M. POND.

Hot Air Furnace.

No. 35,541. Patented June 10, 1862.

Fig. 4

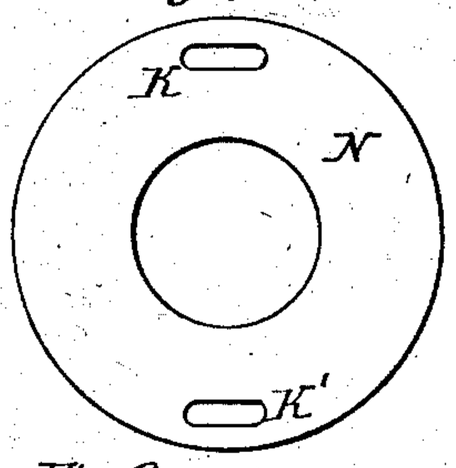


Fig. 3.

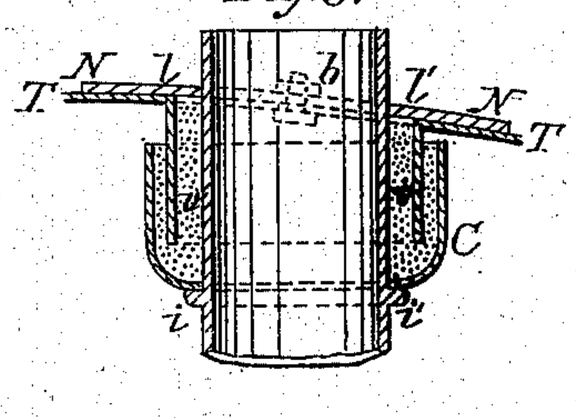


Fig. 5.

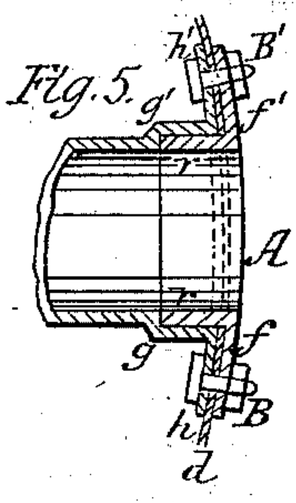


Fig. 2.

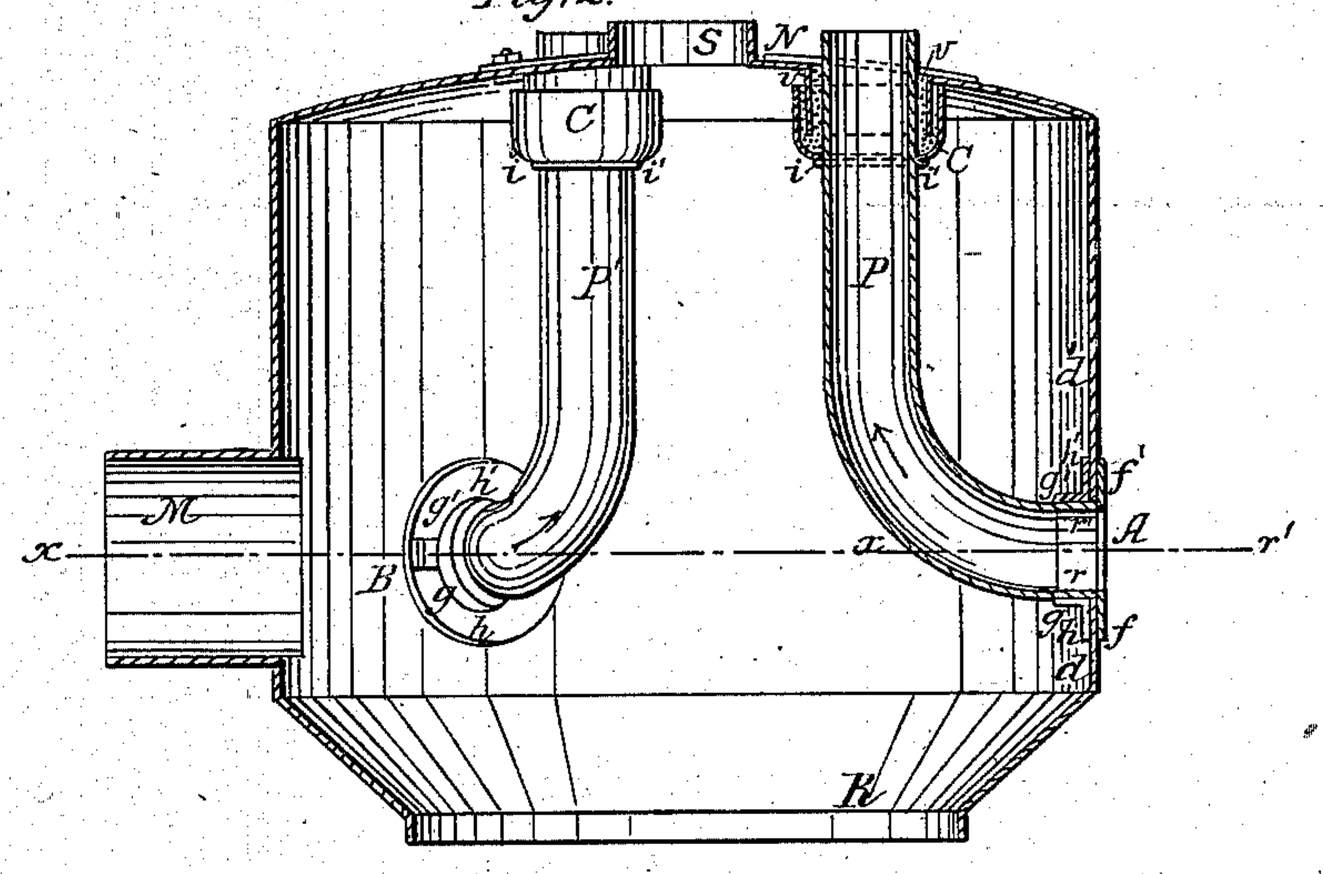
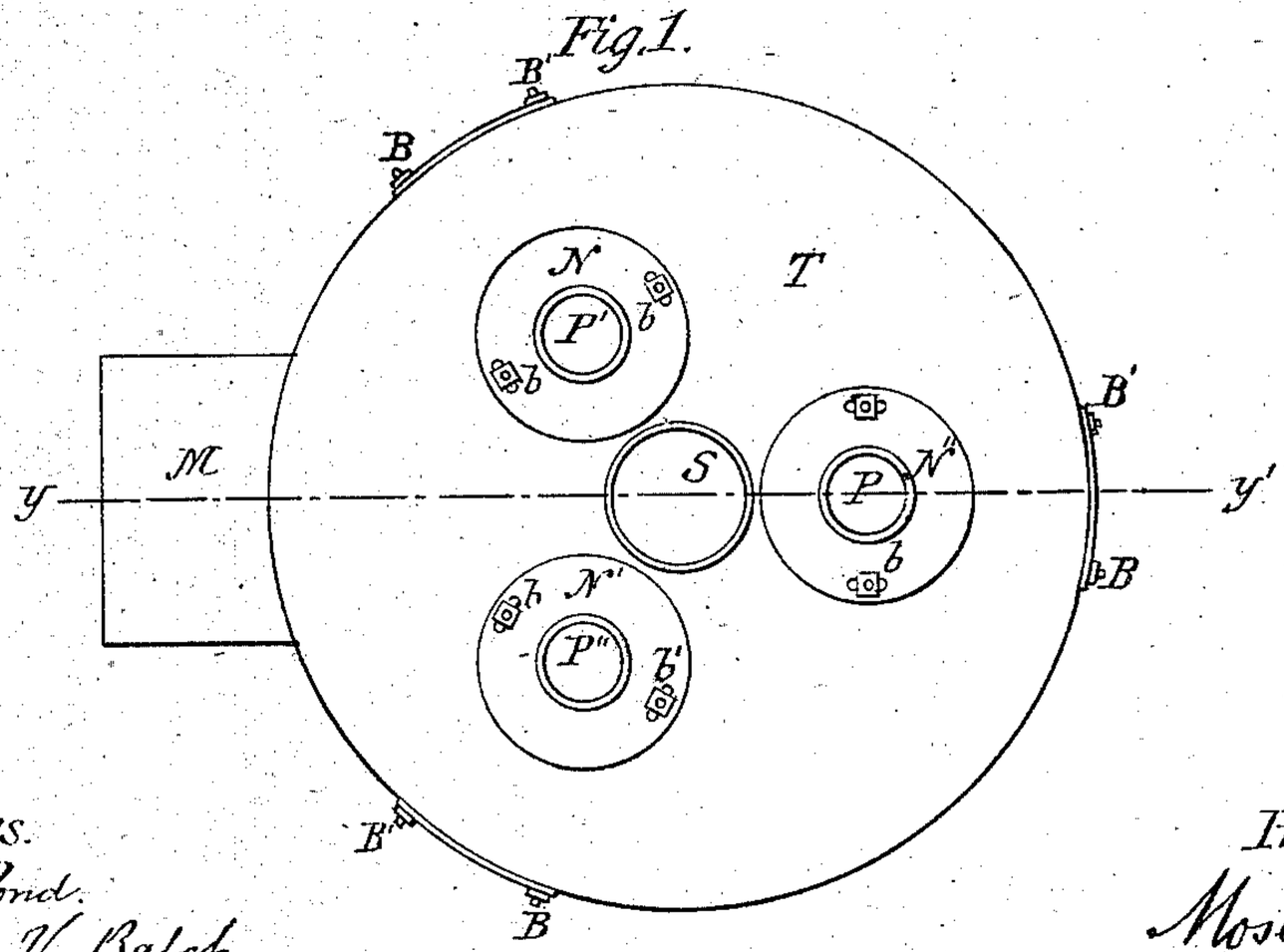


Fig. 1.



Witnesses.
Geo. E. Pond.
Francis V. Balch.

Inventor.
Moses Pond

UNITED STATES PATENT OFFICE.

MOSES POND, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN HEATERS.

Specification forming part of Letters Patent No. **35,541**, dated June 10, 1862.

To all whom it may concern:

Be it known that I, MOSES POND, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and Improved Mode of Constructing Hot-Air Furnaces and Stoves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a top view of the drum or dome of a furnace containing my improvements. Fig. 2 is a vertical transverse and central section (on the line *y y'* of Fig. 1) of the dome and of one of the pipes therein contained, more particularly described hereinafter. Fig. 3 is an amplified view of the upper portion of one of the pipes, embracing its cup and the parts adjacent thereto. Fig. 4 is a larger view of the flange or collar, of which three are represented in Fig. 1. Fig. 5 is a horizontal central section of one of the pipes at its lower mouth on the line *x x'* of Fig. 2.

I have long observed that much of the heat evolved in a furnace escapes through the smoke-pipe to the chimney and is lost to use from the difficulty of bringing enough radiating-surface near the fire.

The object of this invention is to economize a portion of such heat, otherwise wasted, by the following apparatus.

Into the drum or dome of the furnace I introduce one or more suitably-prepared tubes or pipes, of iron or other material, which pipes are so arranged as to convey external air up into the dome and over the fire, where it becomes heated, and thence into the air-chamber, where it mingles with the hot air which has been thrown off, as in ordinary furnaces, by radiation. In ordinary furnaces heat is procured by radiation from the outer surface of the dome; but my invention, while not diminishing any of the caloric volume so obtained, increases it by the quantity which is carried through the interior pipes, before referred to, and discharged into the air-chamber. In this way it adds to the efficient heat-producing power of the furnace. These pipes are now so perfected as to obviate three objections, which I at first met in attempting to use them, and hence may be said to possess at least three advantages, as follows: First, the necessary expansion and contraction of the pipes from becoming hot and cold, and their consequent displacement and danger of cracking, are provided for; second, the gases and smoke are prevented from escaping around the pipes into the air-chamber; third, the pipes can be taken out and replaced at pleasure.

I now proceed to a more specific description of the pipes and their method of operation, by the aid of drawings taken from the model.

In the drawings, M is the mouth of the furnace; R, the lower ring or rim of its dome, which rests on the fire-pot, containing the burning fuel. P, P', and P'' are three of the pipes to be described; T, the top of the dome, above and around which is the air-chamber; S, the smoke-pipe.

Each pipe is constructed and adjusted as follows: Beginning at its lower end, at the lower part of the dome, Figs. 5 and 2, A represents the mouth of the pipe, open to the outer air. *d d'* is the line of the portion of the dome adjacent to the mouth of the pipe. Around this mouth A, on the exterior surface of the dome, runs a circular flange, *f f'*, with a rim, *r r'*, reaching into the pipe. Inside the dome the pipe has a shoulder, *g g'*, terminating in a flange, *h h'*, which laps along the inner surface of the dome *a a'*, around the pipe, as the outer flange, *f f'*, does along its exterior. The pipe, the shoulder *g g'*, and flange *h h'* are cast in one piece, and the outer flange, *f f'*, with its rim *r r'*, in a second piece, which method of casting will be found the best. The pipe, thus armed with its shoulder *g g'* and flange *h h'*, is secured to the outer flange, *f f'*, and its rim *r r'* by bolts B B', each consisting of a nut and screw. These bolts run through the two flanges and the dome and bind all three tightly together. Moreover, between the shoulder *g g'* and the rim *r r'* is spread, when they are brought together, a thin layer of cement, and the joint being thus secured the whole is bolted upon the dome by the bolts B and B', as aforesaid. In this way the lower part of the pipe is made perfectly air-tight, for the outer flange, with its rim, exactly covers the joint of the pipe and dome and fits the recess in the pipe contrived at its shoulder for the reception of the rim. In addition, the cement which has been crowded in must remain fixed, there being no outlet for it, and thus the joint is bolted air-tight. The pipe

thence leads up the dome through an aperture (whose diameter is the line *l l'*) in its top T, and opens into the air-chamber. If the position of the pipe were unaffected by the heat of the fire, this aperture *l l'* might be cut to fit the pipe, and the latter secured immovably to the top; but the pipe when heated must expand, and in expanding is thrown forward or inward toward the center of the dome by a considerable amount. It is obvious, therefore, that with this constant pressure inward by heat and shrinking outward or backward by cooling again the pipe would soon loosen in its upper socket, or break, and the gases would escape around it into the hot-air chamber, and thence ascend by the various conduits to the building above. To remove this difficulty I introduce an expansion and contraction joint, with its accompanying contrivances, (Figs. 3 and 2 chiefly,) as follows: Near the top of the dome, but before the pipe emerges therefrom, is a shoulder, *i i'*, running round the pipe, on which rests a cup, C. This cup C may be cast solid on the pipe with it and the shoulder, but it will more easily be cast separate and set upon the shoulder. This cup, too, may be of any suitable size, so that it does not interfere with the other cups, and allows the pipe full liberty to play forth and back in its expansions and contractions. With the cup is connected another contrivance, as follows: On the exterior surface of the top of the dome, and near the top of the pipe which it surrounds and to which it is suitably fitted, is a movable plate or follower, N N' N'', Figs. 1, 2, or 3, whereof Fig. 4 is a larger projection. In the drawings, this follower or "collar," as we may properly style it, is a circular flange similar in general shape to the immovable flange *f f'* at the other extremity of the pipe, and fastened to the dome by bolts *b b'* similar to the bolts B B'; but this collar N (N' or N'') is cut with two oblong slots, K K', by which the collar may play between the bolts and the dome, to which the bolts secure it; hence whenever the pipe expands the movable collar N follows it along, sliding on the dome by the aid of the slots. It has just been said that the collar is "suitably fitted" to the pipe; but it must not sit so tightly as to impede the pipe in the expanding of the latter upward on being lengthened by the heat.

The aperture *l l'* is of greater diameter than the pipe and of less diameter than the cup. In the drawings its diameter is about a mean between that of the pipe and that of the cup. This aperture is bounded by a rim, *v v'*, Figs. 3 and 2, which is cast solid with the top of the dome and projects downward therefrom into the cup, not entirely reaching its bottom. The cup is nearly filled with sand, (represented by the black dots in Figs. 3 and 2,) and inside the rim *v v'* the sand is filled higher up toward the top of the rim and the dome and the movable collar N. However, the sand will soon reduce and level its inequalities in height inside and outside the rim by its own shiftings. From this contrivance it is apparent that the pipe may lengthen or shorten, may move forward or backward, as its expansion and contraction force it to move, and yet by the shifting of the sand inside the cup the joint at the top between the pipe and the dome is always kept perfectly air-tight. It might be expected that some of the sand would be dislodged and blown out by the powerful draft of the furnace; but as the collar N fits conveniently close to the pipe it overlaps the rim *v v'* and acts as a sort of sliding cover to prevent any current or draft from carrying off the contents of the cup.

In the working-furnace, pipes may be inserted through the outer casing of the furnace, conducting external air across the hot-air chamber into the lower mouths of these hot-air pipes, now fully described.

What I claim as my invention, and desire to secure by Letters Patent, is—

The upper joint of the pipe, consisting of the cup or its equivalent, with the sand and the collar N with its elongated slots K K' and the rim projecting into the cup, or its equivalent, all constructed substantially as above specified and operating as described, so as to allow the expansion and contraction of the pipe, and at the same time, by making the joint air-tight, to prevent gas and smoke from escaping into the hot-air chamber.

MOSES POND.

In presence of—
GEORGE E. POND,
FRANCIS V. BALCH.