No. 881,147. PATENTED MAR. 10, 1908.

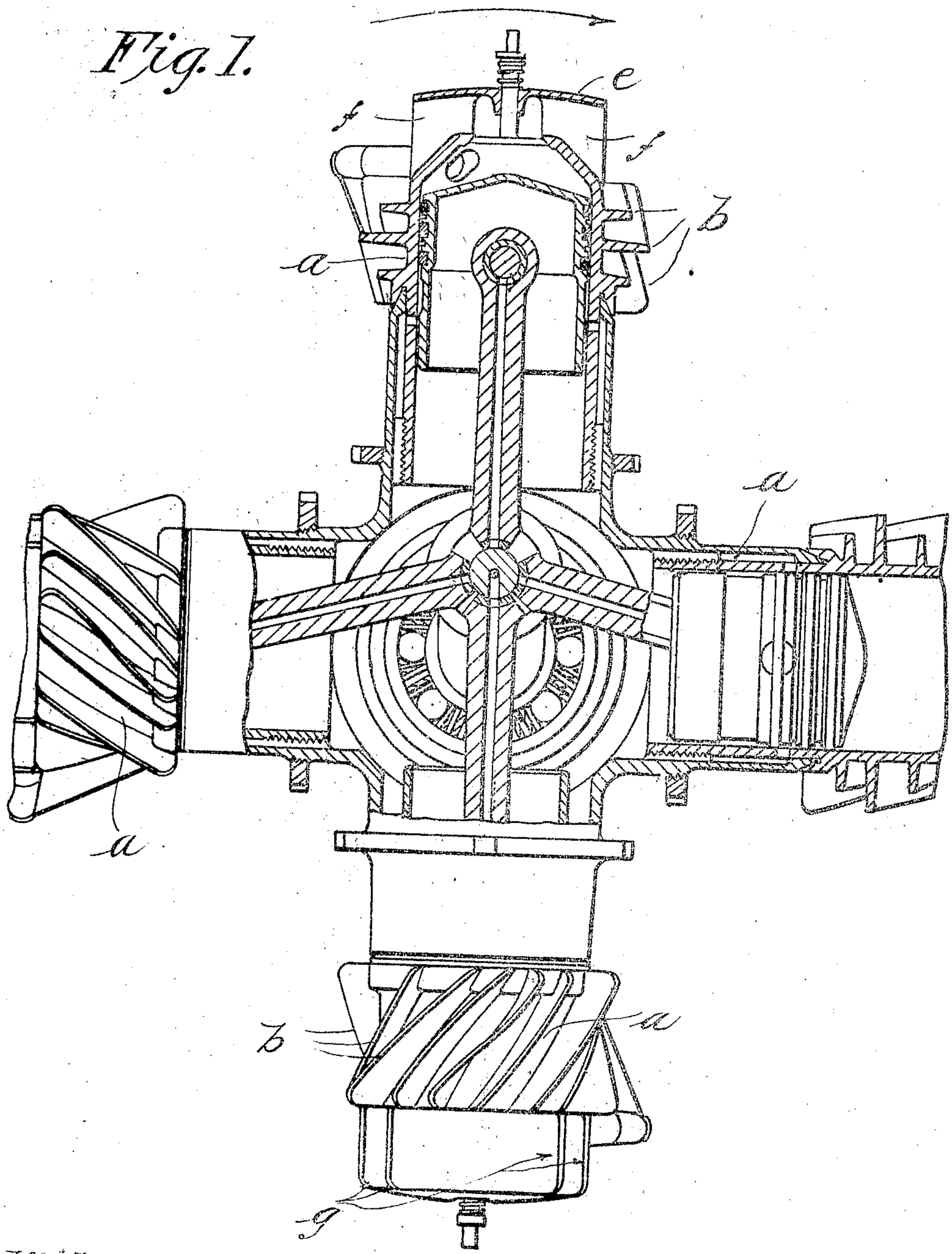
J. L. PERKINS.

HEAT RADIATING DEVICE.

APPLICATION FILED JUNE 5, 1907.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2

Fig. 2.

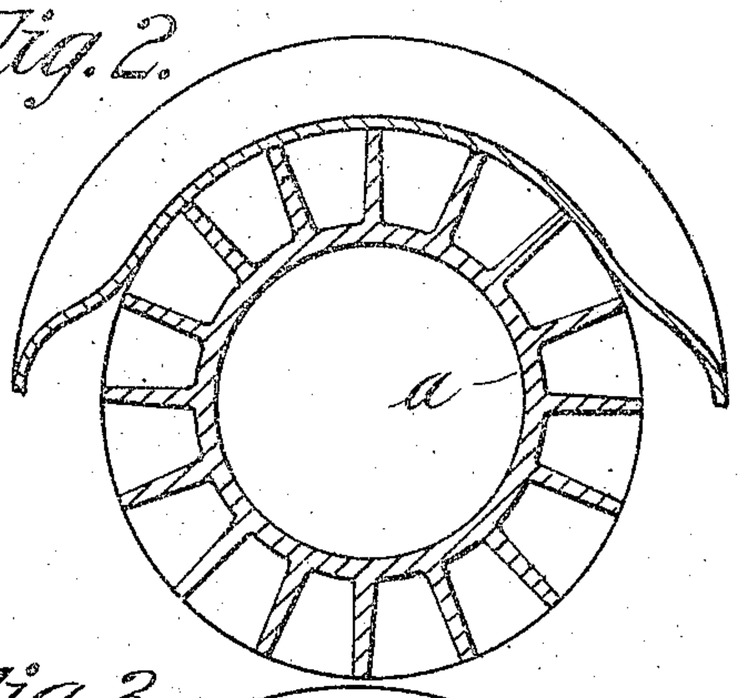


Fig. 5.

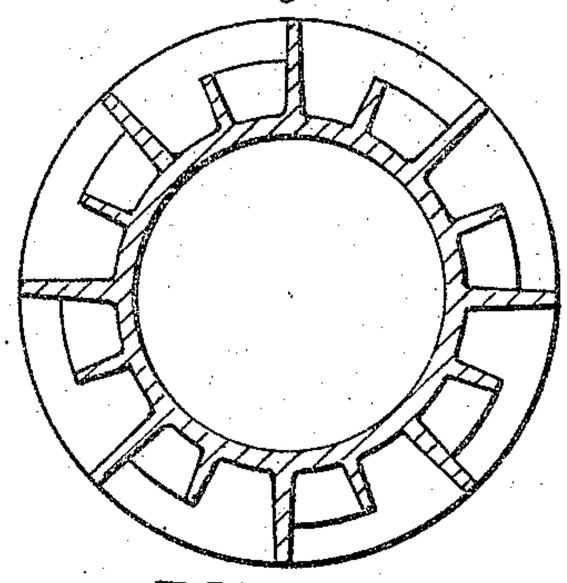


Fig. 3.

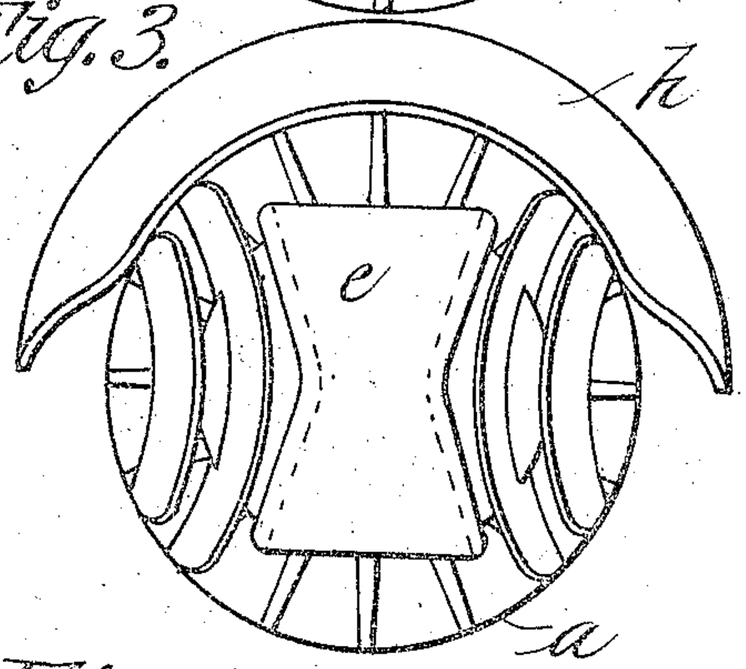


Fig. 6.

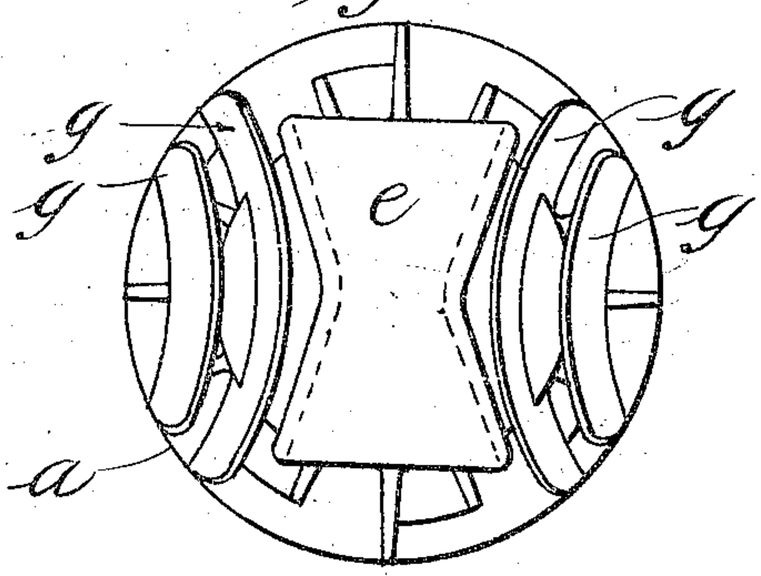


Fig. 4.

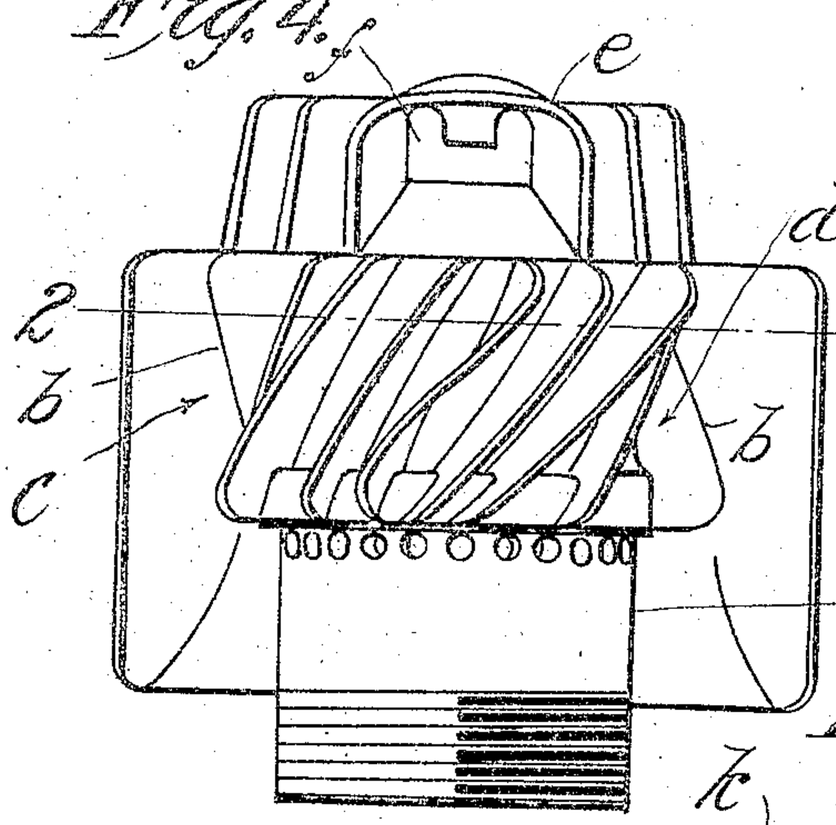


Fig. 7.

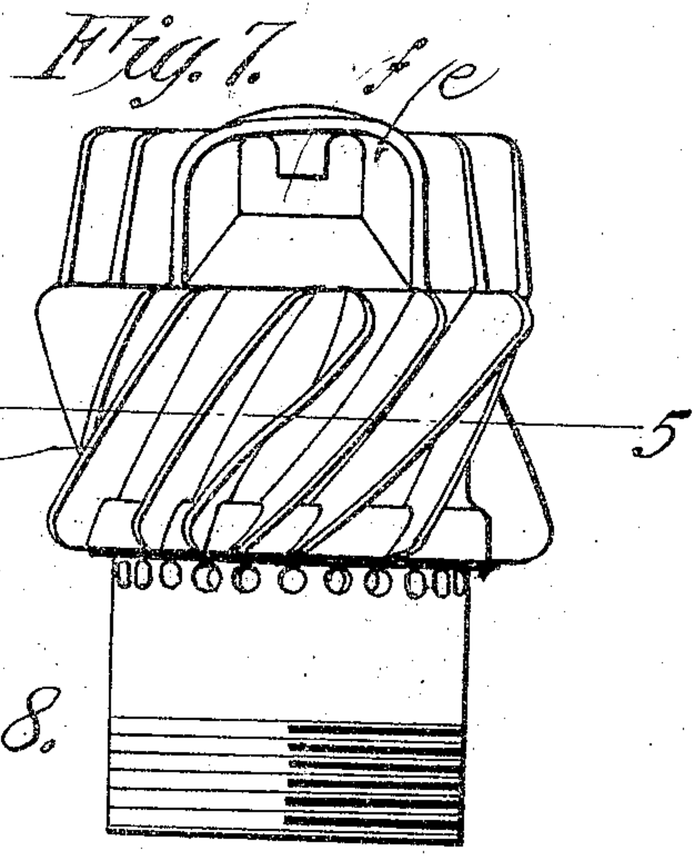
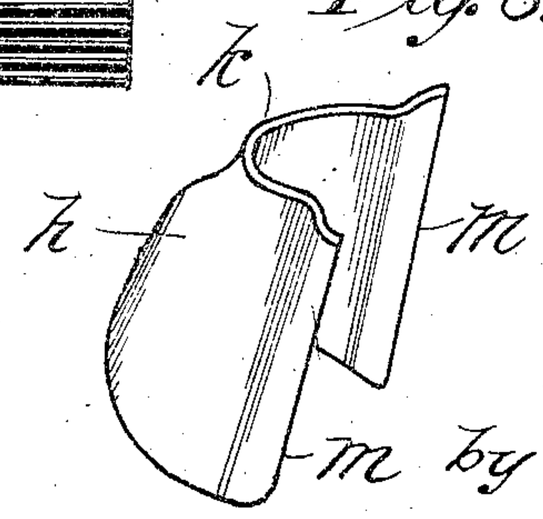


Fig. 8.



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UNITED STATES PATENT OFFICE.

JULIAN L. PERKINS, OF SPRINGFIELD, MASSACHUSETTS.

HEAT-RADIATING DEVICE.

No. 881,147. Specification of Letters Patent. Patented March 10, 1908.

Application filed June 5, 1907. Serial No. 377,351.

To all whom it may concern:

Be it known that I, JULIAN LEIGH PERKINS, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Heat-Radiating Devices, of which the following is a specification.

This invention relates to internal combustion engines and particularly to engines of that type known as revolving cylinder engines, the object thereof being to provide improved cooling devices for the cylinders of engines of this type, the cooling medium employed being air.

In internal combustion engines of the revolving cylinder type, much difficulty has been found in properly air-cooling the same owing to the fact that the rear side of the cylinders (the word "rear" being used relative to the direction of rotation) travels practically in a vacuum, or at least the air behind the cylinders, as they revolve, is highly rarefied owing to the fact that the front of the cylinders throws the air off on either side making it practically impossible to cool the rear side of the cylinders without applying thereto devices which will positively direct air currents around the cylinder: And this convention consists in the provision of such devices whereby the air is not only directed around the back side of the cylinders but the devices are so arranged and constructed as to take advantage of the effect of the centrifugal force to which the air surrounding the cylinders is subjected when the engine is running.

The invention is fully illustrated in the accompanying drawings, in which,—

Figure 1 is a side elevation, partly in section, of a revolving engine of the type referred to showing the air cooling devices applied to the cylinders thereof. Fig. 2 is a sectional plan view of a cylinder of the engine in the plane of line 2—2, Fig. 4, and showing a semi-circular deflecting plate located on the back side of the cylinder. Fig. 3 is a top plan view of said cylinder showing the deflecting plate and the radiating ribs on the upper end of the cylinder in which the exhaust valve is located. Fig. 4 is a side elevation of Fig. 3 taken from the front side of the cylinder and showing the relation of the heat-radiating ribs on the cylinder proper relative to those on the end of the cylinder. Fig. 5 is a sectional plan view of the cylinder shown in Fig. 7, the plane of the section being on line 5—5, on the last named figure. This section shows a slightly different arrangement of the ribs as compared with Fig. 2. Fig. 6 is a plan view of the top of the cylinder shown in Fig. 7, and Fig. 7 is, like Fig. 4, a side elevation of the cylinder taken from the front thereof and showing alternately arranged heat-radiating ribs having different areas. Fig. 8 is a perspective view on a somewhat smaller scale than in the preceding figures, of the deflecting plate which may be applied to the back side of the cylinders.

Referring now to these drawings, *a* indicates the cylinders as a whole, these preferably being made of cast iron, and cast integrally therewith are the ribs *b*. It is conceded that heat-radiating ribs cast integral with the cylinders, broadly speaking, are well known in this art and no claim will be made herein for such construction.

In the construction shown and described herein, however, the ribs *b* are spirally disposed around the outer ends of the cylinder and not only provide an increased heat-radiating surface but are adapted especially to direct the air around the cylinder to the back side thereof whereby the last named portion of the cylinder may be as efficiently cooled as the front side, and it has been demonstrated in practice that this spiral disposition of the ribs will accomplish this purpose so efficiently as to permit the continuous running of the engine at high rates of speed without self-ignition taking place.

The effect of the spiral arrangement of the ribs when the cylinders are rapidly rotating is to set up spirally flowing air currents around each of the cylinders, the direction of which is from the base of the cylinders outward as will be readily understood from the following description: During the rotation of the cylinders, the following forces coact to produce the desired movement of the air: First, there is a natural flow of air from the center of the engine outwardly, due to centrifugal force; second, on one side of the cylinder, as at *c* Fig. 4, (assuming Fig. 4 to be a view of the front of the cylinder) the pitch or spiral inclination of the ribs *b* extending outwardly as they do beyond the side of the cylinder, will catch and direct the air spirally downward around the cylinder; whereas, on the opposite side of the cylinder, as at *d*, the spirally arranged ribs *b* (whose pitch or inclination is just opposite to those on the side

c) will deflect the air striking thereagainst in an upwardly spiral course opposite to the air currents set up on the opposite side of the cylinder. The currents on the side *d* are aided by centrifugal action as their general direction is away from the center; whereas the air currents on the side *c*, being opposed by the centrifugal force referred to, are arrested in their movement downwardly and around the cylinder and are eventually turned back by the centrifugal action to which they are subjected; and because, as they sweep around back of the cylinder, they are drawn in behind it by the greater or less rarefaction of the air at that point and are then thrown radially outward, thus completely covering the entire surface of the cylinder. The currents from the side *c*, as they sweep downwardly around the cylinder are also met by the upwardly trending currents from the side *d* which are drawn more or less around behind the cylinder by reason of the slight rarefaction of the air at that point above referred to.

On the upper end of the cylinder, a casing *e* is cast extending over the exhaust-valve port *f*, the opening through this casing being so disposed that the air will have a free passage therethrough as the cylinders revolve, and on each side of said casing are cast the deflecting ribs *g* whose sides are substantially parallel with the axis of the cylinder, the general direction of which, as shown in the plan view, follow the outline of the casing which is somewhat narrowed down midway between its ends; these ribs *g* therefore tend to direct the air currents against the wall of the casing *e*, and, with the passage of air through said casing, the exhaust valve and its seat are efficiently cooled.

In engines of relatively large size which are to run at high rates of speed, it is desirable to apply to the back side of the cylinders a deflecting plate *h* of sheet metal, shown in Figs. 2, 3, 4 and 8. Preferably, this deflecting plate is made as shown in said Fig. 8 of a shape which closely follows the contour of the ribs on the cylinder, the top thereof, as at *k*, being narrowed down so that it will lie in contact with, or in close proximity to, the edges of the spiral ribs at the upper end of the latter, the lower end of the plate flaring outward a little, and the two edges *m* at the sides of the plate being bent outwardly in the form of wings to catch the air, these wings facing, of course, in the direction of the rotation of the engine.

By narrowing the upper end of the plate, as at *k*, the volume of air taken in at the sides is forced through the relatively restricted openings between the upper ends of the spiral ribs and thus directed against the hottest part of the cylinder. It will be observed that the deflecting plate does not extend above the upper ends of the spiral ribs and therefore does not in any way interfere with the circulation of air through the exhaust-valve casing or faver the top of the cylinders.

What I claim, is:—

1. The combination with the cylinder of a revolving engine, of heat-radiating ribs spirally disposed around the cylinder whereby air is directed around the latter to the rear side thereof, when the engine is running.

2. The combination with the cylinder of a revolving engine, of heat-radiating ribs spirally disposed around the outer end of the cylinder, whereby air is directed around the latter to the rear side thereof when the engine is running, together with a deflecting plate surrounding the rear side of the cylinder, and having forwardly facing wings extending beyond the edges of the ribs, at the sides of the cylinder.

3. A cylinder of a revolving engine provided with an exhaust valve in the outer end thereof, heat-radiating devices spirally disposed therearound whereby air is directed around the cylinder to the rear side thereof when the engine is running, and heat-radiating devices on the outer end of the cylinder to direct air over the exhaust valve.

4. A cylinder of a revolving engine provided with an exhaust valve in the outer end thereof, heat-radiating devices spirally disposed therearound whereby air is directed around the cylinder to the rear side thereof when the engine is running, a casing over the exhaust valve having an opening therein facing in the plane of rotation of the cylinder, and heat-radiating devices to direct air against the sides of said casing.

5. A cylinder of a revolving engine provided with an exhaust valve in the outer end thereof, heat radiating devices spirally disposed therearound whereby air is directed around the cylinder to the rear side thereof when the engine is running, a casing over the exhaust-valve having openings at either end thereof facing in the plane of rotation of the cylinder, whereby when the engine is running air will pass through said casing and across the exhaust valve.

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Witnesses:
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