No. 671,768. Patented Apr. 9, 1901.

H. A. KNOX.

DEVICE FOR EFFECTING THE RADIATION OF HEAT.

(Application filed Sept. 22, 1900.)

(No Model.)

Fig. 1.

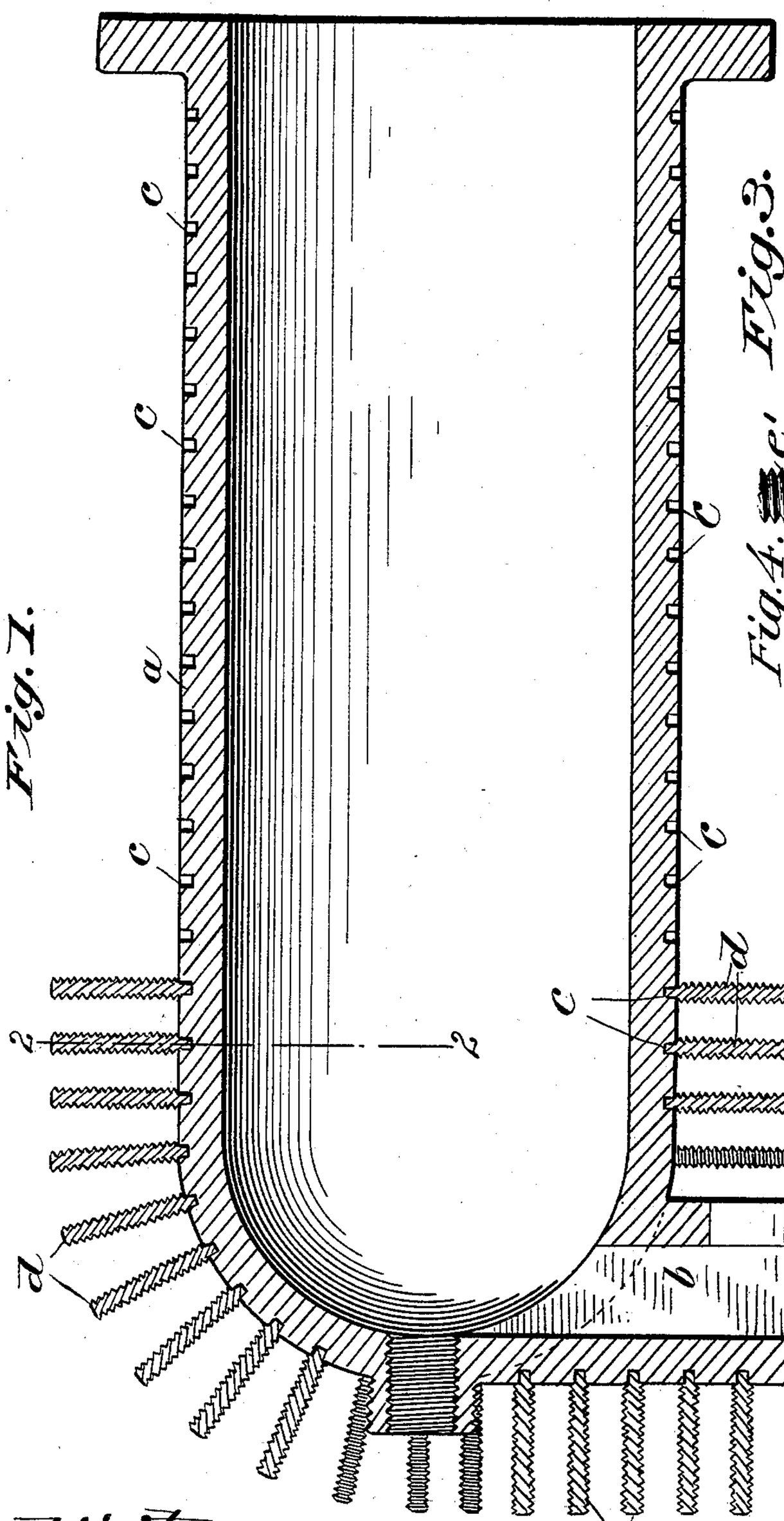


Fig. 2.

Fig. 3.

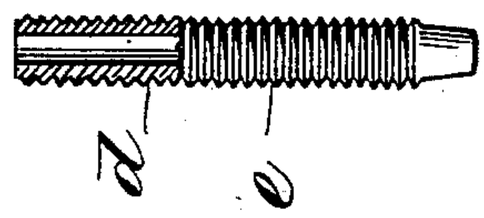
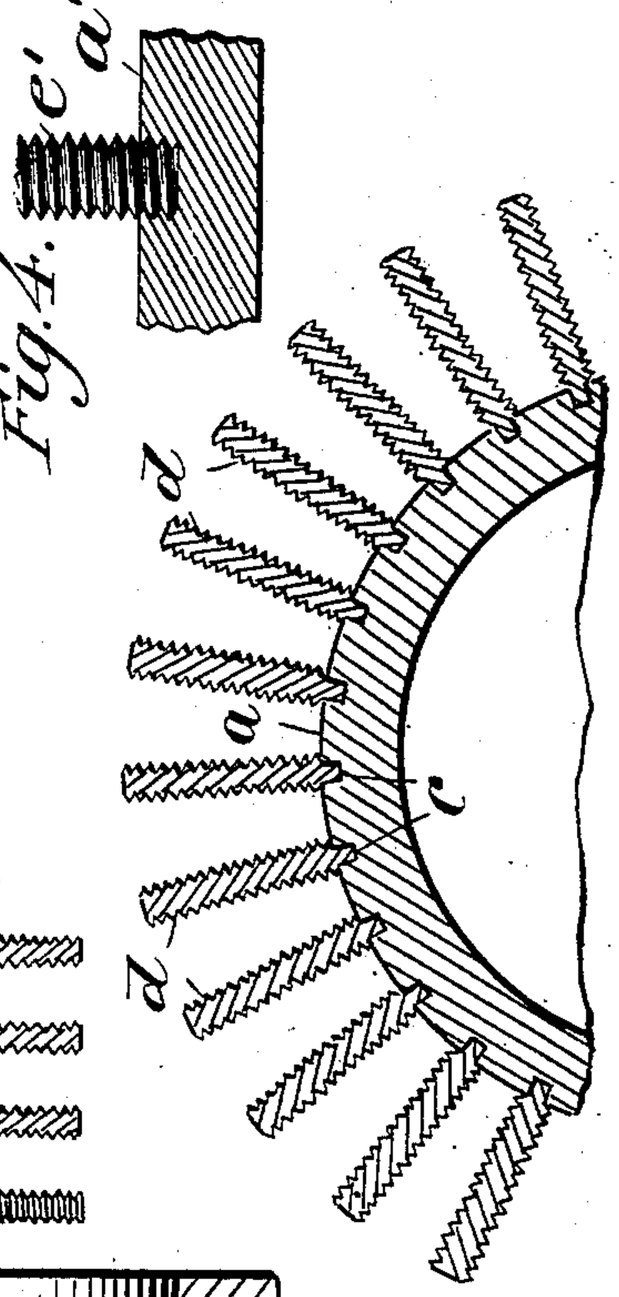


Fig. 4.



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UNITED STATES PATENT OFFICE.

HARRY A. KNOX, OF SPRINGFIELD, MASSACHUSETTS.

DEVICE FOR EFFECTING THE RADIATION OF HEAT.

SPECIFICATION forming part of Letters Patent No. 671,768, dated April 9, 1901.

Application filed September 22, 1900. Serial No. 30,816. (No model.)

To all whom it may concern:

Be it known that I, HARRY A. KNOX, 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 Devices for Effecting the Radiation of Heat, of which the following is a specification.

This invention relates to means for effecting the rapid radiation of heat from objects exposed to high temperatures; and the object of the invention is to provide means for effecting such reduction of temperature with the least possible weight of radiating material.

In the drawings the invention is shown applied to the cylinder of an internal-combustion engine, as it is to this particular use that the invention is particularly applicable.

I am well aware of the various methods which have been adopted heretofore to keep the temperature of the cylinders of engines of this class at the lowest possible point, and the many devices that have been tried with more or less success testify to the need of accomplishing this object. The most commonly accepted means, perhaps, for this purpose has been the water-jacket for the cylinder; but, as is well known, this possesses the disadvantage of largely-increased weight, and poor radiating qualities of the water render it ineffective after a short time, for the heat is absorbed faster than it is parted with. Another method is the air cooling method, and in this system fans have been employed to direct currents of air against the cylinder, the latter being made with annular ribs thereon to increase the radiating-surface thereof. The latter form of cylinder is also used independently of any means to direct an air-current against the cylinder, reliance being had solely on the movement of the natural air-currents.

Cylinders of motors of the class described are usually made of cast-iron, and to obtain the necessary radiating-surface in the form of ribs to rapidly dissipate the heat generated therein would greatly add to the weight. Furthermore, the natural surface of cast-iron or other metal is not as good a radiator of heat on account of the presence of sand, &c., which adheres to it from its contact therewith in a molten state.

The object of this invention is to produce a radiating-surface having the largest possible area for a given weight and to bring this radiating-surface into such intimate contact with the heated body that the passage of heat from the latter to the radiating-surfaces may be as free as though the parts were integral; and the invention consists in the construction described in the following specification and particularly pointed out in the claims forming part thereof.

In the drawings forming part of this specification, Figure 1 shows a view in longitudinal sectional elevation of a cylinder of an explosion-engine, and Fig. 2 is a transverse section of a portion of said Fig. 1 on line 2 2 thereof. Fig. 3 is a longitudinal sectional view of a heat-radiating pin, showing a slight difference in construction. Fig. 4 is a broken detail section of a modification described herein.

The cylinder (indicated by *a*) is that of a single-cylinder engine of a common type, having the chamber *b*, through which explosive mixture may be admitted to said cylinder. The outer surface of the cylinder has bored therein a series of holes *c*, which enter the wall of the cylinder a short distance and which, preferably, are slightly tapered and, preferably, are disposed in equidistant rows parallel with the axis of the cylinder *a*, said holes being equally spaced one from the other. These holes receive the pins *d*, which are made of some metal—such as brass, copper, or aluminium—which is a good conductor of heat, the ends of said pins adapted to enter said holes *c* being slightly tapered, whereby a good driving fit with said holes may be insured.

While the above-described means for securing the pins in the wall of the cylinder is the preferred construction, it is to be understood that I do not confine myself to this particular mode of construction, for the pins may, if desired, be screwed into said holes, as indicated in the modification illustrated in Fig. 4, in which *a'* indicates a broken section of the cast-metal cylinder, and *e'* a broken screw-threaded pin. Furthermore, while the preferable disposition of said pins is as described—viz., in equidistant lines parallel with the axis of the cylinder and with the pins equidistant apart—said pins may be ap-

plied to the cylinder in irregular lines. In straight rows, as described, however, they provide for straight open passages between them whether viewed from the end or the side of the cylinder or from a diagonal position, and thus air may more readily circulate between them than when they are irregularly disposed. Again, it has been found in practice that if the said pins are provided with a screw-thread, whereby the surface thereof is greatly increased, the length thereof may be decreased relative to the length required for pins having a plane surface, and thereby a considerable saving in weight may be effected. I therefore prefer to construct said pins, as shown, with a screw-thread extending over the exposed part thereof or with some analogous surface corrugation.

It is obvious that parallel V-shaped grooves *e* may be rolled or turned in said pins, as shown in Fig. 3 on a somewhat enlarged scale, if desired, instead of cutting a screw-thread thereon; but this would clearly fall within the scope of my invention, and, if desired, instead of solid pins metal tubes may be substituted whereby an increased radiating area may be obtained for the same weight. As shown, the pins *d* may be applied as well to the wall of the chamber *b* as to the surface of the cylinder.

By constructing the radiating pins of a metal having a higher conductivity of heat than the material of which the cylinder is composed I am enabled to convey the heat away from the cylinder and radiate it into the air much more rapidly than would be the case with pins of the same size cast with the cylinder. By making the pins removable I am enabled to apply such numbers and in such positions as may be desirable for the particular purpose intended, and I can easily replace broken pins. By making the surface of the pins ribbed or screw-threaded I largely increase the air contact therewith and hasten the radiation, as stated.

I am aware that cast metal heat radiators with projecting pins or bosses integral therewith are old and well known.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination with a metal vessel in which heat is developed, of threaded recesses in said vessel, and external radiating pins tapped into said recesses, said pins having external ribs, substantially as described.

2. The combination with a metal cylinder having recesses in its outer surface, of removable pins tapped into said recesses, said pins having external ribs to increase the radiating area exposed to air, substantially as described.

3. In an internal-combustion engine, the combination with the motor-cylinder thereof, of recesses formed in the outer surface of said cylinder in such manner that the peripheral surface of each recess is at least equal to its cross-sectional area, and corrugated pins secured in said recesses in intimate contact with the peripheral walls thereof, substantially as described.

4. In an internal-combustion engine, the combination with the motor-cylinder thereof, of recesses formed in the outer surface of said cylinder in such manner that the peripheral surface of each recess is at least equal to its cross-sectional area, and heat-conducting pins screw-threaded throughout substantially their entire length and secured in said recesses in intimate contact with the peripheral walls thereof, substantially as described.

5. In an internal-combustion engine, the combination with the motor-cylinder thereof, of corrugated recesses formed in the outer surface of said cylinder in such manner that the peripheral surface of each recess is at least equal to its cross-sectional area, and corrugated heat-conducting pins secured in said recesses in intimate contact with the peripheral walls thereof, substantially as described.

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