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CYLINDER FOR A FOUR-CYCLE INTERNAL COMBUSTION ENGINE

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Fig. 1

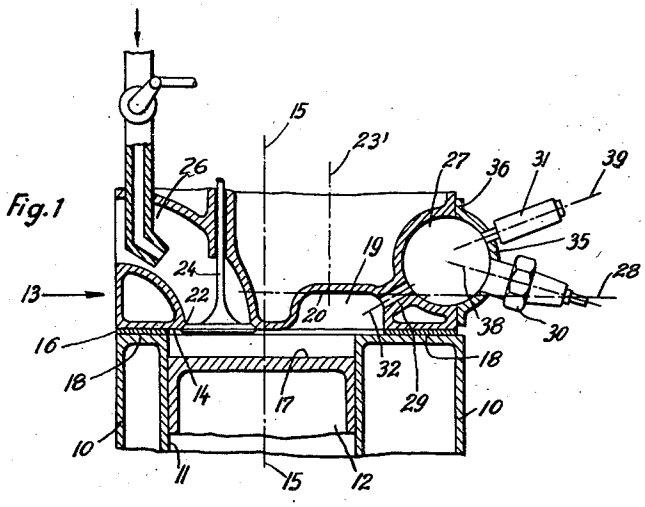
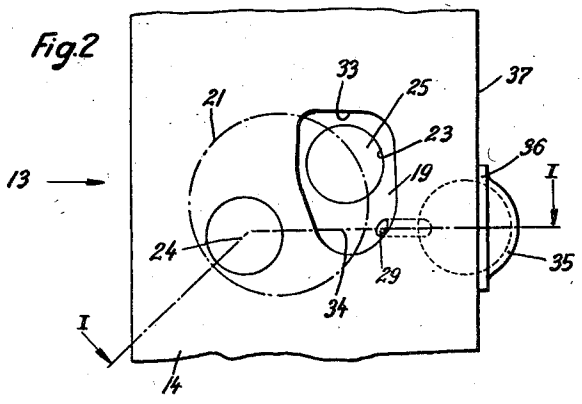


Fig. 2



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CYLINDER FOR A FOUR-CYCLE INTERNAL COMBUSTION ENGINE

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7 Claims. (Cl. 123—32)

My invention relates to a cylinder for a four-cycle internal combustion engine and, more particularly, to an engine of the type in which a pair of valves and a recess constituting the main combustion chamber are disposed within the cylinder head.

It is the object of the present invention to provide a cylinder of the type indicated which results in a highly efficient and smooth combustion of the fuel permitting of a high compression without risking undue knocking of the engine.

It is a further object of the invention to provide a cylinder head for a four-cycle internal combustion engine in which part of the fuel is injected into a combustion chamber, the balance of the fuel being supplied by carbureting the air sucked into the cylinder.

Further objects of the invention will appear from a detailed description of a preferred embodiment of the invention illustrated in the accompanying drawings, it being understood that such detailed description serves the purpose of illustrating the invention rather than that of restricting or limiting the same. In the drawings,

Fig. 1 is a longitudinal section taken through the upper part of the jacket and through the lower part of the cylinder head of the engine embodying the present invention, such section being taken along the line I—I of Fig. 2, and

Fig. 2 is a bottom view of the cylinder head shown in Fig. 1.

The cylinder illustrated in Figs. 1 and 2 comprises a water-cooled jacket **10** having a cylindrical bore **11** adapted to accommodate a reciprocatory piston **12** and a cylinder head **13** which is detachably mounted on the jacket **10** and has an end face **14** extending substantially at right angles to the axis **15** of the bore **11**. A seal **16** is interposed between the end face **14** of the cylinder head and the top face **18** of the jacket **10** to seal the joint therebetween. The upper dead center position of the plane end face **17** of the piston is disposed in close proximity to the end face **14** of the cylinder head and substantially registers with the top end face **18** of the jacket.

The cylinder head is formed with a recess **19** provided in the end face **14**. This recess **19** has a bottom **20** extending substantially parallel to the end face **14**. The recess **19** partially overlies the jacket **10** so as to be intersected by a cylindrical surface indicated by the dash-dotted line **21** in Fig. 2 coinciding with the cylindrical bore **11** of the jacket.

A first valve seat **22** is provided in the end face **14** and a second valve seat **23** (Fig. 2) is provided in the bottom **20** of the recess **19**. The second valve seat is likewise intersected by the cylindrical surface **21**, as will appear from Fig. 2. A pair of valves **24** and **25** is slidably mounted in the cylinder head **13** in parallel relationship to the axis **15** for cooperation with the valve seats **22** and **23**. While the valve **23** does not appear in Fig. 1, the location of its axis is indicated by the dash-dotted line **23'**. The duct **26** terminating at the first valve seat **22** is preferably the

inlet duct, whereas the duct (not shown) terminating at the second valve seat **23** is preferably the outlet duct.

Moreover, the cylinder head is provided with an ignition chamber **27** which is located laterally of and spaced from the recess **19**. This ignition chamber is located substantially above the plane indicated by the dash-dotted line **28** coinciding with the bottom **20** of the recess and is connected therewith by a passageway **29**. Moreover, the ignition chamber is equipped with a spark plug **30** and with a fuel-injecting nozzle **31**. The recess **19**, which at its bottom is partly confined by the top wall **18** of the jacket, constitutes the main combustion chamber of the engine. Preferably, the ignition chamber **27** is substantially spherical. The axis **32** of the passageway **29** preferably extends below the center of the ignition chamber **27** at a distance therefrom. This distance may more or less approach the radius of the ignition chamber so that the passageway is disposed more or less tangentially thereto. The passageway **29** communicates with the recess near the bottom **20** thereof and its axis **32** intersects the piston in its upper dead center position below the recess **19**. The recess has a side wall **33** which, as shown in Fig. 2, extends tangentially to the cylindrical surface **21** which coincides with the cylindrical bore **11** of the jacket. Preferably a plane **34** including the axis **32** of the passageway **29** and extending parallel to the axis **15** of the cylindrical bore intersects the first valve seat **22** and is laterally spaced from the second valve seat **23**, as will appear from Fig. 2. As indicated in Fig. 1, the cylinder head **13** is hollow for water-cooling purposes in the customary manner.

The wall of the ignition chamber **27** is partly formed by a dished cover plate **35** having a flange **36** bolted to the side wall **37** of the cylinder head **13**, the injecting nozzle **31** and the spark plug **30** being mounted on such cover plate **35**. Preferably, the axis **38** of the spark plug intersects the center of the spherical ignition chamber **27**, whereas the axis **39** of the injecting nozzle **31** intersects the axis **38** at a point located between the opposed wall of the ignition chamber and the center of the latter.

Only part of the fuel required for full power is supplied by means of the injecting nozzle **31**. The balance of the fuel is supplied by carbureting the air supplied through the inlet conduit **26**. Preferably, the injection of the fuel into the ignition chamber **27** occurs during the compression stroke in which the carbureted air sucked into the cylinder is compressed by the ascending piston **12** preparatory to the ignition initiated by the spark plug **30**. The power is preferably controlled by controlling the amount of fuel admixed to the air stream entering through the duct **26**, whereas the quantity of fuel injected through nozzle **31** is constant, irrespective of the power produced. In other words, a quantity of fuel that is nearly constant over the entire range of speeds is injected into the ignition chamber **27** by the nozzle **31**, such quantity being so chosen as to ensure ignition by the spark plug **30**. The descending piston **12** sucks through duct **26** a constant quantity of air which is not controlled by any throttle valve. This air is carbureted, however, by an adjustable nozzle with a quantity of fuel commensurate with the required power. The air-fuel mixture sucked into the cylinder is ignited after compression by the flame issuing from the passageway **29** and entering the main combustion chamber constituted by the recess **19**.

While the invention has been described in connection with a preferred embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or

customary practice in the art to which the invention pertains, and as fall within the scope of the invention or the limits of the appended claims.

What I claim is:

1. A cylinder for a four-cycle internal combustion engine comprising a jacket having a cylindrical bore adapted to accommodate a reciprocatory piston, a cylinder head detachably mounted on said jacket and having an end face extending substantially at right angles to the axis of said bore in close proximity to the upper dead center position of said piston and formed with a recess in said end face having a bottom extending substantially parallel to said end face, said recess partially overlying said jacket, a first valve seat being provided in said end face and a second valve seat in said bottom, a pair of valves slidably mounted in said cylinder head in parallel relationship to said axis for cooperation with said valve seats, said cylinder head being further provided with an ignition chamber located laterally of and spaced from said recess and located substantially above a plane coinciding with said bottom and connected with said recess by a passageway, and a spark plug and a fuel-injecting nozzle, both associated with said chamber, said recess constituting the main combustion chamber.

2. A cylinder as claimed in claim 1 provided with an inlet duct terminating at said first valve seat and with an outlet duct terminating at said second valve seat.

3. A cylinder as claimed in claim 1 in which said ignition chamber is substantially spherical.

4. A cylinder is claimed in claim 1 in which an imaginary extension of the cylinder bore intersects said second valve seat provided in said bottom.

5. A cylinder as claimed in claim 1 in which the axis of said passageway extends below the center of said ignition chamber.

6. A cylinder as claimed in claim 1 in which said recess is terminated by a side wall extending substantially tangentially to a cylindrical surface coinciding with said cylindrical bore.

7. A cylinder as claimed in claim 1 in which a plane including the axis of said passageway and extending parallel to the axis of said cylindrical bore intersects said first valve seat and is laterally spaced from said second valve seat.

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