July 17, 1934. J. A. BOUCHER, JR 1,966,785

AIR COOLED INTERNAL COMBUSTION ENGINE

Filed Sept. 18, 1931

Fig. 1.

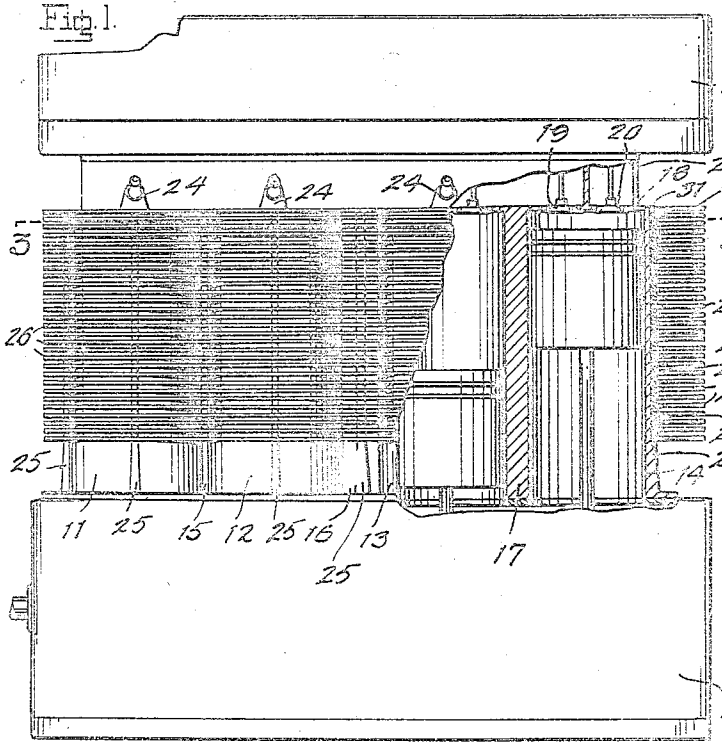


Fig. 2.

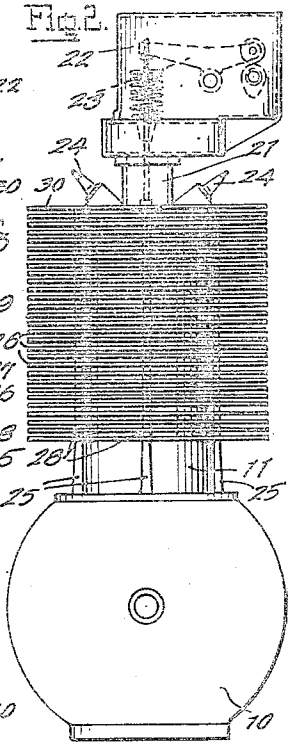


Fig. 3.

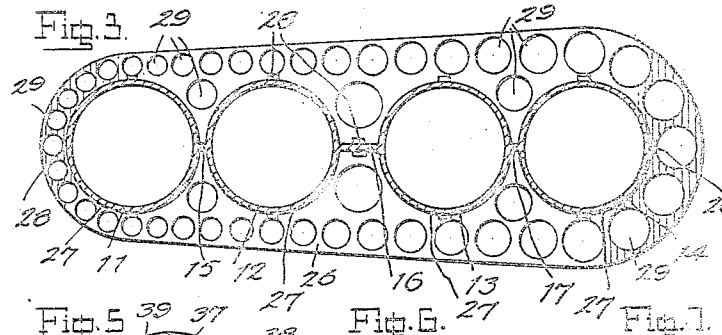


Fig. 4.

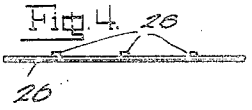


Fig. 5

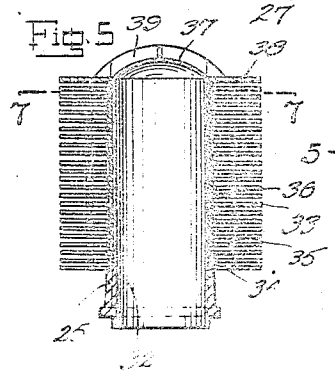


Fig. 6.

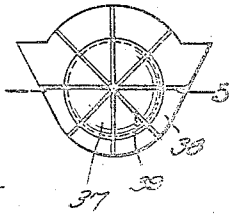
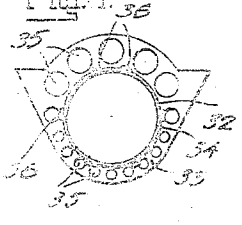


Fig. 7.



INVENTOR.

Joseph A. Boucher, Jr.

BY

ATTORNEY.

Patented July 17, 1934 1,966,785

UNITED STATES PATENT OFFICE

1,966,785

AIR-COOLED INTERNAL COMBUSTION ENGINE

Joseph A. Boucher, Jr., Bridgeport, Conn., assignor of one-third to D. Lewis Mattern, Bridgeport, Conn.

Application September 18, 1931, Serial No. 563,559

15 Claims. (Cl. 123—171)

The present invention relates to an improved air-cooled internal combustion engine, and has for an object to provide a construction which will be light in weight, simple and economical to manufacture, and reliable and efficient in operation.

It is particularly proposed to provide a series of cooling fins arranged in spaced and stacked relation upon the cylinder block, each fin being common to the entire block, and being perforated in a manner to draw the heat generated in the engine away from the cylinders, and to rapidly and effectually dissipate it. It is further proposed to construct the fins of a metal, such as cast aluminum, which will be light in weight and which because of its porous nature will rapidly dissipate heat. Another object is to provide cooling fins which will maintain substantially uniform efficiency along the entire length of the engine, and to this end I propose to gradually diverge the fins from front to rear, so that the air will remain in contact with the fins as it passes along the engine and will not trail off toward the last cylinder.

With the above and other objects in view, embodiments of my invention are shown in the accompanying drawing, and these embodiments will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claims.

In the drawing:

Fig. 1 is a side elevation, partly in vertical section showing an exemplary embodiment of my invention incorporated in a four cylinder internal combustion engine.

Fig. 2 is a front end view thereof.

Fig. 3 is a horizontal sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is an edge view of one of the fins.

Fig. 5 is a vertical sectional view of a modified form of the invention as applied to the cylinder of radial type of engine.

Fig. 6 is a top view thereof.

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 5.

Similar reference characters indicate corresponding parts throughout the several figures of the drawing.

Referring to the drawing, the invention, according to the exemplary embodiment illustrated herein, is incorporated in a four cylinder internal combustion engine comprising a crank case 10 to which the base of the cylinder block is suitably secured, this block comprising a plurality of cylinders 11, 12, 13 and 14 connected by vertical centrally disposed webs 15, 16 and 17. The cylinder heads 18 in which the exhaust and inlet valves 19 and 20 are arranged is preferably cast integral with the cylinders, as is also the exhaust and inlet manifold structure 21 above which latter the housing 22 for the valve operating mechanism 23 is mounted. Spark plugs 24, preferably two to each cylinder are provided in the cylinder heads. While I have shown a particular type of engine it will be understood that I do not wish to be limited in this respect, and may incorporate my invention in any suitable type of engine.

The engine block is preferably cast of semi-steel or other suitable material which possesses sufficient strength and lightness for the production of relatively thin walled cylinders.

Near the base of the cylinders there are provided vertical ribs 25 upon the shouldered upper ends of which the fins are adapted to be supported, as will presently more fully appear.

The fins 26 are concentric at their front and rear ends to the front and rear cylinders and the side edges diverge from the front to the rear, so that the fin is of gradually increasing area toward the rear. An opening 27 conforming to the outline of the cylinder block is provided in the fin, and lugs 28 are cast upon the upper surface preferably in line with the ribs 25 of the cylinder block, these lugs serving as spacers and supports for the superimposed fins which are stacked upon the cylinder block. Perforations 29 of gradually increasing diameters toward the rear are provided in the fins, the larger perforate area toward the rear being substantially proportionate to the increase in width of the fin and the tendency of the heat to build up toward the rear as it passes rearwardly along the cylinders.

As shown in Figs. 1 and 2 the fins are stacked upon the cylinder block in spaced relation, being supported upon the shouldered ribs 25 and secured by a top fin 30, preferably imperforate and formed of semi-steel, or other suitable material, and brazed to the cylinder head, as at 31.

As before pointed out the fins are preferably formed of cast aluminum, which has the desired characteristics of lightness and strength, and which due to its porous nature is particularly efficacious in drawing and dissipating heat.

The large perforate area of the fins is such that the heat of the engine cylinders is drawn to these perforations, and the air rushing between the fins rapidly dissipates it. Due to the diverging shape of the fins the air will not trail off near the rear cylinders but will remain in relation to the fins in sufficient volume to dissipate the heat until it passes beyond the last cylinder.

The cylinders are preferably fired in reverse order, that is the No. 1 cylinder will be fired in the rear instead of in front, so that the heat of the No. 1 cylinder immediately passes off without passing over the other cylinders. When the No. 4 cylinder in front fires the heat passes over the entire motor, so that a substantial uniformity of temperature is maintained throughout the cylinders.

In Figs. 5 to 7 I have illustrated a modified

form of the invention, incorporated in a radial type engine, one cylinder 32 of which is shown in Fig. 5. As in the first embodiment the fins 33 are concentric to the cylinder at the front and rear and diverge toward the rear and have an opening 34 for engaging the cylinder. Perforations 35 are provided of increasing size toward the rear, and spacing and supporting lugs 36 are formed adjacent the opening 34. The head 37 of the cylinder and the top securing fin 38 are preferably provided with radial fins 39.

I have illustrated and described preferred and satisfactory embodiments of my invention, but it will be obvious that changes may be made therein within the spirit and scope thereof as defined in the appended claims.

Having thus described my invention what I claim and desire to secure by Letters Patent is:—

1. In an air-cooled engine, a cylinder, and a series of perforated separately formed plates stacked exteriorly upon said cylinder in superimposed and spaced relation to each other, the perforation of said plates being of increasing size from front to rear.

2. In an air-cooled engine, a cylinder, and a series of perforated separately formed plates stacked exteriorly upon said cylinder in superimposed and spaced relation to each other, the side edges of said plates diverging from front to rear and said perforations being of increasing size from front to rear.

3. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated fins exteriorly of said cylinder in superimposed and spaced relation to each other, each fin being common to a plurality of said cylinders, the perforations of said plates being of increasing size from front to rear.

4. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated separately formed plates stacked exteriorly upon said cylinder in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders and having a plurality of openings adapted to be respectively engaged by said cylinders, the side edges of said plates diverging from front to rear.

5. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated separately formed plates stacked exteriorly upon said cylinder in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders and having a plurality of openings adapted to be respectively engaged by said cylinders, the perforation of said plates being of increasing size from front to rear.

6. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated separately formed plates stacked exteriorly upon said cylinder in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders and having a plurality of openings adapted to be respectively engaged by said cylinders, the side edges of said plates diverging from front to rear and said perforations being of increasing size from front to rear.

7. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated separately formed plates stacked exteriorly upon said cylinders in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders and having a plurality of openings adapted to be respectively engaged by said cylinders, the lateral area of said plates increasing from front to rear.

8. In an air-cooled engine, a plurality of in-line cylinders, a plurality of perforated separately formed plates stacked exteriorly upon said cylinders in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders and having a plurality of openings adapted to be respectively engaged by said cylinders, the side edges of said plates diverging from front to rear.

9. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated fins exteriorly of said cylinders in superimposed and spaced relation to each other, each fin being common to a plurality of said cylinders, the side edges of said fins diverging from front to rear.

10. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated plates arranged exteriorly of said cylinders in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders and having a plurality of openings adapted to be respectively engaged by said cylinders, the side edges of said plates diverging from front to rear.

11. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated plates arranged exteriorly of said cylinders in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders and having a plurality of openings adapted to be respectively engaged by said cylinders, the perforations of said plates being of increasing size from front to rear.

12. In an air-cooled engine, a cylinder, a series of perforated plates having a cylinder engaging opening and stacked exteriorly upon said cylinder in superimposed relation, and a plurality of spacing means carried by said plates contiguous to said cylinder engaging opening and in spaced relation about said opening and adapted to support and space said plates relative to each other, said spacing means being contiguous to said cylinder whereby air cannot pass between said spacing means and the cylinder, and the cylinder wall being exposed circumferentially at each side of said spacing means.

13. In an air-cooled engine, a cylinder, and a series of perforated separately formed plates stacked exteriorly upon said cylinder in superimposed and spaced relation to each other, the side edges of said plates diverging at each side from front to rear and to a point rearwardly of the transverse diameter of said cylinder, whereby the lateral area of said plates increases from front to rear.

14. In an air-cooled engine, a cylinder, and a series of perforated separately formed plates stacked exteriorly upon said cylinder in superimposed and spaced relation to each other, said plates being of increasing width from front to rear and to a point rearwardly of the transverse diameter of said cylinder whereby the lateral area of said plates increases from front to rear.

15. In an air-cooled engine, a plurality of in-line cylinders, and a plurality of perforated fins exteriorly of said cylinders in superimposed and spaced relation to each other, each plate being common to a plurality of said cylinders, the side edges of said plates diverging from front to rear, and the perforation of said plates being of increasing size from front to rear.

JOSEPH A. BOUCHER, JR.