G. A. BLACK.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED NOV. 24, 1919. RENEWED FEB. 17, 1921.

1,390,486. **Patented Sept. 13, 1921.**

Fig. 1.

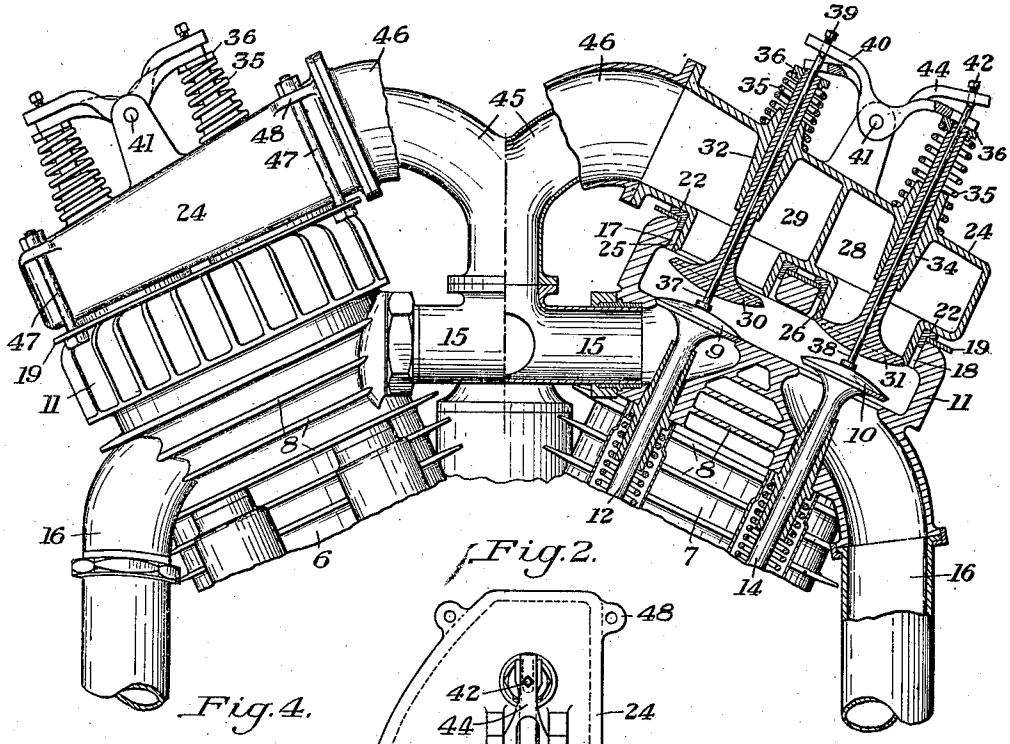


Fig. 2.

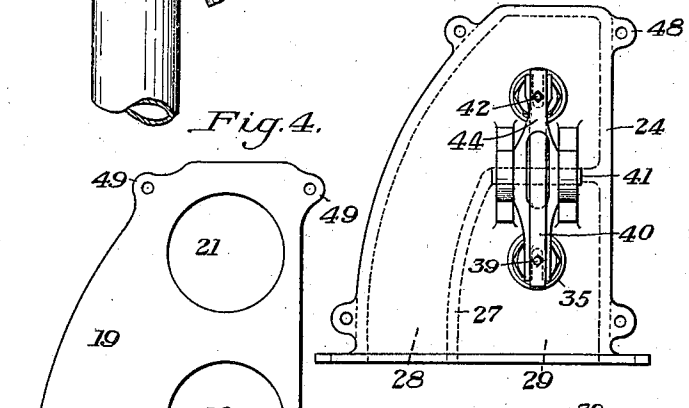


Fig. 4.

Fig. 5.

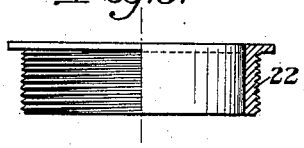
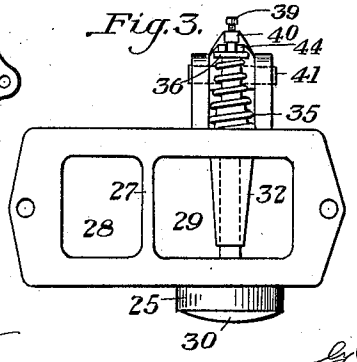


Fig. 3.



WITNESS

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,390,486. Specification of Letters Patent. Patented Sept. 13, 1921.

Application filed November 24, 1919, Serial No. 340,264. Renewed February 17, 1921. Serial No. 445,859.

To all whom it may concern:

Be it known that I, GEORGE A. BLACK, a citizen of the United States, residing at Franklin, Venango county, Pennsylvania, have invented a new and useful Improvement in Internal-Combustion Engines, of which the following is a full, clear, and exact description.

The present invention relates broadly to internal combustion engines and more particularly to a valve arrangement for engines of this nature.

The principal object of the present invention is to increase the available admission and exhaust port areas of a standard internal combustion engine. A further object of the present invention is to approximately double the areas of the usual admission and exhaust ports without increasing the size of the engines or materially adding to the cost thereof.

A still further object of the invention is to provide a supplemental valve attachment for cylinder heads, which attachment carries valves operated in unison with the usual admission and exhaust valves.

Another object of the present invention is to utilize the usual openings in the cylinder head of an L-head motor as supplemental admission and exhaust ports.

The foregoing and other objects, together with their attendant advantages, will be apparent as the invention becomes better understood by reference to the accompanying specification and drawings forming a part thereof, it being premised that changes may be made in the various details and the manner of operation within the scope of the appended claims without departing from the spirit of the invention.

Figure 1 is a side view partially in section of the upper portion of a pair of cylinders of a V-motor having my invention applied thereto.

Fig. 2 is a plan view of a supplemental valve attachment.

Fig. 3 is an end view of the construction shown in Fig. 2, and

Figs. 4 and 5 are detail views of parts of the attachment.

In the usual type of L-head motors, as distinguished from valve in head motors, there are provided openings in the cylinder head positioned directly above the admission and exhaust valves, for the purpose of permitting access to these valves.

At the present time it is customary to close these openings by the use of plugs, or the like, which are readily removable to permit access to the interior of the cylinder head. It is the object of the present invention to utilize these openings as supplemental admission and exhaust ports, respectively, by removing the plugs and using in place thereof a supplemental valve attachment.

In the drawings I have illustrated my invention as applied to V-motors, and more particularly to motors adapted principally for use on motorcycles, but it will be apparent that the invention is not limited in this respect.

Referring more particularly to the drawings, I have illustrated cylinders 6 and 7 having the usual heat radiating flanges 8 formed thereon. The cylinders are illustrated as being of the L-head type, each having an admission valve 9 and an exhaust valve 10 formed in the offset in the cylinder head 11. These valves are operated in the usual manner by tappet rods 12 and 14, respectively, mounted in the usual protecting casings, and the ports controlled by the valves are in communication with the inlet manifold 15 and the exhaust pipe 16, respectively.

Above the admission and exhaust valves, the cylinder head is provided with openings 17 and 18, which openings are provided in motors, as at present constructed, for the reception of plugs. According to the present invention, these plugs are removed and a plate 19, machined to fit the cylinder head, is applied thereto. The plate is provided with openings 20 and 21, respectively, cooperating with the openings 17 and 18 and overlying the admission and exhaust valves, respectively. The plate is held in position by bushings 22 screw threaded therethrough into the cylinder head. After the bushings have been placed in position, a supplemental casing 24 having hollow bosses 25 and 26, respectively, is applied above the plate 19 with the bosses slidably fitting the bushings

22. The casing 24 is divided by a centrally located partition 27 into an admission chamber 28 and an exhaust chamber 29, which chambers are in communication, respectively, with the hollow bosses 26 and 25.

The lower ends of the bosses formed on the supplemental casing are machined to constitute seats for the reception of valves 30 and 31, respectively, operating through bearings 32 and 34 formed in the chambers in the casing. Surrounding the valve stems are compression springs 35 abutting at one end against the casing 24 and at their opposite ends against the heads 36 suitably secured on the valve stems.

According to the present invention, the valve stems are provided with openings extending longitudinally therethrough for the reception of actuating tappets 37 and 38 engaging, respectively, the admission and exhaust valve 9 and 10 of the engine. Engaging the upper end of the tappet 37 is an adjustable screw 39 carried by the lever 40, having a pivotal mounting 41 and bifurcated at its opposite end to straddle the tappet rod 38 and engaging the head 36 on the stem of valve 31. The upper end of the tappet 38 is in turn in engagement with an adjustable screw 42 carried by the lever 44 on the pivot 41. This lever is also bifurcated at its opposite end to straddle the tappet rod 37 and engage the head 36 on the stem of valve 30.

The chamber 28 in the casing may be in communication with a source of fuel supply through the inlet manifold 45, while the chamber 29 may exhaust through a suitable exhaust manifold 46. It will be apparent that irrespective of the number of cylinders employed, each cylinder will be equipped with a supplemental valve attachment corresponding exactly to that described, so that in the present description I have for the sake of clearness specifically referred to but one such construction.

In the operation of an engine provided with a supplemental valve attachment such as that described, when the exhaust valve 10 is opened, as shown in Fig. 1, it will lift the tappet 38 which, through the lever 44, will in turn depress the valve 30 thereby providing a supplemental exhaust port. As this port has approximately the same area as the main exhaust port, it will be apparent that the area for the escaping gases is approximately doubled, thereby permitting a rapid escape of such gases from the engine cylinder. Due to the fact that these ports are located on opposite sides of the cylinder head, there results a uniform heating of the entire head. This condition can not be secured in an engine having an admission port for cool gases on one side, and an exhaust port for burned gases on the opposite side. In like manner, when the admission valve 9 is opened, it will operate to open the supplemental admission valve 31 through the tappet 37 and lever 40 thereby doubling the admission area and permitting the free passage of the combustible mixture to the engine cylinder. Due to the fact that a portion of this mixture passes through the chamber 28 adjacent the exhaust chamber 29, in the casing 24, it will be preheated thereby insuring complete vaporization. In operation this supplemental valve attachment has proven highly successful as it permits the throttling of the engine to much lower speeds than has heretofore been permitted where single admission and exhaust valves are employed, and permits the attainment of greater speeds due to the fact that the cylinders are scavaged much more quickly and a more uniform flow of fresh fuel is permitted.

The casings 24 may be held in position by suitable bolts 47 passing through lugs 48 formed on the casings 24, and through corresponding lugs 49 on the plates 19.

The advantages of the present invention result from the increase in the admission and exhaust port areas, and in the more uniform distribution of the heat throughout the cylinder body.

I claim:

1. An internal combustion engine, comprising a cylinder having exhaust and admission ports, valves for said ports, a cylinder head, supplemental exhaust and admission ports in said head, valves for said ports, and means for actuating said second mentioned valves by said first mentioned valves, substantially as described.

2. An internal combustion engine, comprising a cylinder having exhaust and admission ports, valves for said ports, a cylinder head, supplemental exhaust and admission ports in said head, valves for said ports, and means for actuating said second mentioned valves by and in unison with said first mentioned valves, substantially as described.

3. An internal combustion engine, comprising a cylinder having exhaust and admission ports, valves for said ports, a cylinder head, supplemental exhaust and admission ports in said head, valves for said ports, the exhaust valve in said head overlying the admission valve in said cylinder and the admission valve in said head overlying the exhaust valve in said cylinder, and means for actuating said valves in the cylinder head by said valves in the cylinder, substantially as described.

4. An internal combustion engine, comprising a cylinder having exhaust and admission ports, valves for said ports, a cylinder head, supplemental exhaust and admission ports in said head, valves for said ports, the exhaust valve in said head overlying

the admission valve in said cylinder and the admission valve in said head overlying the exhaust valve in said cylinder, and means for actuating said second mentioned valves in unison with said first mentioned valves, substantially as described.

5. An internal combustion engine, comprising a cylinder having an exhaust port, a valve therefor, an attachment for use therewith comprising a casing having a port, a supplemental valve for said port, and means for operating said supplemental valve by said first mentioned valve, said ports opening into the cylinder above the upward limit of the piston travel therein and permitting simultaneous exhaust of gases therethrough during their entire open period, substantially as described.

6. An internal combustion engine, comprising a cylinder having an exhaust port, a valve therefor, an attachment for use therewith comprising a casing having a port, a supplemental valve for said port, and means for actuating said valve in unison with said first mentioned valve, said ports opening into the cylinder above the upward limit of the piston travel therein and permitting simultaneous exhaust of gases therethrough during their entire open period, substantially as described.

7. An internal combustion engine, comprising a cylinder having an exhaust port, a valve therefor, an attachment for use therewith for increasing the exhaust area from the cylinder, said attachment comprising a casing secured to the cylinder head and having a supplemental port opening into the cylinder and off-set laterally from said first mentioned port, a supplemental valve for said port, and means for actuating the supplemental valve by said first mentioned valve, substantially as described.

8. An internal combustion engine, comprising a cylinder having admission and exhaust valves, a cylinder head provided with openings constituting supplemental admission and exhaust ports, a casing having an inlet and exhaust chamber coöperating with said ports, valves for closing said ports, and means for operating said second mentioned valves by and in unison with said first mentioned valves, substantially as described.

9. An internal combustion engine cylinder having a cylinder head provided with openings constituting supplemental admission and exhaust ports, a casing having admission and exhaust chambers coöperating with said ports, valves carried by said casing for closing said ports, said cylinder having the usual admission and exhaust ports, valves for said ports, and means for operating said first mentioned valves by said last mentioned valves, substantially as described.

10. An internal combustion engine, comprising a cylinder and a cylinder head, said cylinder having admission and exhaust ports formed therein, valves for said ports, said head having admission and exhaust ports formed therein, valves for said ports, a casing carried by said head, levers carried by said casing for operating said second mentioned valves, and means for operating said levers by said first mentioned valves, substantially as described.

11. An internal combustion engine, comprising a cylinder and a cylinder head, said cylinder having admission and exhaust ports formed therein, valves for said ports, said head having an exhaust port formed therein, a valve for said port, a casing carried by the cylinder head, and means carried by said casing for operating said last mentioned exhaust valve by said first mentioned exhaust valve, substantially as described.

12. An internal combustion engine, comprising a cylinder and cylinder head, said cylinder having admission and exhaust ports formed therein, valves for said ports, said head having admission and exhaust ports formed therein, valves for said ports, and tappets extending through said valves and engaging said first mentioned valves for operating the same in unison with said first mentioned valves, substantially as described.

13. An attachment for internal combustion engines having exhaust and admission valves, comprising a casing having exhaust and admission ports formed therein, supplemental valves for said ports, tappets extending longitudinally through said supplemental valves, and means carried by the casing and coöperating with the outer ends of said tappets for operating said supplemental valves by said first mentioned valves, substantially as described.

14. An attachment for internal combustion engines, comprising a casing having an admission and an exhaust port, valves for said ports, tappets extending through said valves, a lever engaging one of said tappets at one end and one of said valves at its opposite end, and a second lever engaging said second tappet at one end and said second valve at its opposite end, substantially as described.

15. An attachment for internal combustion engines, comprising a casing having an admission and exhaust port formed therein, valves for said ports, tappets extending through said valves, and pivoted levers carried by said casing, said levers each having one end bifurcated to straddle a tappet and engaging a valve, and the opposite end constituting a projection engaging a tappet, substantially as described.

16. A valve operating attachment for internal combustion engines, comprising a plurality of actuating tappets, a plurality of levers coöperating therewith, and a common pivotal mounting therefor, said levers each

being provided with a bifurcated end and a single end, said bifurcated ends straddling said tappets, substantially as described.

17. A valve operating attachment for internal combustion engines, comprising a plurality of actuating tappets, a plurality of levers coöperating therewith, a common pivotal mounting therefor, said levers each having a bifurcated end and a single end, said bifurcated ends straddling said tappets, and an adjusting screw carried by each of said single ends, substantially as described.

18. An internal combustion engine, comprising a cylinder having a primary exhaust port and a secondary exhaust port formed therein, said ports opening into the cylinder above the upward limit of travel of the piston therein and being offset laterally one from the other, valves for said ports, and means for operating one of said valves by the other of said valves, substantially as described.

19. An internal combustion engine, having a primary exhaust port formed therein, a secondary exhaust port formed therein, said ports opening into the cylinder above the upward limit of travel of the piston therein and being offset laterally, valves for said ports and means for operating one of said valves by and in unison with the other of said valves, substantially as described.

20. An internal combustion engine, comprising a cylinder having a primary exhaust port and a secondary exhaust port, said cylinder also having a primary admission port and a secondary admission port, valves for all of the said ports, and means for operating one of the exhaust valves by the other exhaust valve and one of the admission valves by the other admission valve, substantially as described.

21. An internal combustion engine, comprising a cylinder having a primary admission port and a secondary exhaust port formed therein in overlying relation, said cylinder also having a primary exhaust port and a secondary admission port formed therein in overlying relation, valves for said ports, and means for operating one of the exhaust valves by the other of the exhaust valves and one of the admission valves by the other of the admission valves, substantially as described.

22. An internal combustion engine, comprising a pair of opposed admission and exhaust valves, a second pair of opposed exhaust and admission valves, and means for operating one of the valves of each pair by one of the valves of the remaining pair, substantially as described.

23. An internal combustion engine, comprising a pair of opposed admission and exhaust valves, and a second pair of opposed exhaust and admission valves, and a tappet rod extending longitudinally through one of the valves of each pair and engaging a valve of the other pair, substantially as described.

24. An internal combustion engine, comprising a cylinder having admission and exhaust ports, valves therefor, an integral cylinder head provided with openings, an attachment coöperating with said openings to form supplemental exhaust and admission valves respectively for said engine, said openings being of larger diameter than said ports to permit access to said ports, and means for operating the usual and supplemental exhaust and admission valves respectively in unison, substantially as described.

In testimony whereof I have hereunto set my hand.

GEORGE A. BLACK.