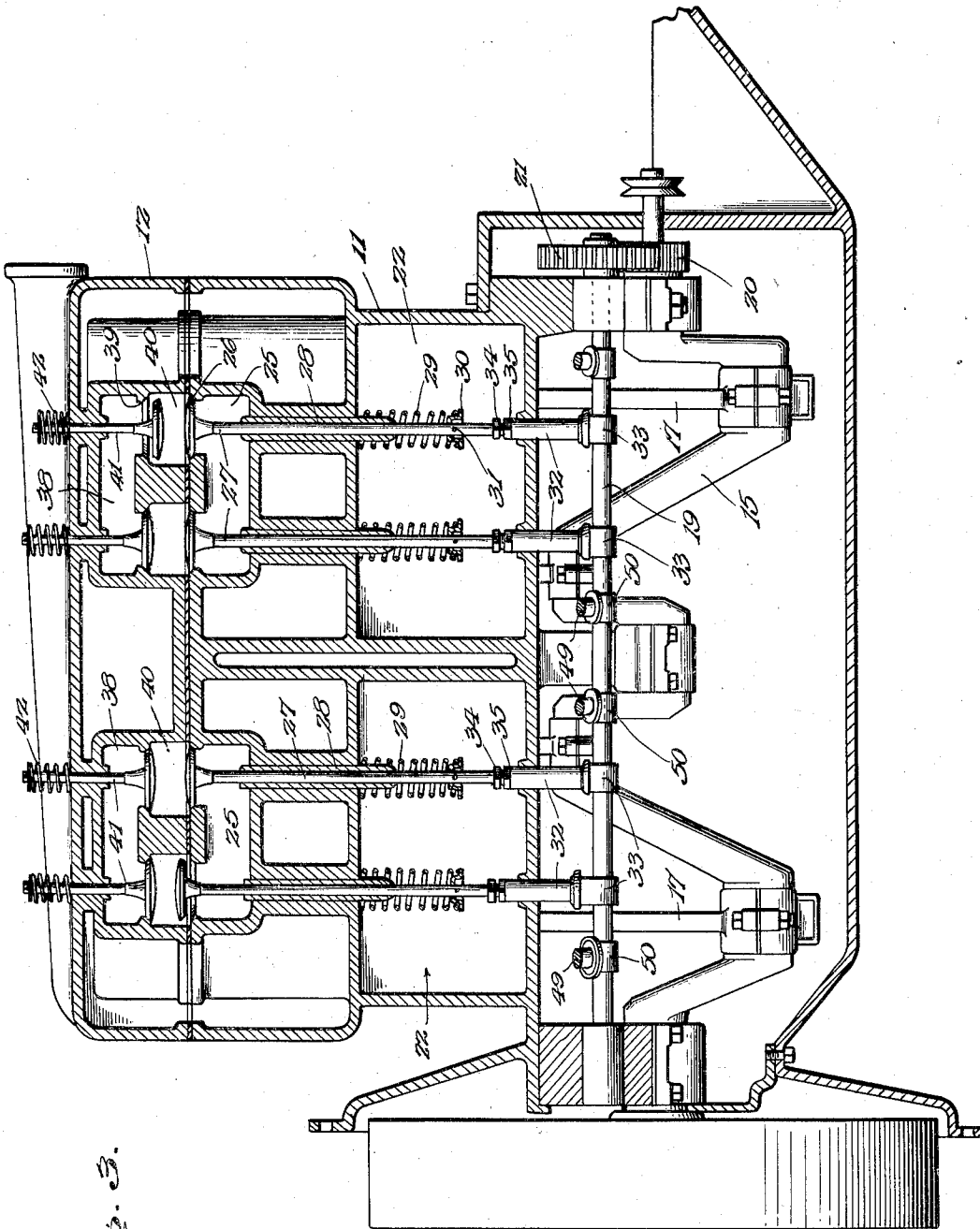
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Fig. 4.

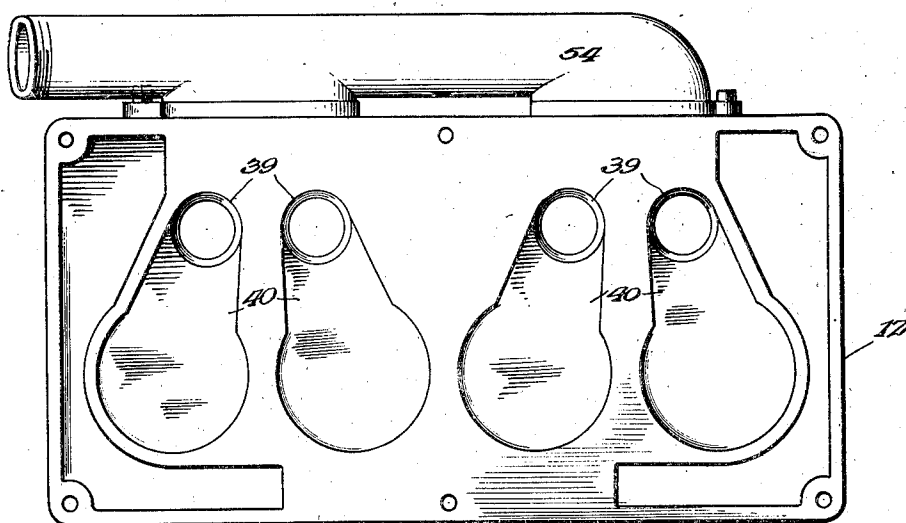
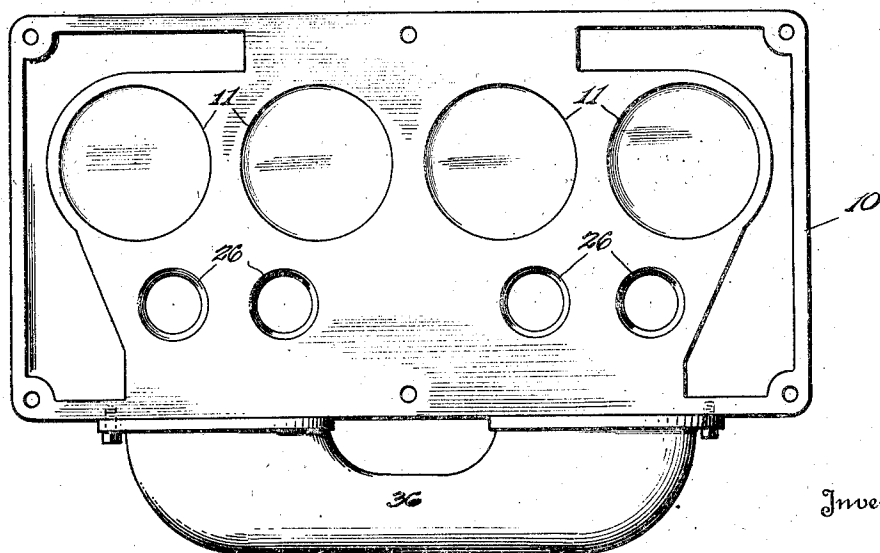


Fig. 5.



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UNITED STATES PATENT OFFICE.

BYRON G. BOSWELL, OF ARLINGTON, KENTUCKY.

INTERNAL-COMBUSTION ENGINE.

Application filed May 21, 1924. Serial No. 714,975.

To all whom it may concern:

Be it known that I, BYRON G. BOSWELL, a citizen of the United States, residing at Arlington, in the county of Carlisle and State of Kentucky, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to an improved internal combustion engine and seeks, among other objects, to provide an engine which will successfully combine the factors of maximum efficiency and structural simplicity.

The invention seeks, as a further object, to provide an engine wherein the exhaust valves will be so arranged that the engine cylinders will be effectually scavenged.

Another object of the invention is to provide an engine wherein the intake valves will be mounted upon the engine block while the exhaust valves will be mounted upon the engine head.

Still another object of the invention is to provide an engine wherein the mechanism for operating the exhaust valves will not interfere with the easy and quick removal of the head.

And the invention seeks, as a still further object, to provide an engine wherein the exhaust valves will be mounted directly over the intake valves.

Other and incidental objects will appear hereinafter.

In the drawings:

Figure 1 is a side elevation of my improved engine, particularly showing the mechanism for actuating the exhaust valves,

Figure 2 is a vertical sectional view particularly showing the mechanism for actuating the intake valves,

Figure 3 is a longitudinal sectional view on the line 3—3 of Figure 2, looking in the direction of the arrows,

Figure 4 is a bottom plan view of the engine head, and

Figure 5 is a top plan view of the engine block.

In carrying the invention into effect, I employ an engine block 10 embodying a plurality of vertically disposed cylinders 11 closed at their upper ends by a head 12 detachably secured to the block by stud bolts 13, and connected to the block is a crank case 14 in which is journaled a crank shaft

15. The block and head are formed with suitable communicating water jackets and, preferably, a suitable gasket is interposed between the block and head to form a sealed joint. In the present instance, I have shown the engine as embodying a total of four cylinders but the number of cylinders employed may, of course, be varied as desired. Reciprocable in the cylinders 11 are pistons 16 equipped with suitable piston rings and connecting the pistons with the crank shaft are connecting rods 17. Axially of the cylinders, the head 12 is formed with suitable openings to receive spark plugs, as conventionally illustrated at 18. Journaled within the crank case 10 above and at one side of the crank shaft 15, is a cam shaft 19 and fixed to the crank shaft and to said cam shaft are timing gears 20 and 21 for driving the cam shaft.

Formed in the side of the engine block at the lower ends of the cylinders 11 is a pair of chambers 22 normally closed by removable cover plates 23 secured by cap screws 24, and formed in the adjacent side of the engine block at the upper ends of the cylinders is a pair of intake passages 25. Formed in the upper face of the engine block at the inner ends of said passages are intake ports 26, one for each of the cylinders, and normally closing said ports are valves 27, the stems of which are slidably received through guides 28 to extend into the chambers 22. Surrounding the lower end portions of the valve stems are springs 29 bearing against washers 30 removably held upon the stems by pins 31 so that, as will be seen, the spring will function to normally hold the valves closed while, by removing the engine head and displacing the cover plates 23, access may be readily had to the lower ends of the valve stems for removing the springs 29, washers 30 and pins 31, when the valve may be lifted upwardly and removed. Slidable through the bottom walls of the chambers 22 are intake tappets 32 cooperating with cams 33 on the cam shaft 19 and screwed into the upper ends of the tappets are headed studs 34 to coact with the lower ends of the valve stems. Thus, the valves will be lifted or opened by the tappets while the studs 34 may be adjusted to obtain the proper clearance between said studs and the lower ends of the valve stems, and mounted upon said studs are lock nuts

35 securing the studs in adjusted position. Suitably connected to the engine block at its adjacent side is an intake manifold 36 having branches to communicate with the intake passages 25 while at its lower end the manifold is, as shown in Figure 1, formed to accommodate a suitable carbureter, as conventionally illustrated at 37.

Formed in the engine head 12 directly over the intake passages 25 of the engine block is a pair of exhaust passages 38 at the inner ends of which are exhaust ports 39, one for each of the cylinders, and formed in the lower side of the head to extend over the upper ends of the cylinders 11 are combined induction and eduction passages 40 each leading to one of the exhaust ports 39 as well as one of the intake ports 26 respectively. As shown in Figure 4, the inner ends of the passages 40 are of a diameter corresponding to the diameter of the cylinders respectively, when the passages taper gradually toward the ports 39. Closing the exhaust ports 39 are inverted exhaust valves 41, the stems of which project upwardly through the block 12 and surrounding the upper ends of said stems are springs 42 normally holding the valves seated, the springs being retained by suitable washers and pins which may be removed to permit displacement of the valves. As will now be observed, the exhaust valves are, as shown in Figures 2 and 3 of the drawings, disposed directly over the intake valves in alinement therewith so that all of said valves will open into the passages 40. Formed on the engine head 12 to incline laterally at the adjacent side thereof are brackets 43 mounting a shaft 44 and journaled on said shaft are pairs of rockers 45. As brought out in Figure 1, each pair of rockers is formed at their inner ends with laterally directed lugs 46 projecting toward each other over a pair of the valves 41 to coact with the upper ends of the valve stems while at their outer ends, each pair of rockers is provided with similar oppositely directed lugs 47 carrying approved sockets 47'. Formed on the engine block near the ends of the chambers 22 are inclined tappet guides 48 and slidable in said guides are exhaust tappets 49 cooperating with cams 50 upon the cam shaft 19. Adjustably screwed into the upper ends of the tappets are push rods 51 secured in adjusted position by lock nuts 52 and mounted upon the upper ends of the rods are ball heads 53 freely and removably received in the sockets 47' of the rockers 45. Thus, when the tappets 49 are lifted, the rockers 45 will be actuated for depressing the exhaust valves 41 to open position and, in this connection, it is to be noted that since the push rods are detachably connected to the rockers, easy and quick removal of the head is permitted. Appropriately secured to the head is an exhaust manifold 54 having

ports communicating with the exhaust passages 38 of the head.

In operation, the fuel gases will, as will now be appreciated in view of the foregoing description, be drawn into the cylinders through the passages 26 and passage 40 while the burnt gases will be discharged through the passages 40, ports 39 and passages 38 to the exhaust manifold. In thus arranging the exhaust ports at the upper ends of the cylinders, better scavenging of the cylinders than would otherwise be had, is realized, while by employing the passages 40 as both induction and eduction passages, structural complications are avoided.

Having thus described the invention, what I claim is:

1. In an internal combustion engine, a block incorporating a plurality of cylinders and provided with an intake passage for said cylinders and with a separate intake port for each cylinder at the inner end of said passage, a head closing the cylinders and provided with an exhaust passage for said cylinders and with a separate exhaust port for each cylinder at the inner end of the exhaust passage as well as with a combined induction and eduction passage for each cylinder connecting one of said intake ports and one of said exhaust ports with each cylinder respectively, intake valves on the block controlling the intake ports, exhaust valves on the head controlling the exhaust ports, a cam shaft, tappets coacting between said shaft and the intake valves, a pair of rockers mounted on the head and provided at their inner ends with lugs extending toward each other to coact with the exhaust valves and at their outer ends with lugs extending away from each other, push rods coacting with the latter lugs, and tappets coacting between the cam shaft and said push rods.

2. In an internal combustion engine, the combination of a block having a flat upper face and incorporating a plurality of cylinders, the block being formed at one side thereof with an intake passage terminating at its inner end in separate intake ports for said cylinders opening through the upper face of the block, a removable head seating flat against the upper face of the block closing said cylinders and provided at its lower side with converging induction and eduction passages conforming at their inner ends to the peripheries of the cylinders and tapered toward their outer ends to overlie said ports, the head being formed axially of said cylinders with spark plug orifices opening into the inner ends of the induction and eduction passages and being provided at one side with an exhaust passage terminating at its inner end in separate exhaust ports for said cylinders, the exhaust ports opening into the outer ends of the induction and eduction passages over said intake ports, intake valves on the

block controlling the intake ports, exhaust valves on the head controlling the exhaust ports, a cam shaft, tappets coacting between said shaft and the intake valves, parallel 5 rockers mounted on the head and provided at their inner ends with lugs projecting toward each other between the rockers to coact with the exhaust valves and at their outer ends with lugs extending away from each other, push rods coacting with the latter 10 lugs, and tappets coacting between the cam shaft and said push rods.

In testimony whereof I affix my signature.

BYRON G. BOSWELL. [L. S.]