Dec. 9, 1958 R. BOUTELEUX 2,863,429

CYLINDER-HEAD FOR INTERNAL COMBUSTION ENGINE

Filed July 29, 1955

Fig. 1

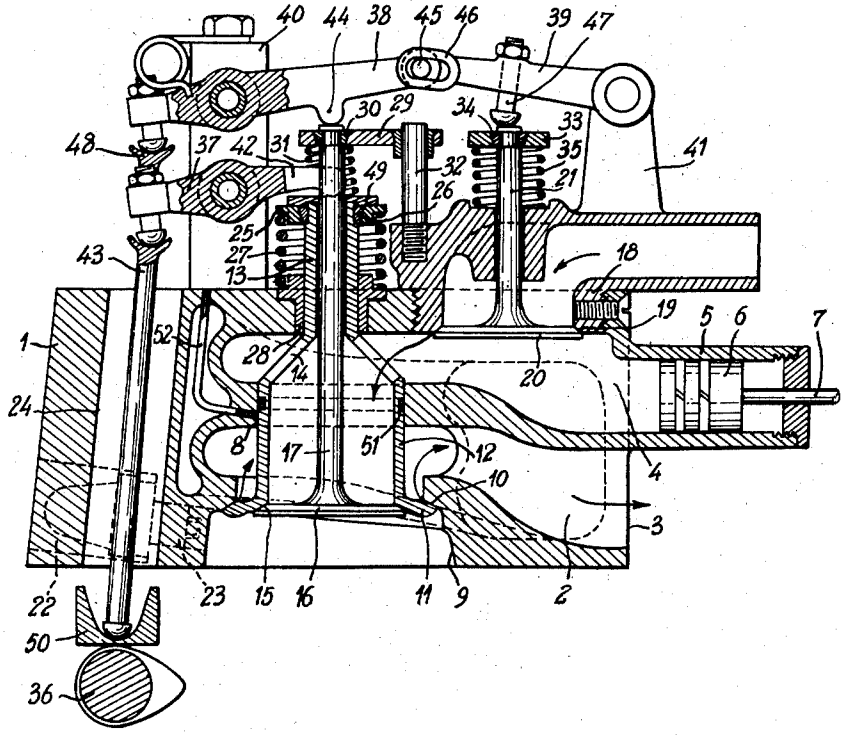


Fig. 2

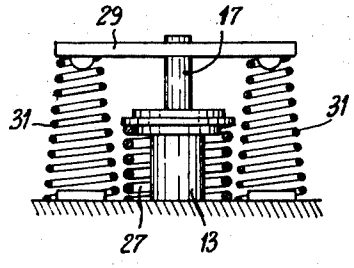
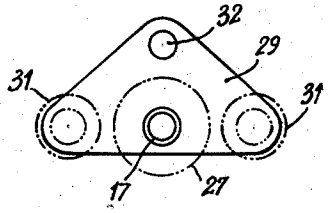


Fig. 3



INVENTOR

RENE BOUTELEUX

By Linton and Linton

ATTORNEYS

United States Patent Office 2,863,429
Patented Dec. 9, 1958

2,863,429

CYLINDER-HEAD FOR INTERNAL COMBUSTION ENGINE

René Bouteleux, Rouen, France

Application July 29, 1955, Serial No. 525,309

4 Claims. (Cl. 123—90)

This invention relates to a cylinder-head for internal combustion engines, wherein the exhaust and inlet valves are disposed concentrically into each other, i. e. about a common axis.

According to an essential feature of this invention the exhaust valve is formed at its inner end with an annular flange comprising an outer valve face and an inner valve seat, and has a tubular cylindrical body guided within the cylinder head, the inner space of this valve communicating with an inlet chamber formed in the cylinder head, while the same valve incorporates a hollow stem actuated by a forked rocker, the stem of the inner inlet valve extending through the aforesaid hollow stem.

According to a subsidiary feature of this invention the inlet chamber comprises at its inlet side a pre-inlet valve actuated by a rocker operatively connected to the rocker of the inlet valve, so that both valves will be actuated synchronously from the same driving member.

In order to afford a clearer understanding of the invention and of the manner in which the same may be carried out in the practice, a preferred embodiment thereof will be described hereafter with reference to the attached drawing forming part of this specification. In the drawing:

Figure 1 is a vertical section of the cylinder head and valve gear mounted thereon;

Figure 2 is an elevation detail view of the inlet and exhaust valve stems, and

Figure 3 is a plane view from above of the detail shown in Fig. 2.

The cylinder head body is designated by the reference numeral **1**. It comprises internally an exhaust chamber **2** with an outlet **3** for the burnt gases and an inlet chamber **4** having a cylinder-forming extension **5** in which is slidably mounted a pre-compression piston **6** the rod **7** of which is operatively connected to any suitable driving mechanism.

Between the exhaust chamber **2** and the inlet chamber **4**, the cylinder head has a cylindrical bore **8** in coaxial alignment with the pair of valves. On the engine cylinder side the cylinder head is formed with a compression chamber **9** constituting the bottom of the combustion chamber; between the exhaust chamber **2** and the compression chamber **9** the cylinder head is formed with an annular seat **10** adapted to be engaged by the valve face formed on the lower flange **11** of the exhaust valve of which the tubular cylindrical body **12** is slidably guided in the bore **8**. At its upper end the exhaust valve is formed with a hollow stem **13** extending through the top of the cylinder head; lateral apertures **14** are provided in the wall of the tubular valve which is located between the tubular cylindrical body **12** and the hollow stem **13**, these apertures being level with the inlet chamber **4**. The lower flange **11** is formed with an inner annular seat **15** adapted to be engaged by the valve face formed on the head **16** of an inlet poppet valve the stem **17** of which extends through the axial bore formed in the hollow stem **13** of the outer valve.

The cylinder head portion in which the inlet chamber **4** is formed has an inlet pipe **18** connected thereto which is formed with an annular valve seat **19** adapted to be engaged by the valve face **20** of a pre-inlet valve the stem **21** of which extends across the wall of the inlet pipe **18** to the outside.

The cylinder head is also formed with a cavity **22** adapted to receive the ignition spark plug or a fuel injection nozzle shown in dotted lines at **23**. It is also formed with passages **24** through which the rocker-actuating push-rods extend with a substantial clearance, as will be made clear presently.

The hollow stem **13** of the outer exhaust valve carries at its upper end and externally of the cylinder head a valve collar **25** secured by a frusto-conical split cotter **26**, a valve spring **27** being interposed between the valve collar **25** and the valve guide **28** through which the valve stem **13** extends as shown. The inner valve stem **17** is also provided with a valve-collar forming plate **29** secured by a frusto-conical split cotter **30**, a pair of parallel springs **31** being interposed between the cylinder head and this plate **29**, the latter being guided on the other hand by a fixed rod **32** carried by the cylinder head and parallel to the stem **17**. The stem **21** carries a valve collar **33** secured by a frusto-conical split cotter **34** and valve spring **35** is interposed between the top of the cylinder head and this valve collar **33**. It is apparent that the springs **27**, **31** and **35** urge the three valves to their closed positions, and that these valves are adapted to be moved to their open positions through valve gears actuated from a camshaft **36**. These valve springs are illustrated in the drawing in the form of coil springs but it will be readily understood by anybody conversant with the art that any other suitable spring forms may be substituted therefor, such as hair-pin springs or torsion bars.

The three rockers through which the valves **11**, **16** and **20** controlled by the springs **27**, **31** and **35** are actuated are designated by the reference numerals **37**, **38** and **39**; rockers **37** and **38** are pivoted on a bracket **40** and the other rocker **39** is pivoted on another bracket **41**.

The rocker **37** engages a washer **49** bearing upon the upper end of the exhaust valve and to this end the washer-engaging portion **42** of the rocker is of fork shape so that the prongs thereof are located on either side of the stem **17**. At its opposite end the rocker is actuated by a push-rod **43** extending through the aforesaid passage **24**; this push-rod is controlled in turn by one of the cams formed on the camshaft **36**, a suitable cam follower **50** being interposed therebetween.

The rocker **38** engages the valve stem **17** through a projection or lug **44** and comprises an extension carrying a transverse pin **45** engaging an elongated aperture **46** formed in the other rocker **39**; this rocker **39** is adapted in turn to actuate the valve stem **21** through an adjustable stud **47**. This operative connection between the pair of rockers **38**, **39** permits the simultaneous actuation thereof from a common push-rod **48** actuated in turn from a proper cam formed on the camshaft **36**.

One or more piston packings **51** may be provided in the outer cylindrical surface of the bore **8** to ensure a sealing engagement between the exhaust chamber **2** and inlet chamber **4**. A pipe **52** carrying a suitable nozzle and fed with valve-gear lubricating oil may be provided for supplying lubricant to the bore **8** around the annular valve.

The above-described arrangement operates as follows:

When the induction stroke is to take place the rockers **38**, **39** are actuated and open the inlet and pre-inlet valves so that the air or the fuel mixture contained in the inlet chamber is forced into the combustion chamber while fresh gas enters the inlet chamber; the filling of the engine

cylinder may be improved by compressing beforehand the gas introduced into chamber 4 by causing a proper movement of piston 6 which may be actuated through any suitable mechanism.

After closing the inlet and pre-inlet valves, the engine cycle continues according to the usual sequence, i. e. the compression stroke followed by the explosion or power stroke, whereafter the exhaust valve opens and carries along the inlet valve. The burnt gases escape between the flange 11 of the exhaust valve and the valve seat 10 across chamber 2 so that only a small percentage of the heat contents of these gases is transferred to the body 12 of the exhaust valve in which the fresh gases issuing from the inlet chamber are now circulating; thus, these fresh inlet gases are pre-heated so as to promote the fuel vaporization and increase the pressure in chamber 4; at the same time, the heat absorbed by the fresh gases will cool the exhaust valve and consequently this valve cannot attain an excessive value. At the end of the exhaust stroke another quantity of fuel mixture is introduced and the cycle is repeated.

Of course, the gases could follow a path exactly opposite to the one just described, without impairing the operation of the cylinder head. The fresh gas inlet would then occur through the chamber 2 and orifice 3 and the burnt gases would escape through the pipe 18 in a direction opposite to that indicated by the arrow in Fig. 1.

The device described hereinabove is particularly suitable for slow-running engines employing fuel oil (compression-ignition engines); in fact, these relatively slow-running engines will not suffer from the use of exhaust valves slightly heavier than those of ordinary or gasoline engines, and on the other hand the advantages of an improved combustion and a more complete filling of the combustion chamber will appear more obviously in fuel-oil engines; it is known that these engines have a relatively poor efficiency with hitherto known or conventional cylinder heads.

Of course, the form of embodiment shown and described herein is given by way of example only and should not be construed as limiting the scope of the invention, as many constructional details may be altered therein without departing from the spirit and scope of the invention. Thus, more particularly, the common axis of the inlet and exhaust valves, instead of being in axial alignment with the combustion chamber, as illustrated, may be inclined in relation thereto to provide a convenient location for the spark plug or fuel injector in the combustion chamber; i. e. at a greater distance from the exhaust valve. Again, the cylinder head may be constructed without the pre-inlet valve 18 and/or the pre-compression piston 6; these two mechanisms may also be provided, if desired, on a separate member secured on the cylinder head.

Experience has proved that a cylinder head according to this invention will improve the engine output to a substantial extent, with the additional advantageous feature that the valve heads and their respective seats may withstand extremely long service periods while retaining perfect operative conditions, so that maintenance costs are reduced proportionally.

This invention is also applicable to gasoline and diesel engines of the types employed in fixed installations, in marine and aircraft construction, and in the automotive industry.

I claim:

1. A cylinder head for internal combustion engines, comprising a cylinder head having a chamber therein, a partition connected to said head and extending within said chamber forming an exhaust chamber and an inlet chamber, a cylinder extension connected to said inlet chamber, an inlet pipe leading into said inlet chamber, said head and said partition having concentric bores, a tubular valve slidably mounted through said bores and

having a flange for being seated against one side of said head closing said bores, a poppet valve slidably extending through said tubular valve with the head of said poppet valve seatable against said valve flange closing said tubular valve, said tubular valve having openings capable of being in communication with one of said chambers, a pre-compression piston slidably and tightly mounted in said cylinder extension, a pre-inlet valve being slidably mounted in said head and adapted to close said inlet pipe, a plurality of resilient means tending to independently urged said valves in their closed position, a driven camshaft, a plurality of push-rods operable by said camshaft, a plurality of rocker arms pivotally mounted on said head for being pivoted by said push-rods and for sliding and opening said valves, and synchronizing means for operating said pre-inlet valve in proper time with respect to said poppet valve.

2. A cylinder head for internal combustion engines comprising a cylinder head having a chamber therein, a partition connected to said head and extending within said chamber forming an exhaust chamber and an inlet chamber therein, a cylinder extension connected to said inlet chamber, an inlet pipe leading into said inlet chamber, said head and said partition having concentric bores, a tubular valve in one piece slidably mounted through said bores and having a flange for being seated against one side of said head closing said bores, said tubular valve having a tubular portion of reduced diameter, a poppet valve slidably extending through said tubular valve and guided by said tubular portion of reduced diameter of said tubular valve with the head of said poppet valve seatable only against said valve flange closing said tubular valve, said tubular valve having openings capable of being in communication with said inlet chamber, a pre-compression piston manually positioned slidably and tightly mounted in said cylinder extension, a pre-inlet valve being slidably mounted in said head and adapted to close said inlet pipe, a plurality of resilient means tending to urge independently said valves in their closed position, a timing arrangement for actuation of said tubular and said poppet valves and synchronizing means for operating said pre-inlet valve in proper time with respect to said poppet valve.

3. A cylinder head for internal combustion engines comprising a cylinder head having a chamber therein, a partition connected to said head and extending within said chamber forming an exhaust chamber and an inlet chamber therein, said head and partition having concentric bores, a tubular valve slidably mounted through said bores and having a flange for being seated against one side of said head closing said bores, a poppet valve slidably extending through said tubular valve with the head of said poppet valve seatable against said valve flange closing said tubular valve, said tubular valve having side openings capable of being in communication with one of said chambers, a plurality of resilient means tending to retain said valves in their closed position, a driven camshaft, a plurality of push-rods operable by said camshaft, a plurality of rocker arms pivotally mounted on said head each contacting one push-rod for being pivoted thereby and one of said valves for sliding and opening the same, a plurality of plates each being connected to one of said valves, said resilient means being positioned between said plates and said head tending to move said plates from said head and a guide pin being mounted on said head with the plate for said poppet valve being slidable on and guided by said pin.

4. A cylinder head for internal combustion engines as claimed in claim 2 wherein said pre-inlet valve has its head positioned for being seated for closing said pipe from said inlet chamber, resilient means tend to hold said pre-inlet valve in its closed position, a rocker arm is pivotally mounted on said cylinder head for sliding said pre-inlet valve from its closed position and means connects

said rocker arm to said inlet valve rocker arm whereby said arms are pivoted in synchronism opening and closing said poppet valve and said pre-inlet valve in proper time.

References Cited in the file of this patent

UNITED STATES PATENTS

878,364	Edwards	Feb. 4, 1908
1,019,488	Krebs	Mar. 5, 1912
1,059,210	Redrup	Apr. 15, 1913
1,191,150	Brown	July 18, 1916
1,232,108	Sims	July 3, 1917
1,493,419	Asbury	May 6, 1924
1,950,911	Zahodiakin	Mar. 13, 1934
2,107,389	Price et al.	Feb. 8, 1938
2,127,692	Lothrop	Aug. 23, 1938
2,303,324	Brumby	Dec. 1, 1942