(No Model.)

J. A. WOODBURY, J. MERRILL, G. PATTEN & E. F. WOODBURY.

AIR ENGINE HEATER.

No. 289,484. Patented Dec. 4, 1883.

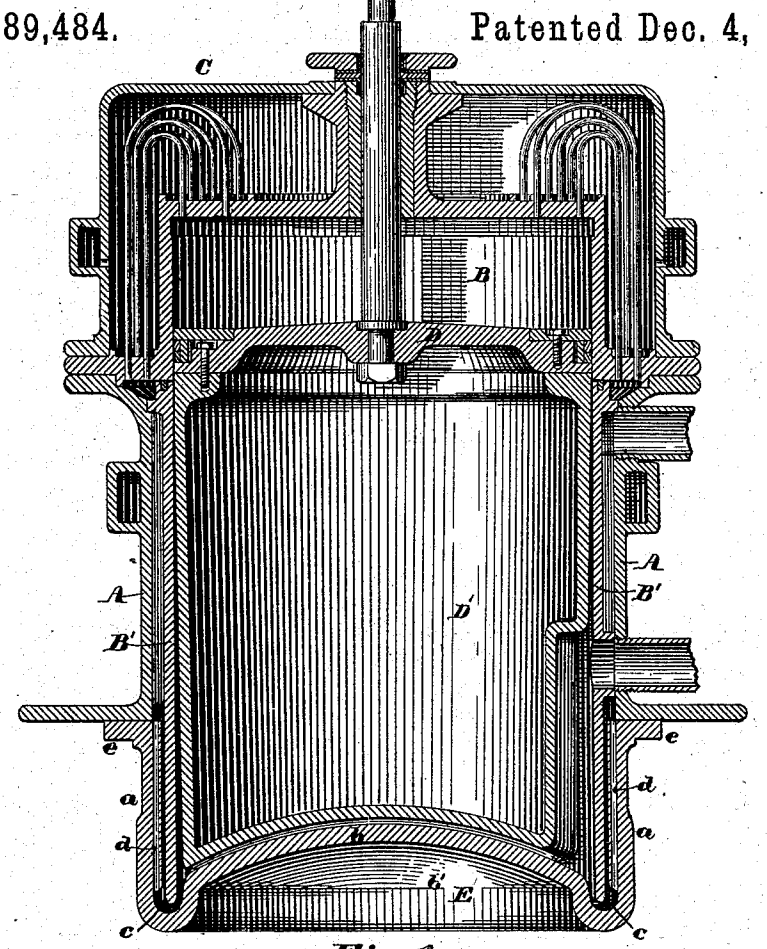


Fig. 1.

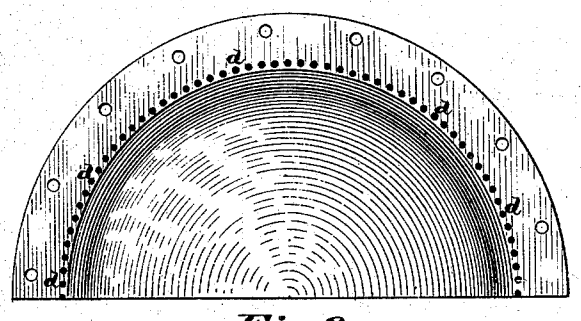


Fig. 2.

0 5 10 15 20

Scale of Inches.

Witnesses:

Walter E. Lombard.

E. A. Hemmenway

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UNITED STATES PATENT OFFICE.

JAMES A. WOODBURY, JOSHUA MERRILL, GEORGE PATTEN, AND EDWARD F. WOODBURY, OF BOSTON, MASSACHUSETTS.

AIR-ENGINE HEATER.

SPECIFICATION forming part of Letters Patent No. 289,484, dated December 4, 1883.

Application filed May 16, 1883. (No model.)

To all whom it may concern:

Be it known that we, JAMES A. WOODBURY, JOSHUA MERRILL, GEORGE PATTEN, and EDWARD F. WOODBURY, all of Boston, in the county of Suffolk and State of Massachusetts, have invented jointly a new and useful Improvement in Air-Engine Heaters, of which the following, taken in connection with the accompanying drawings, is a specification.

Our invention relates to the construction of heaters for air-engines; and it consists in a cast-metal heater in the form of a pan or vessel, having a cylindrical side wall and a dome-shaped bottom raised in the center, and provided with a series of small holes drilled longitudinally through said cylindrical wall parallel with its inner surface and with each other, and all opening into the interior of said heater at or near its bottom, through which holes a large part of the air must pass in when the reverser-piston ascends, and thereby be greatly subdivided and exposed to a greatly-increased heating-surface.

It further consists in the combination of a heater constructed as above described with certain other parts, which will be best understood by reference to the description of the drawings, and to the claims to be hereinafter given.

Figure 1 of the drawings is a central vertical section through the reverser of an air-engine illustrating our invention, and Fig. 2 is a half-plan of our improved heater removed from connection with the other parts of the engine.

In the drawings, A is the regenerator-cylinder, B cooler-cylinder, B′ the displacer-cylinder, C the cooler-cover, and D D′ the displacer-piston, all constructed, arranged, and operating substantially as described in another application of even date herewith.

E is the heater, cast in one piece, and having a cylindrical wall, *a*, of considerable thickness, and a bottom, *b*, the greater part of the area of which is raised above the extreme lower end of the heater, so as to form a dome-like cavity, *b′*, in the under side of said bottom and an annular channel or groove, *c*, in the interior of said heater, the greatest diameter of said channel being considerably greater than the inside diameter of the wall *a*, as shown. A series of small holes, *d d*, are drilled vertically through the wall *a*, near to and parallel with its inner surface and each other, each of said holes opening into and communicating at its lower end with the channel or groove *c*, as shown in Fig. 1. The heater E is provided with the flange *e* at its upper end, by which it is bolted to the lower end of the regenerator-cylinder A, and when so secured in place the inner surface of the wall *a* is parallel with and slightly removed from the exterior surface of the displacer-cylinder B′, so that when the piston D D′ ascends the air contained within the cooler is displaced and forced through the regenerator, and a portion passes downward in the form of a thin circular film between the displacer-cylinder B′ and the wall *a* of the heater, while other portions pass downward through the holes *d d*, thus dividing the body of air into a great number of small or thin divisions and subjecting it to a greatly-increased area of heating-surface.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. A cast-metal heater having a circular vertical wall, and a series of passages extending longitudinally through said wall, and opening at their lower ends into the interior of said heater, substantially as and for the purposes described.

2. The heater E, provided with the vertical wall *a*, the dome-shaped bottom *b*, the annular channel *c*, and the series of passages *d d*, made longitudinally through said wall *a*, and opening into the channel *c*, substantially as described.

3. The combination of a heater having a circular vertical wall, and a series of passages made longitudinally through said wall, and

opening into the interior of said heater at their lower ends, a regenerator-cylinder to which said heater is bolted by its upper end, and a displacer-cylinder which extends to near the bottom of the interior of said heater without touching its vertical wall, substantially as described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, on this 14th day of May, A. D. 1883.

JAMES A. WOODBURY.
JOSHUA MERRILL.
GEORGE PATTEN.
EDWARD F. WOODBURY.

Witnesses:
E. A. HEMMENWAY,
WALTER E. LOMBARD.