Feb. 15, 1938. U. BELFORD 2,108,740

ENGINE

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Fig. 1.

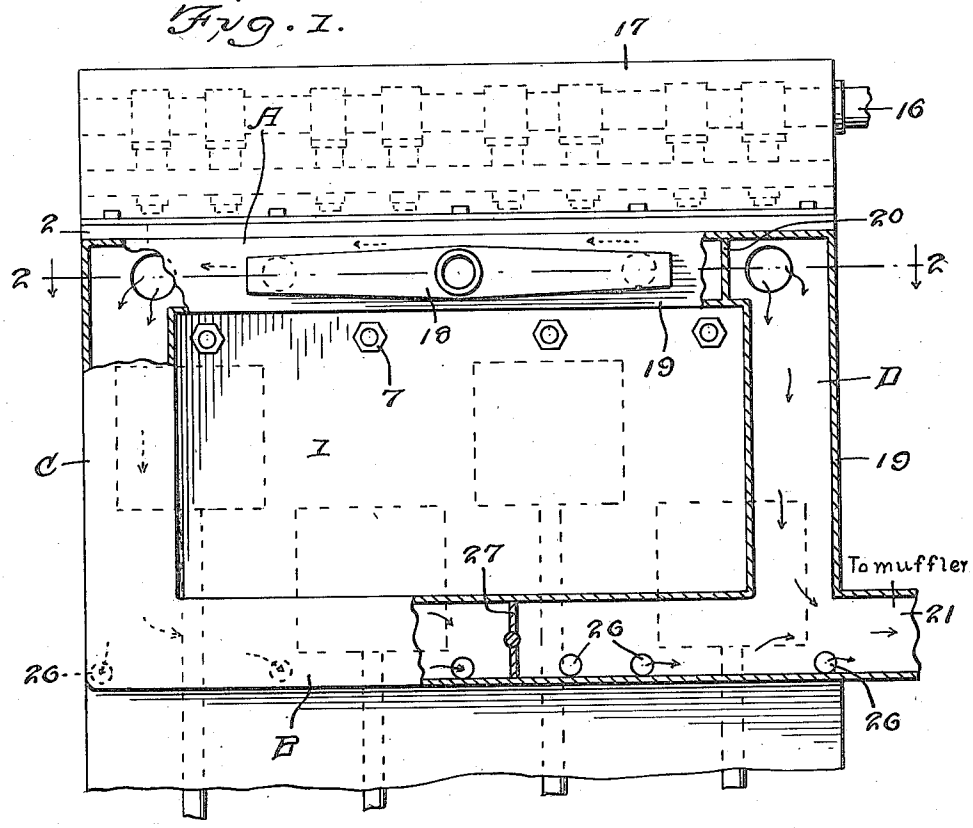
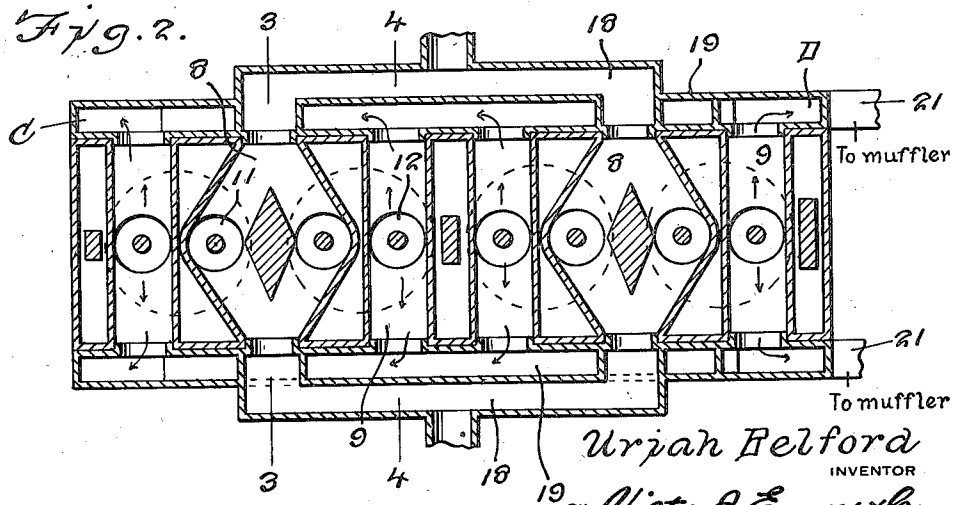


Fig. 2.



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Fig. 3.

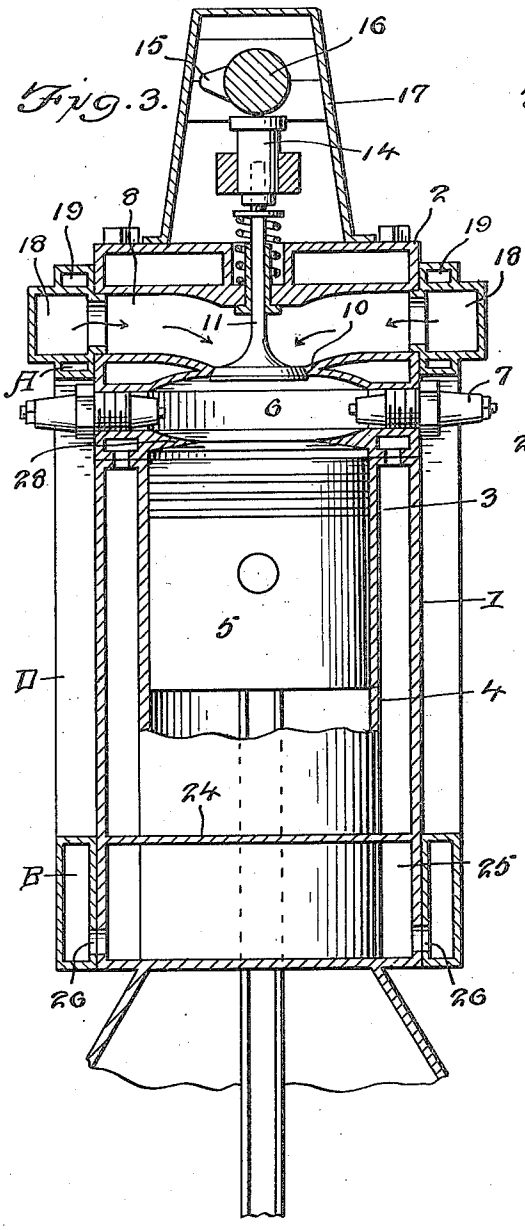
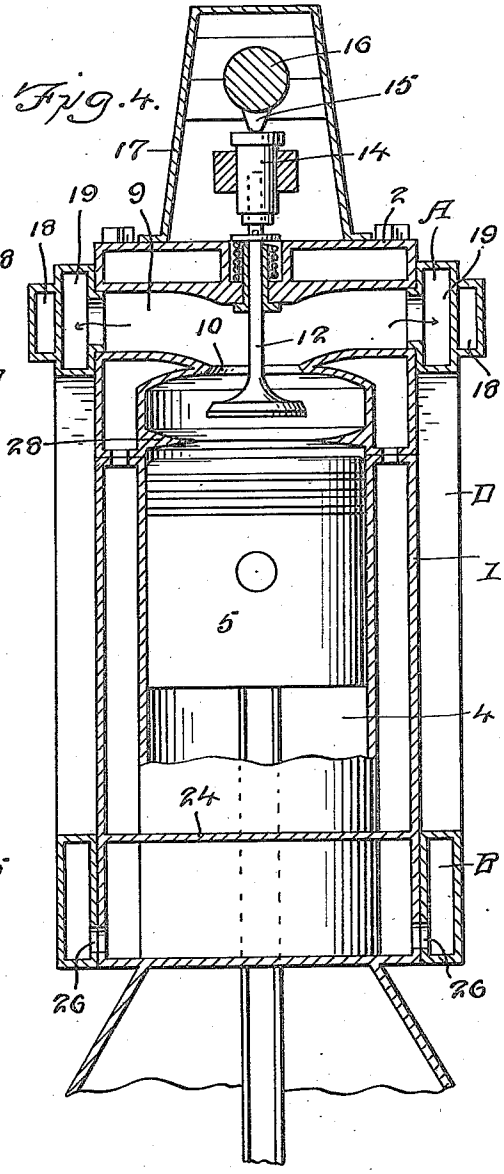


Fig. 4.



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UNITED STATES PATENT OFFICE

2,108,740

ENGINE

Uriah Belford, Golconda, Ill., assignor of one-half to Cody Lightner

Application January 25, 1937, Serial No. 122,288

2 Claims. (Cl. 123—52)

This invention relates to internal combustion engines and has for the primary object the provision of a device of this character wherein the cylinders of the engine will be uniformly heated throughout by employing the exhaust of the engine as the heating medium for the purpose of reducing to a minimum the warping of the cylinders endwise or laterally and thereby bring about uniform wear of the cylinders and consequently increase the life of the engine.

Another object of this invention is the provision of means for preheating the fuel by the exhaust of the engine so that when said fuel reaches the firing chambers of the cylinders it will be in a highly combustible condition which when ignited will produce maximum power with a minimum formation of carbon and like foreign matter in the firing chambers.

Another object of the invention is the provision of the cylinder walls of uniform thickness throughout their length to aid in preventing lateral warping of said cylinders.

A further object of the invention is the provision of means which will freely deliver the preheated fuel to the cylinders or firing chambers thereof and the latter having means which will permit free escape of the exhaust gases which aids in preventing back pressure on the valves and pistons of the engine.

A further object of the invention is the provision of exhaust manifolds which besides preheating the fuel before reaching the firing chambers of the cylinders will also uniformly heat throughout the block of the engine.

With these and other objects in view, this invention consists in certain novel features of construction, combination and arrangement of parts to be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which

Figure 1 is a fragmentary side elevation, partly in section, illustrating an internal combustion engine constructed in accordance with my invention.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1, looking in the direction indicated by the arrows, illustrating the arrangement of the intake and exhaust manifolds and also showing the intake and exhaust passages of the engine.

Figure 3 is a transverse sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a transverse sectional view taken on the line 4—4 of Figure 2.

Referring in detail to the drawings, the numeral 1 indicates the block of the engine, 2 the head of said engine which is detachably secured to the block. The block and head have formed therein communicating water jackets 3. The block 1 has formed therein cylinders 4 receiving pistons 5. The walls of the cylinders are of a uniform thickness for the purpose of preventing the cylinders from warping either endwise or laterally during the life of the engine. Formed in the head 2 are firing chambers 6 each of dome shape and each in communication with a cylinder. Each firing chamber has oppositely arranged spark plug openings in which are mounted spark plugs 7. The spark plugs are opposed to more effectively ignite fuel in the firing chambers.

Intake and exhaust passages 8 and 9 are formed in the head and extend transversely of the latter and open outwardly through opposite sides of said head. The intake passages are of double formation each having communication with a pair of firing chambers while the exhaust passages are of single formation and each is in communication with a firing chamber. The intake and exhaust passages communicate with the firing chambers through the top walls of said firing chambers and directly over the pistons. Valve seats 10 are provided where said intake and exhaust passages communicate with the firing chambers. Intake and exhaust valves 11 and 12 control the intake and exhaust passages to said firing chambers and are of the spring seated type being suitably mounted in the top wall of the head 2. The intake and exhaust valves engage and disengage with the seats 10 being opened by a valve mechanism mounted on the head and consisting of valve tappets 14 operated by cams 15 of a cam shaft 16. The cam shaft is driven in the usual manner by the crank shaft of the engine (not shown). It is preferable that the valves 11 and 12 be connected to their respective valve tappets 14 to assure proper seating and opening of the valves during the operation of the engine. The valve mechanism heretofore referred to is enclosed by a cover 17 mounted on the head 2

Arranged on opposite sides of the block 1 are intake and exhaust manifolds 18 and 19, as clearly shown in Figure 2. The intake and exhaust manifolds on each side of the block are integrally connected. Either down draft or up draft carbureters may be connected to the intake manifolds 18. The intake manifolds are connected with the intake passages 8 while the exhaust manifolds

are connected to the exhaust passages 9. The fuel supplied to the firing chambers by way of the intake manifolds and intake passages 8 is preheated by the exhaust from the engine because of the manifolds being integrally connected, consequently the fuel when reaching the firing chambers is in a preheated and highly combustible condition so that when fired the entire amount of the fuel will be burned thereby assuring maximum power derived from the fuel.

Each exhaust manifold 19 is of substantially rectangular shape providing upper and lower conduits A and B and vertical conduits C and D. The exhaust manifolds being of rectangular shape extend from the front to the rear end of the cylinder block, and from the upper edge of the block to the lower edge of the block. Each exhaust manifold is provided with a gate 20 located in the conduit A adjacent to the conduit D, the latter being located at the rear end of the block. The gate 20 is for the purpose of causing a greater proportion of the exhaust to pass forwardly along the run A, and thence downwardly through the conduit C to the conduit B, while a less amount of exhaust passes from the conduit A down through the conduit D to the conduit B. Having a greater amount of exhaust to pass in the direction of the forward end of the cylinder block will act to maintain the forward portion of the cylinder block at approximately the same temperature as the rear end of the block. Where the conduits B and D join outlet exhaust pipes 21 are connected. These exhaust pipes lead to the usual mufflers (not shown).

Formed in the block and spaced from the lower end thereof is a floor 24. This floor forms in the lower portion of the block around the cylinders an exhaust chamber 25 having communication with the conduits B of the exhaust manifolds by ports 26.

Manually controlled gates 27 are located in the conduits B of the exhaust manifolds dividing the ports 26 into groups, one group extending in the direction of the forward end of the block and the other group extending in the direction of the rear end of the block. By moving the gates 27 to closed position exhaust in the forward portions of the conduits B will enter the chambers 25 and circulate about the lower portions of the cylinders and escape therefrom by the rear group of ports thereby returning to the conduits B for final passage to the exhaust pipes 21. The exhaust passing around the lower portions of the cylinders acts to maintain the lower portions of said cylinders at approximately the same temperature as the upper portions of said cylinders or, in other words, the cylinders are maintained at substantially uniform temperatures throughout their ends. This uniform temperature of the cylinders acts to prevent warping of the cylinders. Should it be desired to decrease the amount of exhaust passing through the chamber 25 about the lower portions of the cylinders the gates 27 may be adjusted towards open position.

Formed in each firing chamber directly above the piston is a flange 28 tapering towards its free edge, as clearly shown in Figures 3 and 4. This flange partially overlies the piston so that when the fuel is fired in the firing chamber the expanding gases passing downwardly will act against the head of the piston and centrally of the latter. The expanding gases acting upon the pistons in this manner aid in maintaining the pistons properly balanced and the balance of the pistons reduces wear upon the wall of the cylinders. The shape of the firing chambers and the flanges therein also brings about balancing of the valves and eliminate undue wear thereon.

What is claimed is:

1. In an internal combustion engine cylinder block having cylinders provided with intake and exhaust means opening outwardly through opposite sides of the block, intake and exhaust manifolds located on opposite sides of the block and communicating with the intake and exhaust means, said intake and exhaust manifolds on each side of the block being integrally connected, and each exhaust manifold being of substantially rectangular shape providing upper and lower and vertical conduits, said vertical conduits being located at the forward and rear portions of the block and the upper conduits adjacent the upper edge of the block and the lower conduits adjacent the lower edge of the block, exhaust pipes connected to the exhaust manifolds where one of the vertical conduits communicates with the lower conduit and at the rear end of the block, and gates located in the upper conduits and located adjacent the rear end of the block where the exhaust gases from the exhaust means will be divided and the major portion of the exhaust gases caused to travel forwardly through the upper conduits and downwardly through the forward vertical conduits and through the lower conduits while a less amount of exhaust gases will be directed through the vertical conduits at the rear end of the block to the lower conduits.

2. In an internal combustion engine cylinder block having cylinders provided with intake and exhaust means opening outwardly through opposite sides of the block, intake and exhaust manifolds located on opposite sides of the block and communicating with the intake and exhaust means, said intake and exhaust manifolds on each side of the block being integrally connected and each exhaust manifold being of substantially rectangular shape providing upper and lower and vertical conduits, said vertical conduits being located at the forward and rear portions of the block and the upper conduits adjacent the upper edge of the block and the lower conduits adjacent the lower edge of the block, exhaust pipes connected to the exhaust manifolds where one of the vertical conduits communicates with the lower conduit and at the rear end of the block, gates located in the upper conduits and located adjacent the rear end of the block where the exhaust gases from the exhaust means will be divided and the major portion of the exhaust gases caused to travel forwardly through the upper conduits and downwardly through the forward vertical conduits and through the lower conduits, while a less amount of exhaust gases will be directed through the vertical conduits at the rear end of the block to the lower conduits, a flooring located in the block above the lower end thereof to form an exhaust chamber passing about the lower portions of the cylinders, said exhaust chamber having ports communicating with the lower conduits of the exhaust manifolds, and adjustable gates located in the lower conduits of the exhaust manifolds for directing exhaust gases into the exhaust chamber for circulation about the lower portions of the cylinders from the forward portions of the lower conduits and adapted to escape from the exhaust chamber to the rearward portions of the lower conduits.

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