3 Sheets—Sheet 1.

A. K. RIDER.

Apparatus for Molding and Casting Heaters for Air-Engines.

No. 219,412. Patented Sept. 9, 1879.

Fig. 1.

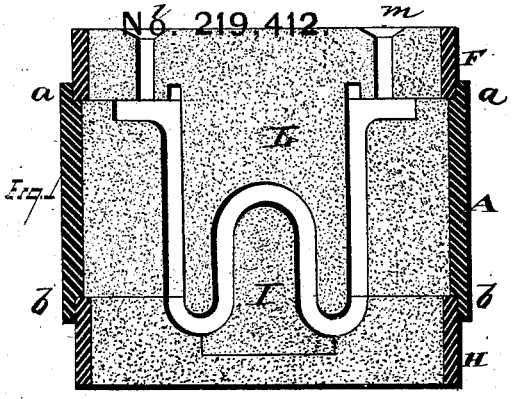


Fig. 2.

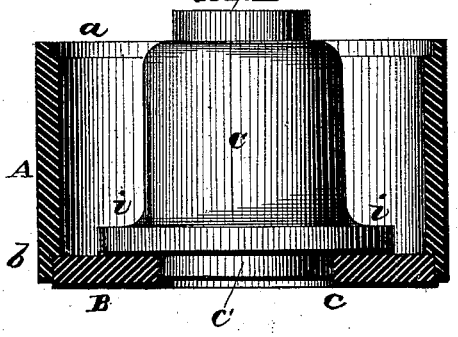


Fig. 3.

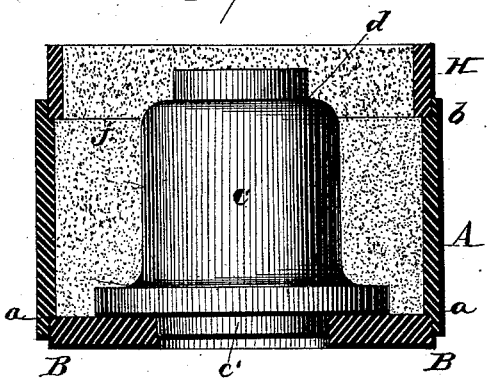


Fig. 4.

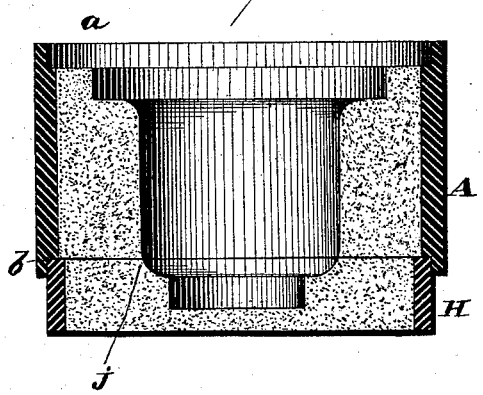


Fig. 5.

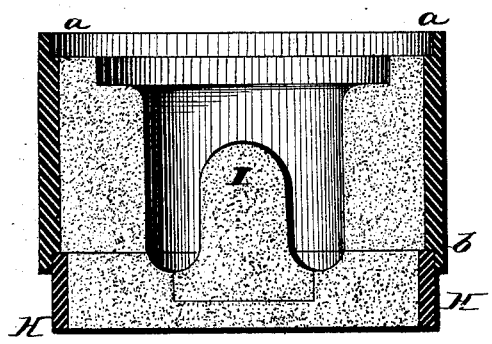
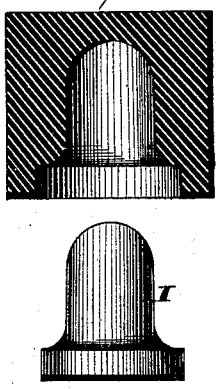


Fig. 6.



WITNESSES

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3 Sheets—Sheet 2.

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Fig. 7.

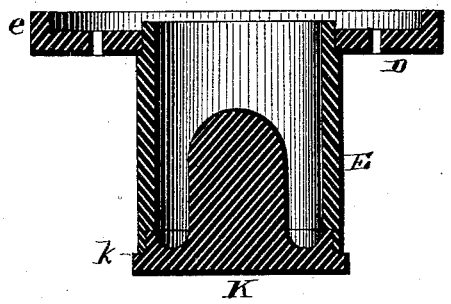


Fig. 8.

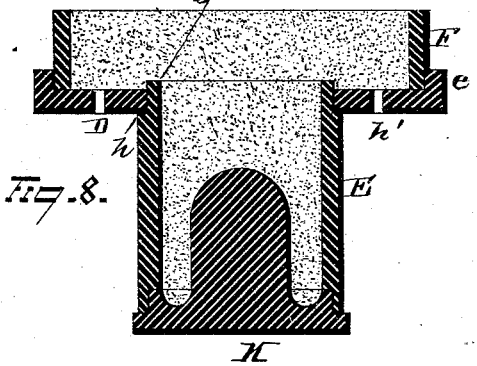


Fig. 9.

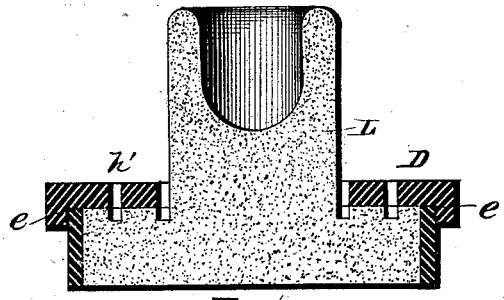


Fig. 10.

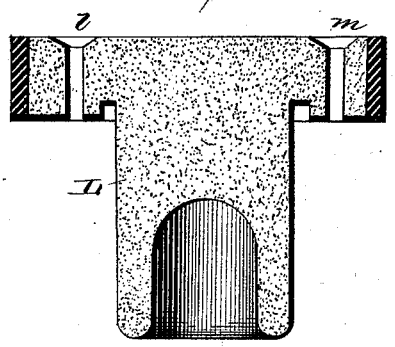
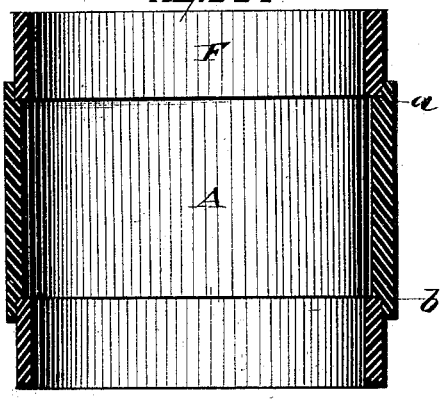


Fig. 11.



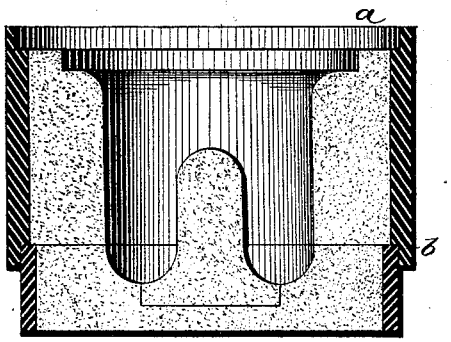


Fig. 15.

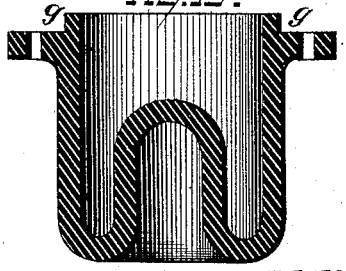


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Fig. 12.

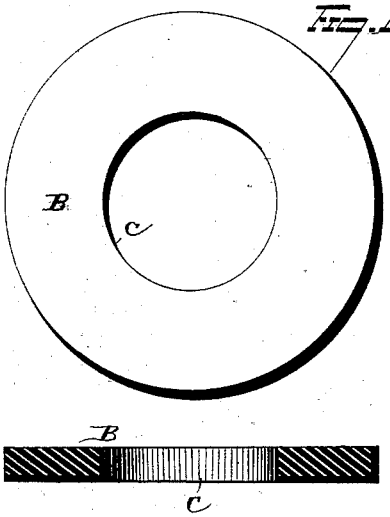


Fig. 13.

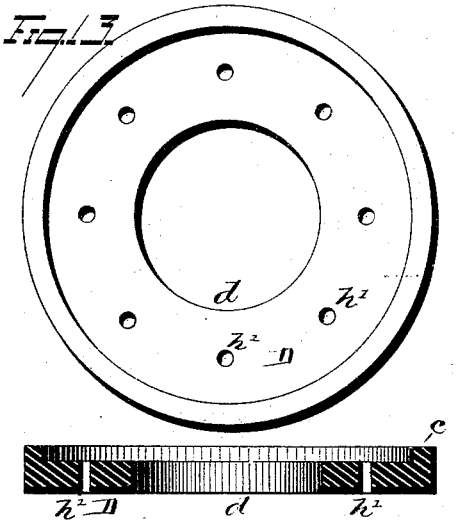
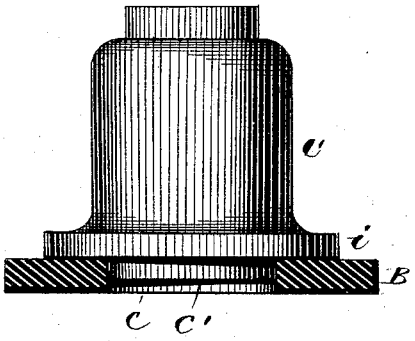


Fig. 14.



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UNITED STATES PATENT OFFICE.

ALEXANDER K. RIDER, OF WALDEN, NEW YORK, ASSIGNOR TO THOMAS J. RIDER, OF SAME PLACE.

IMPROVEMENT IN APPARATUS FOR MOLDING AND CASTING HEATERS FOR AIR-ENGINES.

Specification forming part of Letters Patent No. **219,412**, dated September 9, 1879; application filed July 8, 1879.

To all whom it may concern:

Be it known that I, ALEXANDER K. RIDER, of Walden, in the county of Orange and State of New York, have invented certain new and useful Improvements in Apparatus for Molding and Casting Heaters for Air-Engines; and do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in apparatus for molding and casting heaters for air-engines.

Heretofore heaters for air-engines have been found defective, for the reason that they have been made of cast metal, such as common cast-iron, chilled iron, cast-steel, and cast malleable iron, and it has been found that such metals cannot withstand the action of the fire the desired length of time, owing to the oxidating and disintegrating action of the flames on heaters thus constructed. Again, the apparatus heretofore employed in molding and casting heaters for air-engines necessitated the turning and fitting of the heaters after having been cast. These heaters have heretofore been molded in green sand in an ordinary three-part flask, composed of a bottom part, a middle part, and a cope. The bottom and middle parts of the mold formed the exterior of the heater and the lower surface of the flange around the upper end thereof, while the cope formed the face of said flange with its rabbet. The interior part of the heater was formed by a separate dry-sand core, which was suspended to the green-sand cope by a bolt.

By means of the apparatus made mention of it was found impossible to produce heater-castings of sufficient accuracy to avoid the necessity of turning and fitting the flanges of the heater in order to make perfect face-joints, as it was found impossible to fasten the dry-sand core to the green-sand cope with any close degree of squareness or contricity; and, again, the core frequently became more or less displaced upon the inflow of the molten metal, so that the flange of the heater was cast with its surface too uneven and irregular to form a face-joint without turning and fitting the same.

The object of my invention is to provide means for molding and casting heaters for air-engines, whereby the heaters can be cast so perfect in form as to entirely avoid the necessity of turning, fitting, or drilling any portion of the heater, and allow of the employment of cast metal of so great density and hardness as will not practically admit of being turned or drilled, and also to simplify and cheapen the manufacture of heaters irrespective of the quality or the characteristics of the metal employed.

To these ends my invention consists in core-boxes and flasks of the construction hereinafter described, and pointed out in the claims, whereby the utmost accuracy is preserved in the centricity, squareness, and truth of surface of the mold, and consequently of the casting, so that the heaters will fit into their places when cast without any subsequent turning or fitting.

In the accompanying drawings, Figure 1 is a vertical section of the mold and flask complete and ready for casting. Fig. 2 is a vertical section of one part of the flask and the pattern and one centering-ring in position to begin to mold. Fig. 3 is a vertical section of the pattern and two parts of the flask rammed up and centering-ring ready to turn over. Fig. 4 is a vertical section of the two parts of the flask and pattern shown in Fig. 3 after having been turned over and the centering-ring withdrawn. Fig. 5 is a vertical section of the parts shown in Fig. 4, with the small bottom core placed in position. Fig. 6 is a side elevation of the small bottom core and a vertical section of the core-box by which it is formed. Fig. 7 is a vertical section of the main core-box complete, with the other centering-ring in position. Fig. 8 is a vertical section of the parts shown in Fig. 7, together with the third part of the flask in position in readiness to commence making the main core. Fig. 9 is a vertical section of the main core and third part of the flask turned over, the centering-ring remaining in place, but the cylindric part and bottom of the core-box taken off. Fig. 10

is a vertical section of the mold and main core in position to be secured to each other. Fig. 11 is a vertical section of the flask. Fig. 12 represents a plan view, and also a transverse section, of plain-faced centering-ring. Fig. 13 shows a plan view and transverse section of the flanged centering-ring. Fig. 14 is a side elevation of the pattern and transverse section of the plain-faced centering-ring. Fig. 15 is a vertical section of the finished heater.

The flask, which is preferably made of cast-iron, is composed of three cylinders furnished with rabbet-joints, that the sections may snugly fit one into the other, as shown in Fig. 11, the rabbets being represented at *a* and *b*. The central portion, A, of the flask is preferably made to receive the others, said central portion being bored out at each end, as at *a b*, for this purpose.

The centering-ring B is turned off true on one side and on its edge, its diameter being of such size that the ring will snugly fit into the rabbet in one end of the middle portion, A, of the flask. Centering-ring B is provided with a central hole, *c*, to receive a correspondingly-shaped hub, *c'*, on the pattern C, in order that said pattern may be kept accurately centrical and square in the flask while the latter is being rammed up. The centering-ring B may also, if desired, be made to serve as a print in case the heaters were to be made without the flask described, and in that case the impression in the sand made by the edge of the centering-ring would form a guide for the core which forms the interior of the heater. The centering-ring D is also turned true on one side, and has a central opening, *d*, to receive the main core-box E. It has in addition a raised edge or flange, *e*, the interior surface of which is turned true, and of such diameter as to receive and fit snugly the upper portion, F, of the flask, which corresponds in exterior diameter to the outer edge of the centering-ring B.

The main core-box E is fitted centrically into the central opening, *d*, of the centering-ring D, and projects through it a short distance, as at *f*, which serves to form the rabbet *g*, as represented in the heater-casting illustrated in Fig. 15. The height of this projection *f*, as well as the truth of the centering-ring, is governed by a shoulder or collar, *h*, on the main core-box E, upon which the centering-ring seats when in position for use. Centering-ring D is also provided with a circular row of small holes, *h'*, which are drilled through the centering-ring, corresponding in number to bolt-holes to be cast in the heater flange. These small holes are to receive prints in which to insert the small cores for the bolts of the flange of the heater.

The employment of the centering-ring D is to make the main core and the upper part of the mold all in one piece, and to have the main core centrical and square with the upper portion of the flask, and main core-box accurately in square and centrical position when being rammed up.

It will thus be observed from the foregoing description that the exterior portion of the mold is made truly concentrical with and within one portion of the flask, while the interior portion or main core and that part which forms the face of the flange is also produced true and square and accurately concentrical to and in another portion of the flask. These parts of the flask being fitted together on accurate rabbets, the utmost accuracy is secured.

The operation of molding is as follows: The pattern C is placed with its flange *i* resting upon the top of the centering-ring B, and its central hub, *c'*, snugly fitting within the central hole, *c*, in said ring. The wide or middle part, A, of the flask is next placed in position, its rabbet closing over the edge of the centering-plate B, on which it rests in the bottom of the rabbet, as illustrated in Fig. 2. The lower part, H, of the flask is then placed upon the middle part, A, and this portion of the flask then rammed up, as shown in Fig. 3, a joint being provided at *j* for the after facility of placing the small core, or, as occasion may require, in getting out the patterns if made of greater diameter below, which is sometimes the case. These two parts A H of the flask are now turned over, and the pattern C withdrawn, as illustrated in Fig. 4. Next, the small core I is inserted in the print, as shown in Fig. 5, and this part of the mold is finished ready to receive the main core with the remaining part F of the flask.

The main core is made in the following manner: The centering-ring or plate-ring D is placed over the shoulder *h* of the core-box E, as represented in Fig. 7, and next the upper part, F, of the flask is inserted into the rabbet formed by the raised edge or flange of the centering-plate. The lower end of the core-box is seated upon the shoulder *k* of the bottom K, and the core-box is then rammed up with core-sand, as shown in Fig. 8. The core-box is then turned over, and the cylindrical portion E of the core-box and bottom K removed, as shown in Fig. 9, and as the centering-ring D nicely fits the neck of this part of the core-box, it serves to keep the fine edge of the sand at the corner of the rabbet from being broken in the withdrawal of the core-box, which is an important item in obtaining perfect results. The small holes in the flange are next provided for by inserting a hollow tube or plug successively into each of the holes drilled through the centering-plate D. This operation gives the required prints, in which small cores are afterward placed. The core L having been dried, it now remains but to withdraw ring D and put the main core in its place, as shown in Fig. 10, or completely closed, as represented in Fig. 1. The casting holes or runners *l* and *m* are provided in the upper part of the mold, as shown in Figs. 1 and 10.

As heretofore stated, I am enabled to use

hard white cast-iron in the construction of heaters by the use of my improved means for molding and casting the same, and I have found the best mixture of such iron to be one-half charcoal iron and one-half anthracite iron.

When the molten metal is poured into the mold the most perfect face-joint will be formed on the flange of the heater-casting, owing to the accuracy and precision of the different parts employed in forming the mold, and thus the heaters have the exact form and shape required imparted to them when cast, thus obviating all necessity for afterward turning or fitting the flanges.

The means heretofore described may be employed for casting heaters of any kind of cast metal; but they are especially useful in casting hard white cast-iron heaters, owing to the fact that it is practically impracticable to turn or refit the flanges of a heater cast of this kind of metal.

While I consider that the form and construction of parts hereinbefore described are most convenient and desirable for the purpose in view, I would have it understood that I do not limit myself to the exact construction hereinbefore described, as slight changes may be made without departing from the spirit of my invention.

I make no claim in this application to the construction of heater hereinbefore described, as such subject-matter is reserved for a separate application.

Having fully described my invention, what I claim, and desire to secure by the grant of Letters Patent, is—

1. In apparatus for molding and casting heaters for air-engines, the combination, with the core-box E, constructed with rabbeted ends, and provided with shoulder *f*, of greater width than the thickness of the centering-ring, of the centering-ring D, having flange *e*, and upper portion, F, of the flask, substantially as set forth.

2. In apparatus for molding and casting heaters for air-engines, the combination, with the core-box E, having rabbeted ends, and provided with shoulder *f*, of greater width than the thickness of the centering-ring, of the centering-ring D, having flange *e*, and provided with a circular row of small holes for accurately spacing the bolt-holes, and upper portion, F, of the flask, substantially as set forth.

3. In apparatus for molding and casting heaters for air-engines, the combination, with the core-box E, having rabbeted ends, and provided with shoulder *f*, of greater width than the thickness of the centering-ring, of the centering-ring D, having flange *e*, upper portion, F, of the flask, and bottom core-piece, K, substantially as set forth.

4. In apparatus for molding and casting heaters for air-engines, the combination, with the sections A, F, and H of the flask, of the detachable core I and main core L, the latter adapted to form the inside of the heater, and also serve as a cope, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 1st day of July, 1879.

ALEXANDER K. RIDER.

Witnesses:
GEO. W. STODDARD,
C. U. SADLIER.