Nov. 26, 1935. C. S. BROWN 2,022,556

CYLINDER HEAD CONSTRUCTION

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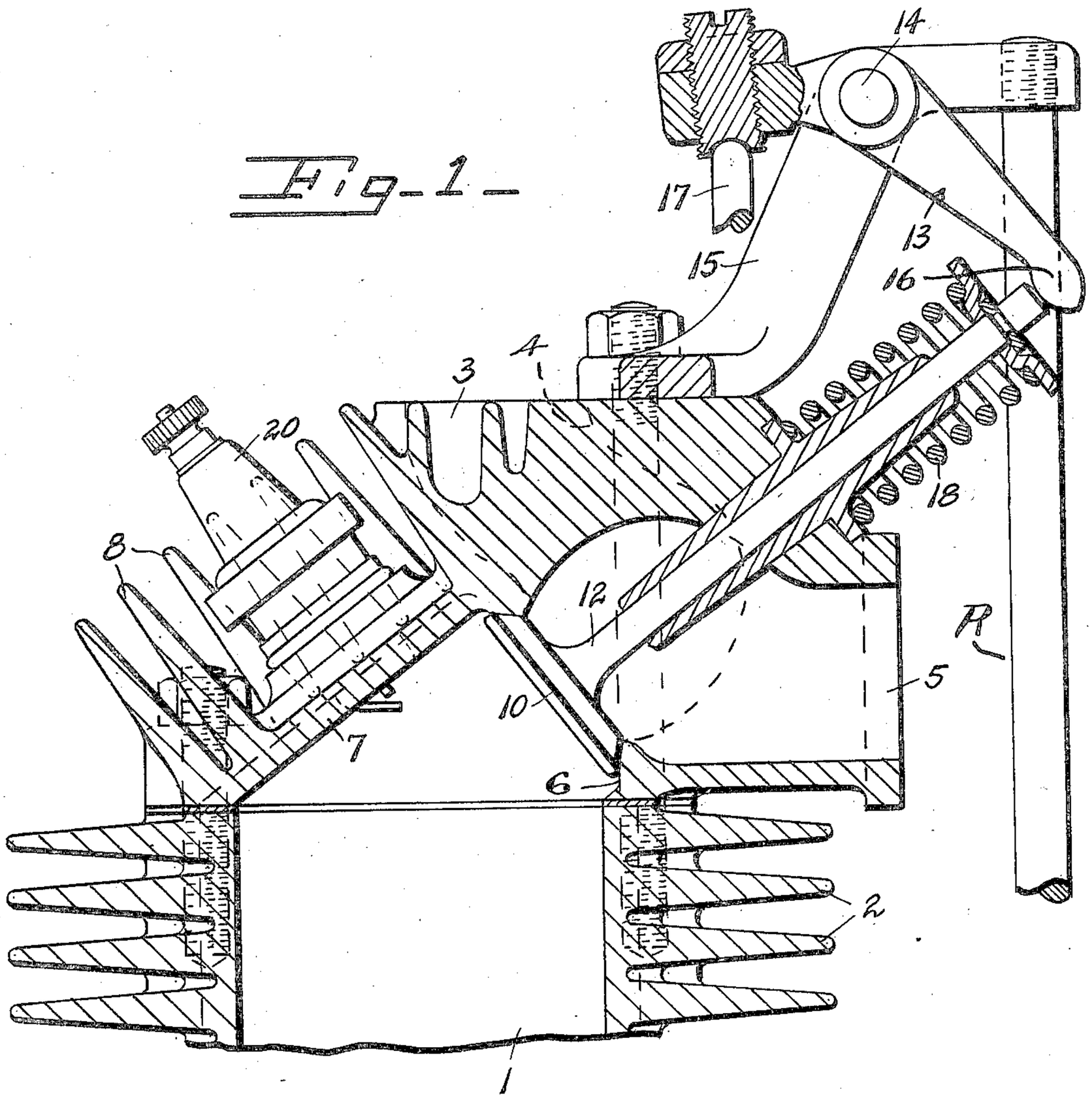
Fig-1-



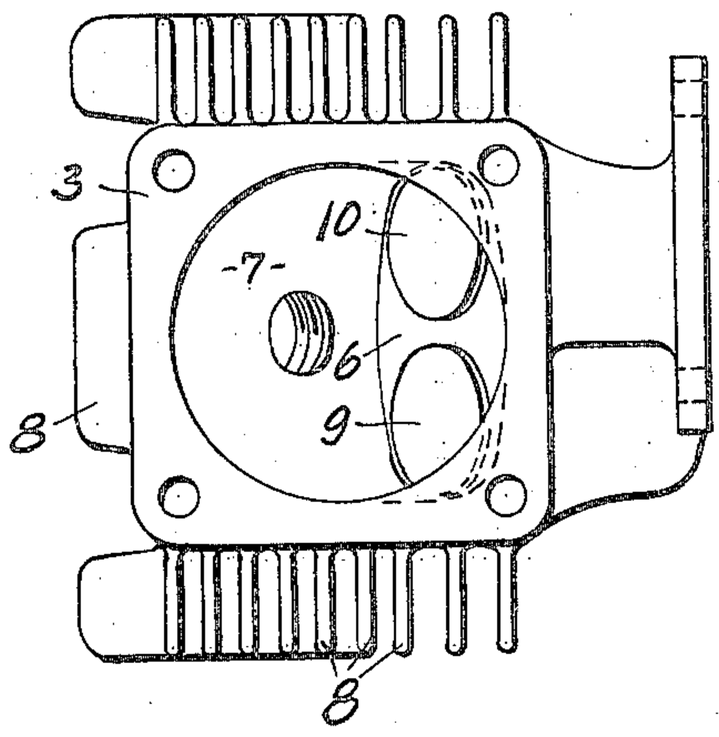


Fig-3-

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Fig-2-

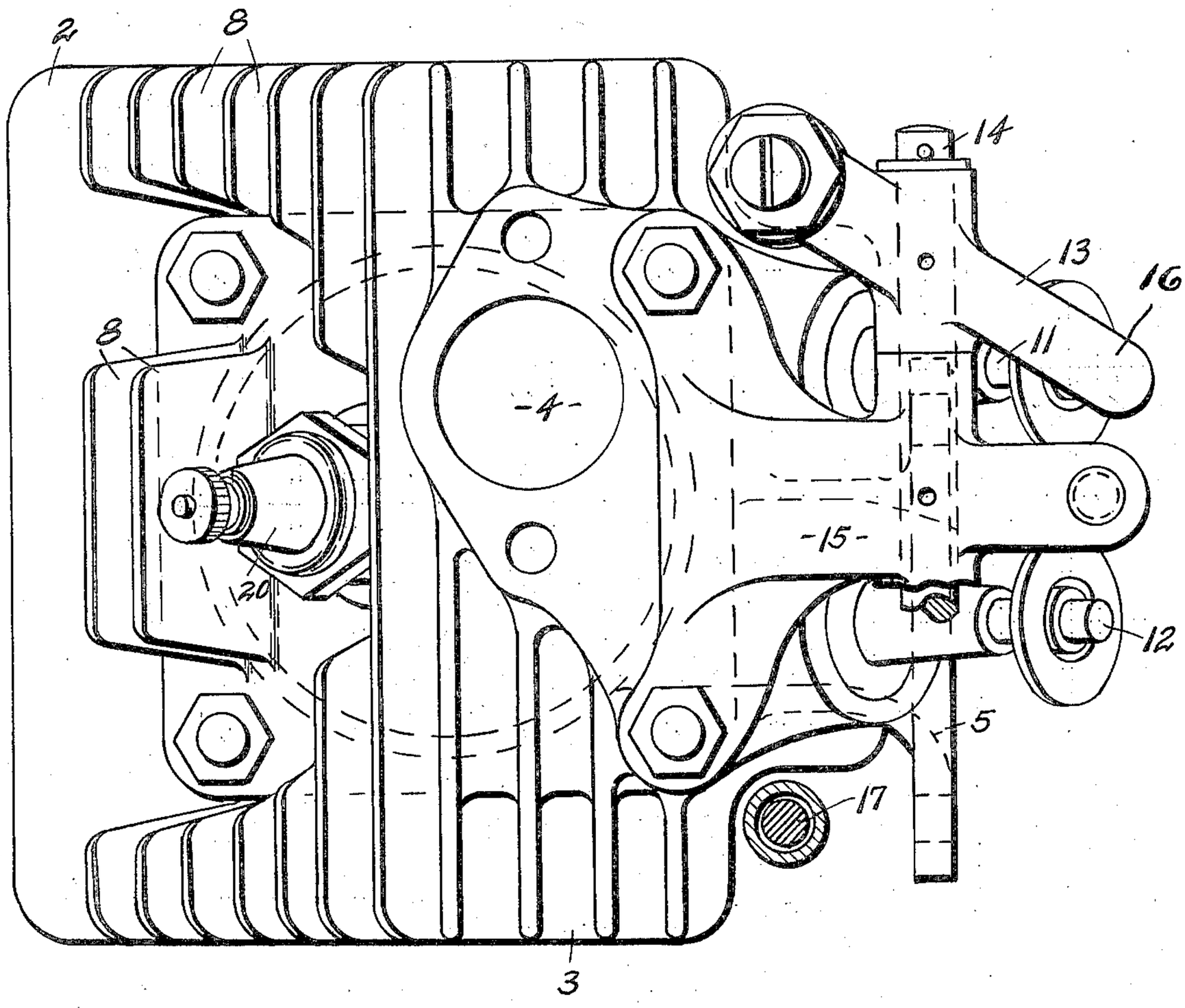


Fig-4-

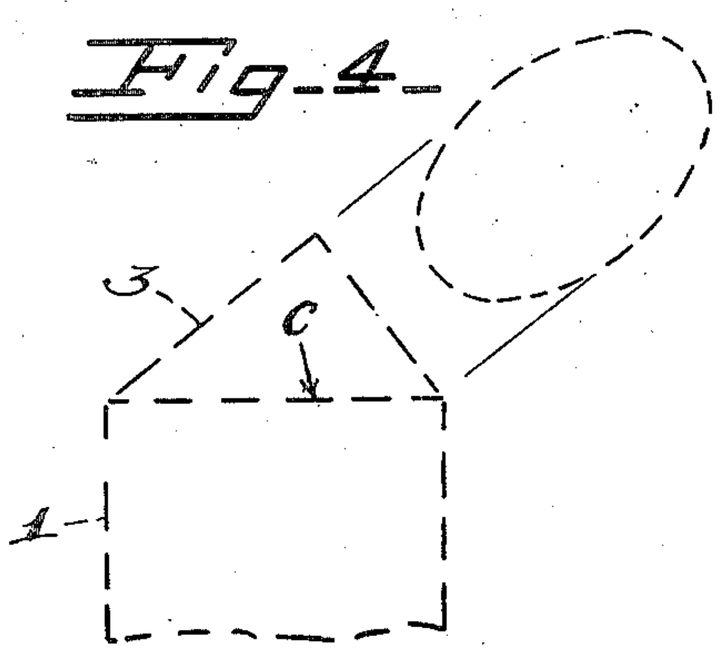
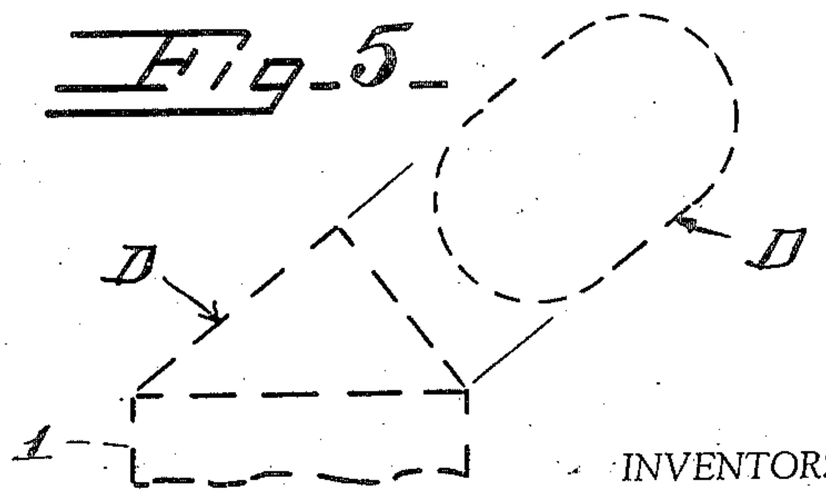


Fig-5-



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UNITED STATES PATENT OFFICE

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CYLINDER HEAD CONSTRUCTION

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Application November 10, 1932, Serial No. 642,074

1 Claim. (Cl. 123—191)

This invention relates to internal combustion engines of the valve-in-the-head type, and particularly to air cooled engines, and has for its object, a head construction by which valves of maximum size for "cocked" heads of over-head type can be used, and at the same time the external cooling surface of the head increased compared with the cooling surfaces of the heads of air cooled engines with over-head valves heretofore used.

It further has for its object, an air cooled head having the wall, through which the intake and exhaust ports open, arranged at an inclined angle to the axis of the engine cylinder, and the stems of the intake, and exhaust, valves, extending upward and outward at an inclined angle to the axis of the engine cylinder so that the ends of the valve stems overhang one side of the cylinder.

A still further object of the invention is the provision of, valve operating mechanism including walking beams, or rocker arms, carried by the head above the valves without unduly increasing the over-all width of the head and valve mechanism in this type of engine, or reducing the over-all width to a minimum in this type of engine and other types in which the valve mechanism overhangs one side of the cylinder block.

A still further object of the invention is the provision of a maximum cooling surface for the cylinder head and also provision for locating the spark plug substantially at the center of the combustion chamber in order to shorten flame travel and thereby eliminate "knocking".

It further has for its object an air cooled head in the general form of a truncated cylinder arranged with its axis at an inclined angle to the axis of the engine cylinder or barrel so that the head is "cocked" relatively to the engine cylinder, and valves in the head arranged with their stems extending at an inclined angle to the axis of the engine cylinder and substantially parallel to the axis of the truncated cylinder head, so that the rocker arms mounted on the head co-act with the valve stems without increasing, and in fact, decrease the over-all width of the cylinder compared with the overhead valve engines heretofore used. The truncated cylinder may be either a truncated circular cylinder modified to fit on the circular end of the engine cylinder barrel, or a truncated elliptical cylinder or a truncated oblong cylinder with semi-circular short sides.

Other objects will appear throughout the specification.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings, in which like characters designate corresponding parts in all the views.

Figure 1 is a fragmentary, vertical, sectional view through an engine cylinder embodying the invention.

Figure 2 is a plan view.

Figure 3 is an under face view of the head.

Figures 4 and 5 are diagrams illustrating the general arrangement of the truncated cylinders.

The numeral **1** designates the engine cylinder, here shown as having heat radiating flanges **2**, the cylinder being arranged in vertical position on the crank case in the usual manner.

The numeral **3** designates the cylinder head, this being in the general form of a truncated cylinder, cut by a plane at an oblique angle to the axis of the cylinder, and to the end face of the cylinder, the plane preferably cutting through the said end face. The cylinder for the head is preferably an elliptical cylinder truncated by a plane cutting it at such an inclined angle to the axis of the cylinder that the cross section is circular and fits the end of the engine cylinder or barrel. Thus, the elliptical cylinder formation of the head is "cocked" relatively to the engine cylinder or barrel, or arranged with its axis at an inclined angle to the axis of the engine cylinder or barrel. The cylinder head is in the form of a truncated elliptical cylinder of such a shape and angle to make a perfect circle on the intersecting plane between the head and cylinder.

The numerals **4** and **5** designate intake and exhaust passages respectively which open through ports in the wall **6**, which wall **6** is at the end of the truncated elliptical cylinder, one of these passages, as the intake passage **4**, extending upwardly, for a down draft carburetor, and the other laterally. By reason of forming the intake and exhaust ports in the wall **6**, ports or valves of maximum diameter can be used, thus leaving a maximum elliptical or cylindrical wall **7** of the truncated elliptical cylinder head formation to be provided with heat radiating flanges **8**. Also, by truncating the cylinder by a plane cutting through the lower margin of the wall **6**, and by modifying the curve of the upper edge of the wall **6**, from an arc to an elliptical curve, the width of the wall **6** can be reduced to a minimum leaving its entire length available for the valve ports without reducing the area of the cylindrical wall **7**. The head is bolted to the cylinder in any

well known manner. The maximum axis of the elliptical wall 6 is in line with the center line joining the two valves so that the maximum diameter valve is possible and the short diameter of the ellipse is sufficient to allow the width of one valve. It will be understood that space for two valves on one axis and width of one valve on the other is all that is necessary.

The numerals 9 and 10 designate the intake and exhaust valves, respectively, these being poppet valves having stems as 11 and 12 respectively, extending upwardly and outwardly at an angle to the axis of the cylinder 1 and parallel to the axis of the truncated elliptical cylinder formation of the cylinder head. The outer ends of the valve stems 11 and 12 overhang one side of the cylinder.

The valve operating mechanism includes levers, or rocker arms, or walking beams 13 pivotally carried by the head, and here shown as pivoted at 14 to a bracket 15 suitably mounted on the head structure. The rocker arms extend laterally relatively to the cylinder, the outer arms 16 thereof co-acting with the ends of the valve stems, and their inner arms extend toward the center of the head and co-act with the lift rods 17. The lift rods 17 are actuated from the cam shaft (not shown) within the crank casing in the usual manner. The heat radiating flanges on the engine cylinder are formed with suitable cut-outs for the lift rods. The valves are opened against the action of the springs 18 in the usual manner. The overhanging ends of the bracket 15, that is, the ends remote from the cylinder head are supported from any other suitable part of the engine, as the crank case, by tubes or rods R.

The numeral 20 designates the spark plug which is carried by the elliptical cylinder wall 7 of the head.

In Figure 4, the cylinder head is shown as in the form of an elliptical cylinder truncated along a plane of such an angle that the truncated face is circular to conform to the circle of the end face C of the barrel of the cylinder 1. A circular cylinder so truncated and modified to fit on the barrel of the engine cylinder, and of sufficient diameter to allow valve ports of maximum size would result in practical effect in an elliptical cylinder.

In Figure 5, the cylinder is shown as in the form of what for want of a better term I call an "oblong" cylinder D with the narrow sides that is, the ends of the oblong formation, cylindrical and of the curvature of semi-circles tangent at their extremities to the parallel or flat sides of the cylinder D. The cylinder D is truncated on a plane inclined to its axis at such an angle that one of the flat sides of the cylinder is left for the top side of the head to provide a larger cooling surface. With the oblong cylinder D, the truncated side is modified slightly to fit the end of the barrel of the cylinder.

In any case, the truncated circular cylinder and the truncated "oblong" cylinder are in practical effect an elliptical cylinder.

By reason of the relative arrangement of the cylinder head and the cylinder, the valves and the valve mechanism, particularly the rocker arms thereof, especially large valves can be used, and at the same time, the cooling area of the head increased as compared with valve-in-the-head engines heretofore used. Also the valve operating mechanism, or the rocker arms, can be located within a widthwise dimension space of less over-all width than in the valve-in-the-head engines heretofore used, especially of the V type design. Further the valves can be made as large as in L head engines, and located within less over-all width of the cylinder, and more cooling area is thereby provided on the head than in valve-in-the-head types of engine.

What I claim is:

In an internal combustion engine, a cylinder barrel, a detachable head therefor having a combustion chamber in the general form of a truncated cylinder cut by a plane at an inclined angle to its axis, and cutting through the cylindrical wall of the cylinder and the end wall of the truncated cylinder formation, whereby the axis of the combustion chamber is at an inclined angle to the axis of the barrel of the engine cylinder with the curved peripheral wall of the truncated cylinder head formation forming the greater part of the top of the cylinder head and with the edges of the cylindrical wall and the truncated cylinder formation meeting the top edge of the barrel of the engine cylinder and intake and exhaust ports formed in the end wall of the truncated cylinder formation.

CHARLES S. BROWN.