

July 8, 1941.

T. N. SMITH

2,248,516

MEANS FOR CONVERTING L-TYPE ENGINE TO VALVE-IN-THE-HEAD TYPE

Filed Dec. 9, 1940

3 Sheets-Sheet 1

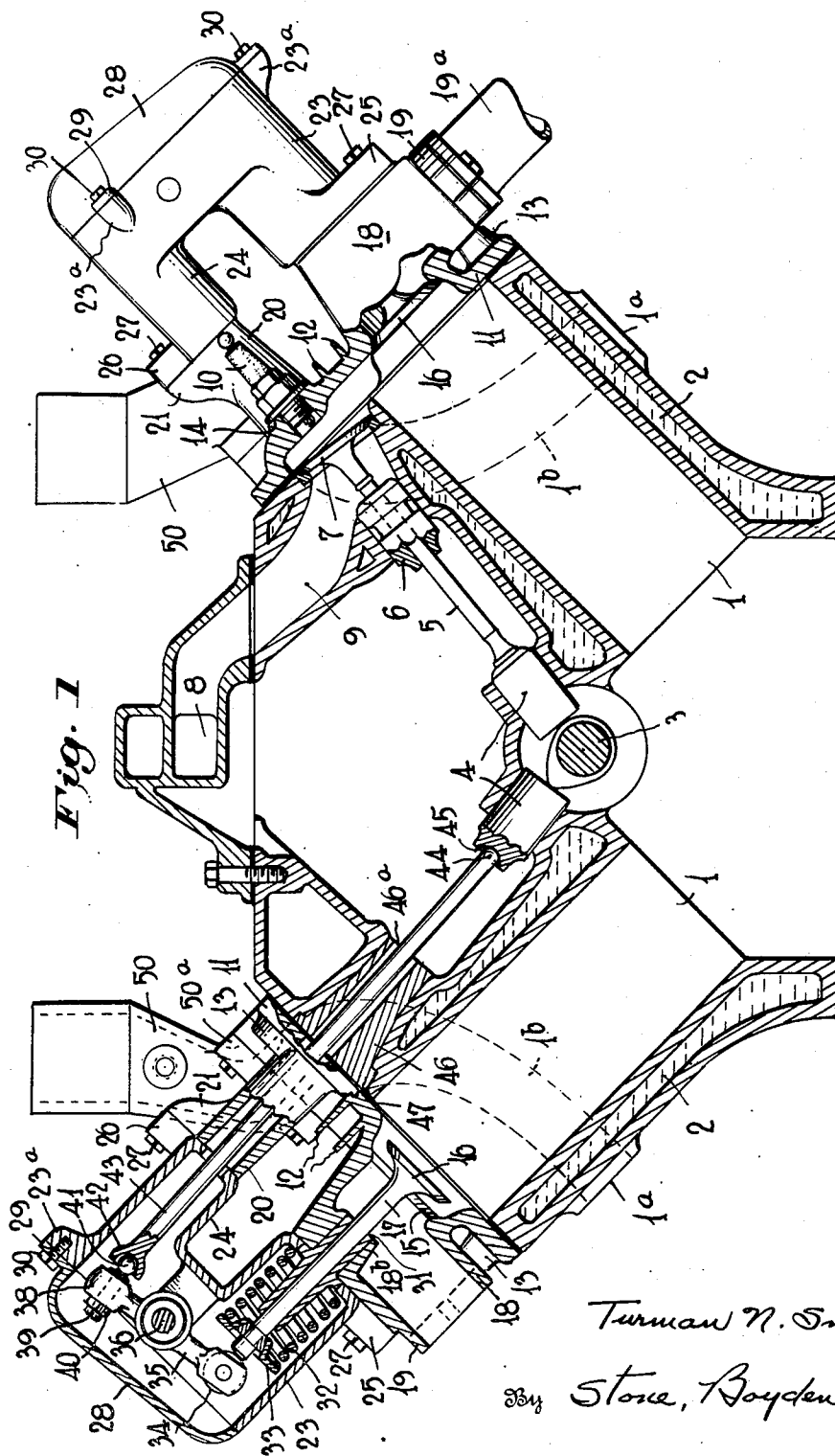


Fig. 1

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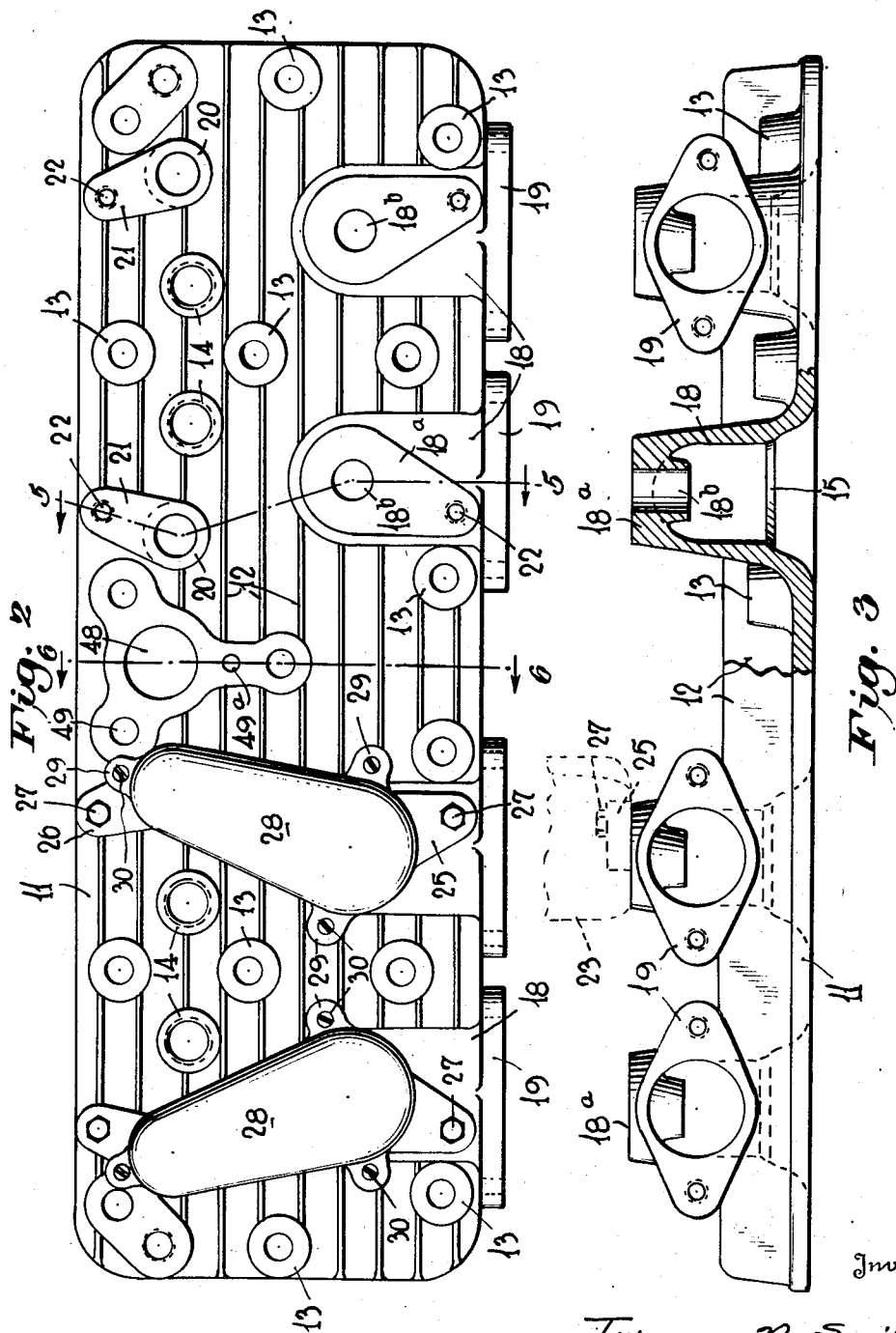
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Fig. 4

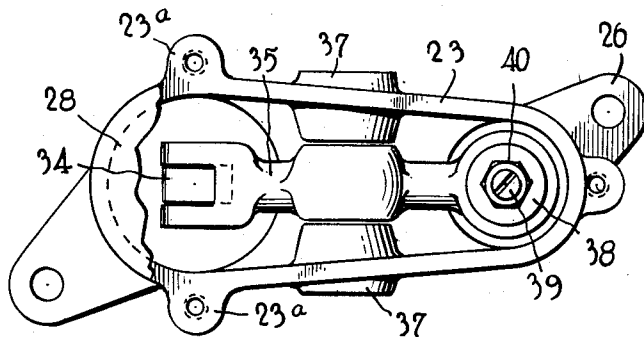


Fig. 5

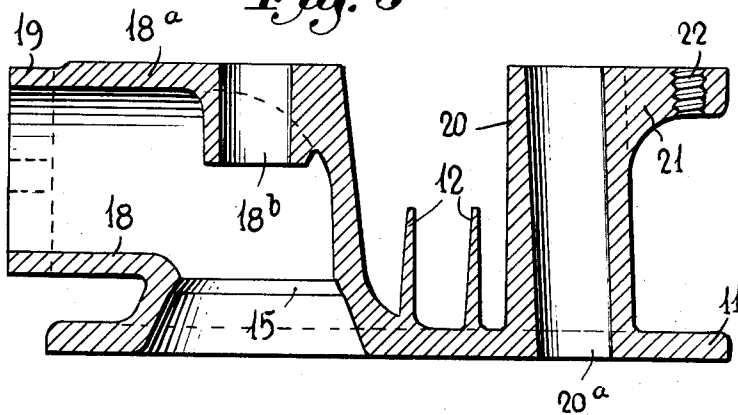
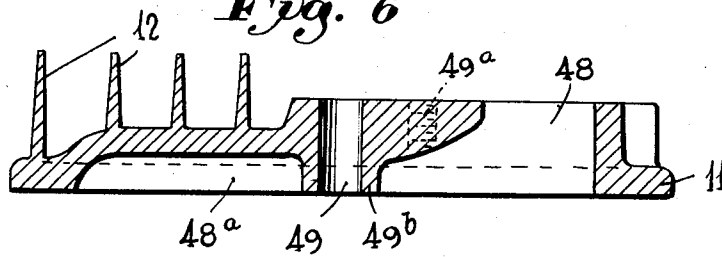


Fig. 6



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UNITED STATES PATENT OFFICE

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MEANS FOR CONVERTING L-TYPE ENGINE
TO VALVE-IN-THE-HEAD TYPE

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Application December 9, 1940, Serial No. 369,342

9 Claims. (Cl. 123—59)

This invention relates to means, in the nature of an attachment, for converting L-type engines to valve-in-the-head type, and more particularly to an attachment comprising a cylinder head carrying the exhaust valves.

While the invention is applicable to other makes of engines, it is designed especially for converting "Ford" engines of the 8 and 12-cylinder V-class. Such engines, as commonly constructed, have both inlet and exhaust valves mounted in the L-type block, the exhaust gases flowing from the valves through more or less restricted passages extending through the engine block itself to exhaust ports on the opposite side. This not only results in the creation of an objectionable back pressure on the engine, but the bringing of the hot gases into such close and extended contact with the walls of the water jacket tends to unduly heat the same.

One object of the invention, therefore, is to provide an improved cylinder head carrying exhaust valves located immediately above the cylinders and discharging directly into the exhaust manifold, which cylinder head may be applied to existing engines in place of the head with which they were originally equipped.

Another object is to devise improved and simple means by which the new exhaust valves may be effectively operated from the existing cam shaft.

Still another object is to devise an improved valve-operating rocker arm, and housing therefor.

A still further object is to provide an improved cylinder head which, while itself air-cooled, is equipped with a water connection by means of which cooling liquid may be supplied to the usual water jacket of the cylinder block.

With the above and other objects in view, and to improve generally upon the details of such devices, my invention consists in the construction, arrangement and combination of parts hereinafter described and claimed, and illustrated in the accompanying drawings, forming part of this specification, in which drawings:—

Fig. 1 is a transverse section through a V-type engine equipped with my improved head carrying the exhaust valves and associated mechanism, parts being shown in elevation;

Fig. 2 is a plan view of my improved cylinder head itself, parts being omitted for the sake of clearness;

Fig. 3 is an edge or side view of the cylinder head shown in Fig. 2, parts being omitted and other parts being shown in section;

Fig. 4 is a plan view on an enlarged scale showing my improved rocker arm and rocker arm housing with cover removed;

Fig. 5 is a transverse section on an enlarged scale through my improved cylinder head, substantially on the line 5—5 of Fig. 2, looking in the direction of the arrow; and

Fig. 6 is a similar section substantially on the line 6—6 of Fig. 2, looking in the direction of the arrow.

Referring to the drawings in detail, I have illustrated a "Ford" engine of the V-8 type, that is to say, an engine comprising two sets of four cylinders each, disposed at an angle to each other. The cylinders are indicated at 1, and the usual water jacket at 2. 3 designates the usual cam shaft which is located at the angle of the V and serves to operate both sets of valves.

In these engines, as ordinarily constructed, both inlet and exhaust valves are carried by the L-type cylinder blocks, and are disposed one behind the other in a row. The sectional view constituting Fig. 1 is taken through the exhaust valve of one cylinder and the inlet valve of the other.

In the said Fig. 1 is shown a pair of reciprocating plungers 4, slidably mounted adjacent the cam shaft so as to be operated by the cams to actuate the several valves. As shown at the right of Fig. 1, an operating rod 5 extends from the plunger 4 and passes through a guide 6, this rod carrying at its upper end an inlet valve 7. Fuel mixture is supplied to this valve from the intake manifold 8 through the passage 9. 10 designates the spark plug which is set in the cylinder head immediately above the intake valve 7.

As ordinarily constructed, these "Ford" engines are provided with passages 1^b extending from the exhaust valves transversely through the cylinder block to exhaust outlets 1^a which discharge into the exhaust manifold (not shown). Owing to the relatively small size and substantial length of these passageways, they tend to create a back pressure in the engine. Also, because of the fact that they pass through the engine block in close proximity to the water jacket, the passage of exhaust gases therethrough tends to produce undue heating of the water.

To remedy these defects, I have devised the improved cylinder head and associated parts shown in the drawings. This cylinder head is designated in its entirety by the reference numeral 11 and is preferably of the air-cooled type, being provided with longitudinally extending, upstanding fins 12, as shown. Projecting from the top

of the cylinder head are a plurality of apertured bosses 13, adapted to receive the usual bolts for securing the head to the cylinder block. The head 11 is also provided with interiorly threaded bosses 14 to receive the spark plugs, which are located directly over the existing inlet valves.

The head 11 is formed with a plurality of valve seats 15, each directly over the corresponding cylinder, and adapted to engage each of these seats is an exhaust valve 16, having a stem 17.

Extending upwardly and laterally from each exhaust valve seat 15, at the opposite side of the engine block from the inlet valves, is an exhaust passage 18 terminating in a bolting flange 19 by means of which the exhaust manifold 19^a may be attached.

Also extending upwardly from the head 11 at a point adjacent each exhaust passage 18 is a hollow boss 20, the upper end of this boss and the upper surface of the wall of the exhaust passage 18 being preferably at the same height. Also, the upper surface of such wall is preferably ground flat as shown at 18^a in Fig. 2, and the upper end of the boss 20 is also flat and is provided with a laterally extending bolting lug 21 having a threaded opening 22, as shown in Fig. 5.

As hereinafter described, each exhaust valve 16 is operated by a rocker arm and push rod, and I provide a novel and improved individual housing to enclose these parts. This housing, as best shown in Fig. 1, is of substantial inverted U-shape, comprising an outer wall 23 and an inner wall 24 forming a pair of spaced legs. One leg of said housing is supported upon the flat upper surface 18^a of the exhaust passage 18, and the other leg is supported upon the upper end of the hollow boss 20. Projecting laterally from each of these legs are bolting lugs 25 and 26, and bolts 27 pass through these lugs into threaded openings 22 formed in the wall of the passage 18 and in the bolting lug 21, respectively. Thus, the rocker arm housing is rigidly secured to the head 11 at a point substantially above the general outer surface thereof, and the space between the legs of the housing serves to provide for free circulation of air so as to assist in cooling the parts.

The upper or outer end of the housing is open and is normally closed by means of a cap or cover 28. This is provided with laterally extending bolting lugs 29 through which bolts 30 pass into threaded sockets formed in correspondingly located lugs 23^a, carried by the housing. By removing the cover 28, ready access may be had to the rocker arm for adjusting the clearance between it and the valve stem.

Set into an opening in an inwardly projecting boss 18^b on the exhaust passage 18 is a guide 31 through which the valve stem 17 freely slides, this guide being surrounded by a helical spring 32, bearing under a washer 33 at the upper end of the valve stem and serving to urge the valve to closed position. A roller 34, carried at one end of a rocker arm 35, engages the upper end of the valve stem 17, such rocker arm being pivotally mounted on a shaft 36 carried in bosses 37 formed on the housing 23, and thus wholly supported by said housing.

Set into the enlarged end 38 of the rocker arm opposite the roller 34 is a set screw 39 provided with a lock nut 40, and formed at its lower end with a ball 41. This ball is received in a socket 42 formed at the end of a push rod 43, which push rod also has a ball or rounded portion 44

at its lower end which is received in a socket 45 formed in the plunger 4.

In converting an existing engine of the kind described into a valve-in-the-head type, I proceed as follows. I remove the existing cylinder head and also remove the existing exhaust valves and exhaust manifold, while leaving the existing inlet valves intact. In each exhaust valve seat opening, I place a special plug or bushing 46 as shown in Fig. 1. This is machined to a press fit in the valve guide opening and also fits snug on the exhaust valve seat. Thus, the existing exhaust port is entirely closed. The plug or bushing is machined at its end to coincide with the top of the cylinder block. Having placed these plugs or bushings in position, I then mount my improved cylinder head upon the block, in place of the existing head, employing the usual gasket between the head and block. By reference to Fig. 1, it will be seen that the bushing 46 is sealed off from the cylinder by such gasket at the point 47, and that thus the new exhaust valve 16 is substituted for the existing exhaust valve. This new exhaust valve, being positioned immediately over and in alignment with the cylinder, and discharging directly into the exhaust manifold, entirely independently of the existing exhaust passages, affords free discharge of the gases, thus eliminating back pressure, and also discharges the hot gases without bringing them into contact with the cylinder block or water jacket, thus avoiding objectionable overheating.

An important feature of my design consists in the construction and arrangement of the push rod 43. By reference to Fig. 1, it will be noted that the plug or bushing 46 is provided with a longitudinally extending opening 46^a, which registers and is in alignment with a similar opening 20^a extending through the boss 20, and it will also be observed that these openings 20^a and 46^a are of substantially greater diameter than the rod 43. This affords a substantial clearance around the rod, throughout its length. Thus, it will be seen that the rod is supported by ball and socket joints at its ends, but is wholly unsupported or free from contact with other parts throughout its length between its ends. As a result, the rod is free to move laterally as well as longitudinally, and may thus partake of a slight swinging motion to conform with the rocking movement of the rocker arm 35.

The desired clearance between the roller 34 and valve stem 17 is obtained by adjusting the set screw 39, and it will be seen that the spring 32 serves to hold the ball and socket joints at the ends of the push rod in snug engagement, so as to maintain the rod in position and prevent rattling.

Referring again to Fig. 1, 50 designates the usual water connection with which engines of this type are equipped, such water connection being provided with a bolting flange 50^a. In my improved cylinder head, I provide a flat surface adapted to receive this bolting flange and having an opening 48 communicating at one end with the water connection or conduit 50 and at its other end with a recess 48^a formed in the under surface of the head and communicating with the water jacket in the engine block. My improved head is also provided with bolt holes 49, surrounding the opening 48, the innermost bolt hole 49, as shown in Fig. 6, being surrounded by an interior boss 49^b. This bolt hole registers with a similar bolt hole in the engine block.

Bolts pass through the bolting flange 50^a and through the other bolting holes 49 and into the engine block, while a third bolt passes through a hole in the flange 50^a and into a special threaded socket 49^a, formed in the improved cylinder head, as shown in Figs. 2 and 6.

Thus, although my improved cylinder head is air-cooled, I provide means by which the existing water connection may be attached thereto in such manner that the cooling water may flow through the head into the existing water jacket in the engine block.

What I claim is:

1. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, said means comprising a plug shaped to fit within and engage the existing exhaust valve seat, said plug terminating substantially flush with the surface of the engine block, a cylinder head adapted to cover said seat and plug, an exhaust valve mounted in said head directly over the cylinder, a rocker arm for actuating said exhaust valve, and a push rod engaging said rocker arm and operated by the existing cam shaft.
2. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, said means comprising a plug shaped to fit within and engage the existing valve seat, a cylinder head adapted to cover said seat and plug, said plug having an opening extending longitudinally therethrough, and said head having an opening registering therewith, an exhaust valve mounted in said head over the cylinder, a rocker arm for actuating said exhaust valve, and a push rod for operating said rocker arm working freely through said openings.
3. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, said means comprising a plug shaped to fit within the existing exhaust valve seat, a cylinder head adapted to cover said seat and plug, said plug having an opening extending longitudinally therethrough, and said head having an opening registering therewith, an exhaust valve mounted in said head over the cylinder, a rocker arm for actuating said exhaust valve, and a push rod for operating said rocker arm working freely through said openings, said rod being of substantially smaller diameter than said openings so as to provide a clearance around said rod permitting it to oscillate laterally as well as move longitudinally.
4. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, said means comprising a plug shaped to fit within the existing exhaust valve seat and terminating substantially flush with the surface of the engine block, a cylinder head adapted to cover said seat and plug, said plug having an opening extending longitudinally therethrough, and said head having a hollow boss disposed in alignment with said opening, said head having an exhaust passage and an exhaust valve mounted therein, the outer wall of said passage being of substantially the same height as said boss, an individual rocker arm housing supported on said wall and boss, a rocker arm in said housing engaging at one end said valve, and a push rod extending into said housing through said aligned

opening and hollow boss and engaging the other end of said rocker arm.

5. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, and having a cam shaft, said means comprising a cylinder head adapted to cover and seal the normal exhaust valve seat and having an opening registering therewith, an exhaust valve in said head over the cylinder, a rocker arm for actuating said valve, and a push rod having at one end a pivotal connection with said rocker arm and at the other end an operative connection with said cam shaft, said push rod extending through said opening and being wholly unsupported between its ends, whereby it is free to swing laterally as said arm rocks.

6. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, and having a cam shaft, said means comprising a cylinder head adapted to cover and seal the normal exhaust valve seat and having an opening registering therewith, an exhaust valve in said head over the cylinder, a rocker arm housing of substantially inverted U-shape, having two legs supported on said head, a rocker arm mounted in said housing, the stem of said valve entering one leg and engaged by said arm, and a push rod extending through said opening and entering the other leg and engaging said arm.

7. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in an engine block having a water jacket, supplied with water through a conduit, said means comprising a solid, air-cooled cylinder head adapted to be secured to said block and seal the normal exhaust valve seat therein, said head having a water passage extending transversely directly therethrough between the inner and outer surfaces thereof and communicating at its inner end with said water jacket, and means for securing said conduit to the outer end of said passage.

8. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, and having a cam shaft, said means comprising a cylinder head adapted to cover and seal the normal exhaust valve seat, an exhaust valve in said head over the cylinder, a rocker arm for actuating said exhaust valve, and a push rod for operating said rocker arm and having an operative connection with said cam shaft, said head having an exhaust passage extending laterally therefrom at the side opposite that on which said normal exhaust valve seat is located, and wholly independent of said seat.

9. Means for converting into the valve-in-the-head type engines of the L-type having inlet and exhaust valves normally mounted in the engine block, and having a cam shaft, said means comprising a cylinder head adapted to cover and seal the normal exhaust valve seat, an exhaust valve in said head over the cylinder, an individual rocker arm housing separable from but mounted on said head over said exhaust valve, a rocker arm within and carried wholly by said housing, said rocker arm constricted to actuate said exhaust valve, and a push rod engaging said rocker arm within said housing and having an operative connection with said cam shaft.

TURMAN N. SMITH,

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CERTIFICATE OF CORRECTION.

Patent No. 2,248,516.

July 8, 1941.

TURMAN N. SMITH.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 30; claim 2, before "valve" insert --exhaust--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of December, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.