(No Model.) 2 Sheets—Sheet 1.

L. PATRIC.

HOT AIR FURNACE.

No. 317,005. Patented May 5, 1885.

Fig. 1.

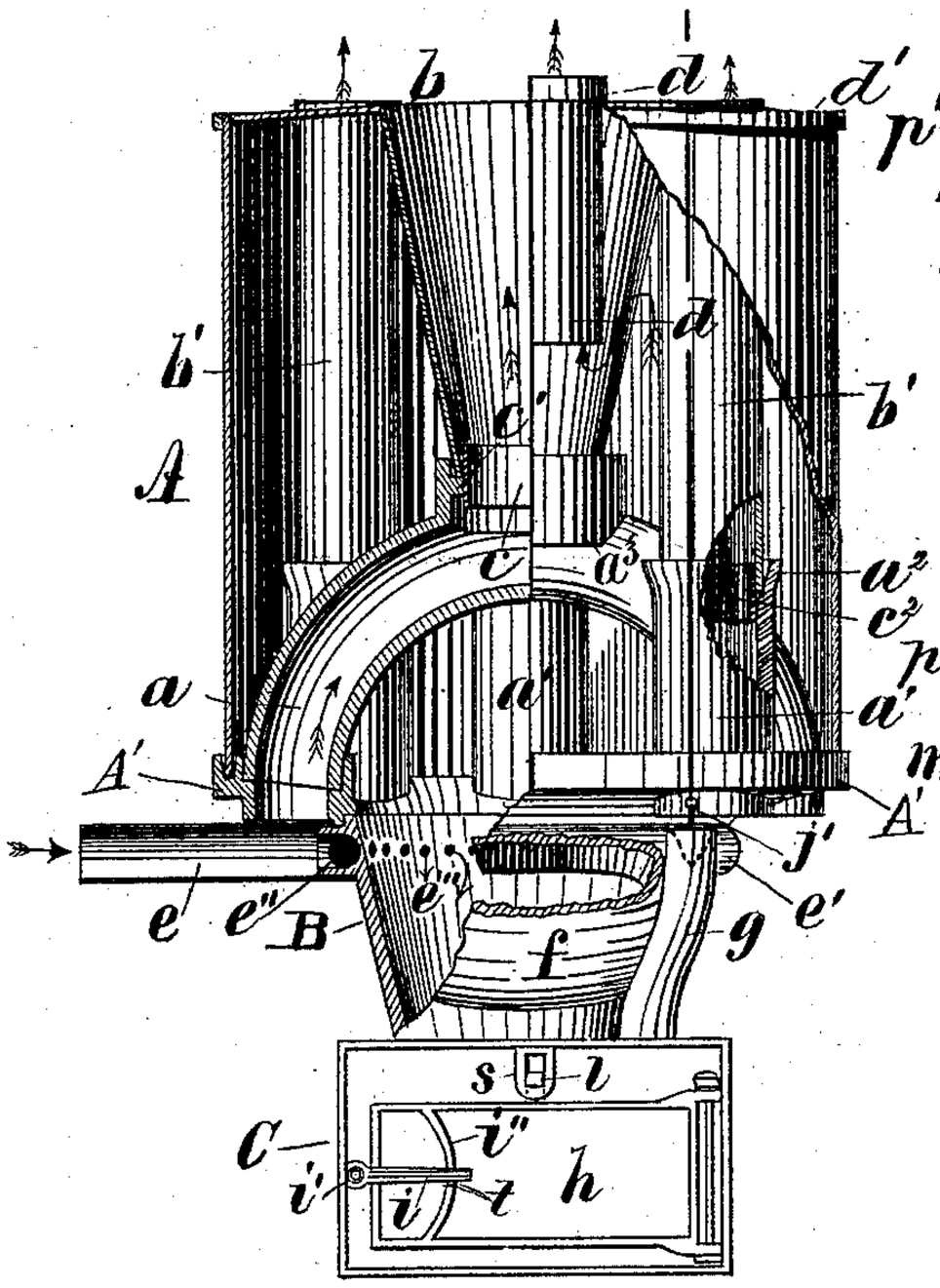


Fig. 2.

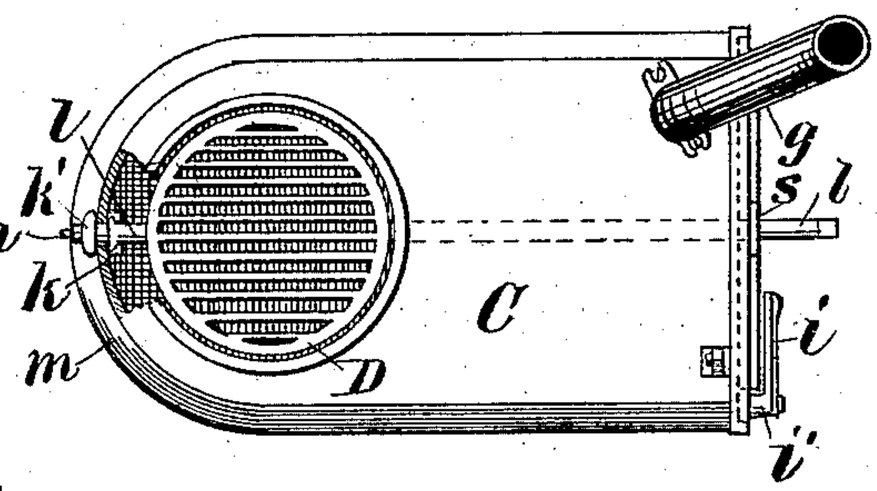


Fig. 3.

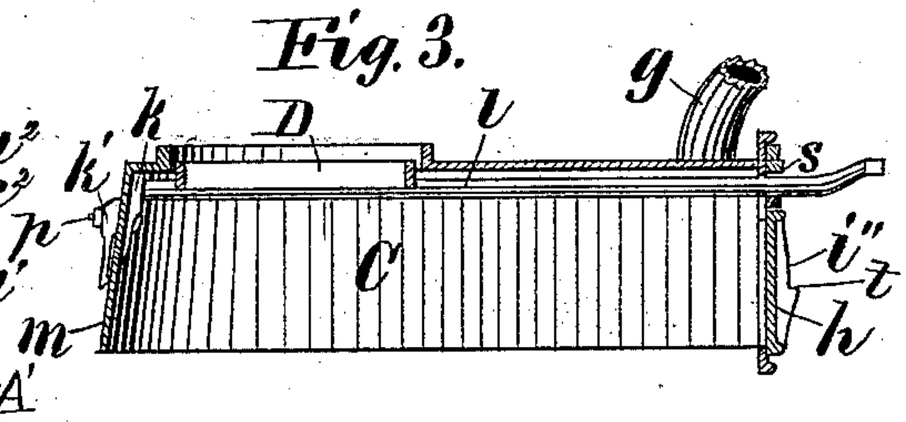
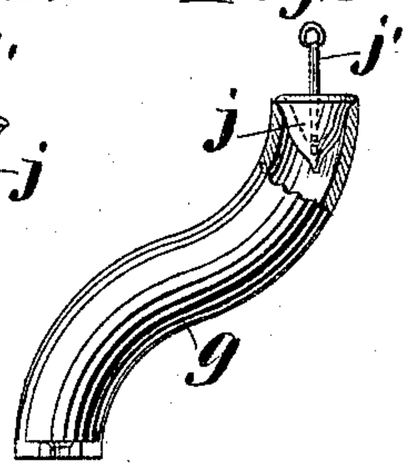


Fig. 4.

Fig. 5.



Attest
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Lewis Patric
per B. C. Converse, Atty.

(No Model.) 2 Sheets—Sheet 2.

L. PATRIC.

HOT AIR FURNACE.

No. 317,005. Patented May 5, 1885.

Fig. 8.

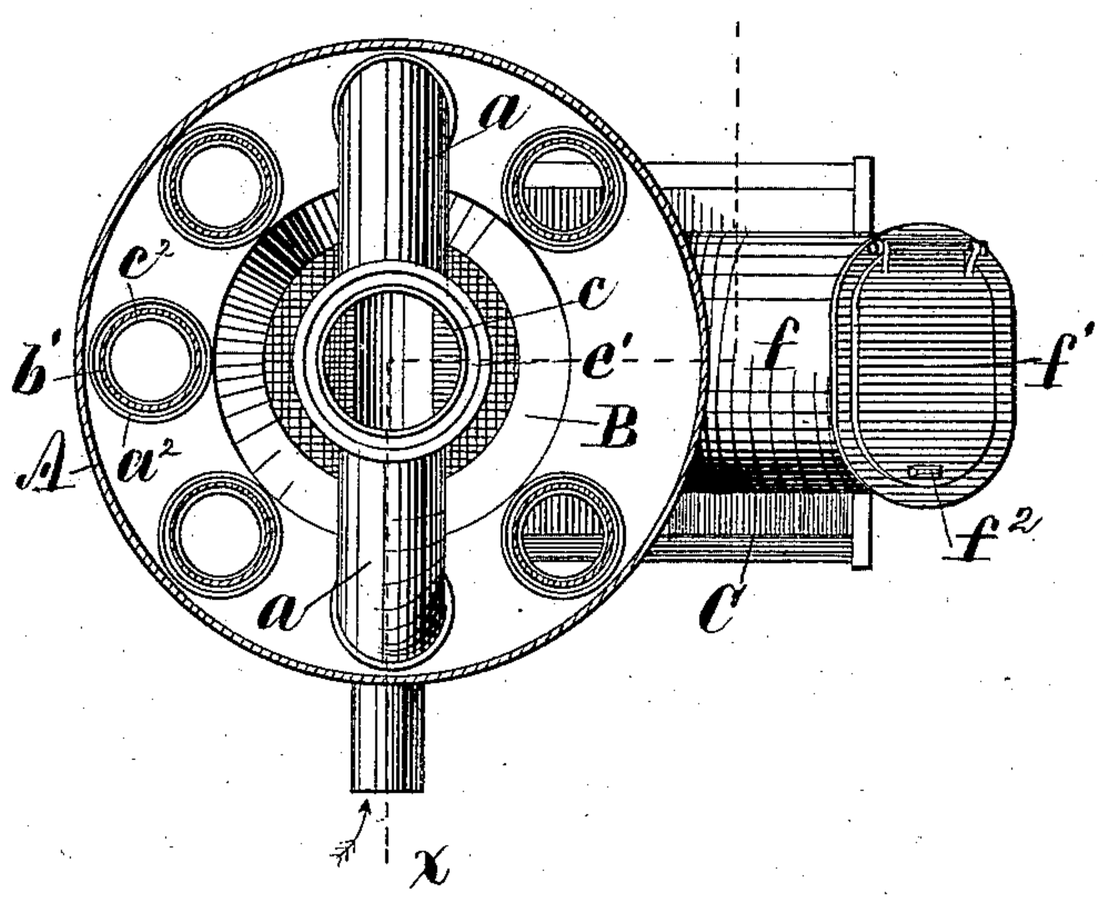


Fig. 9.

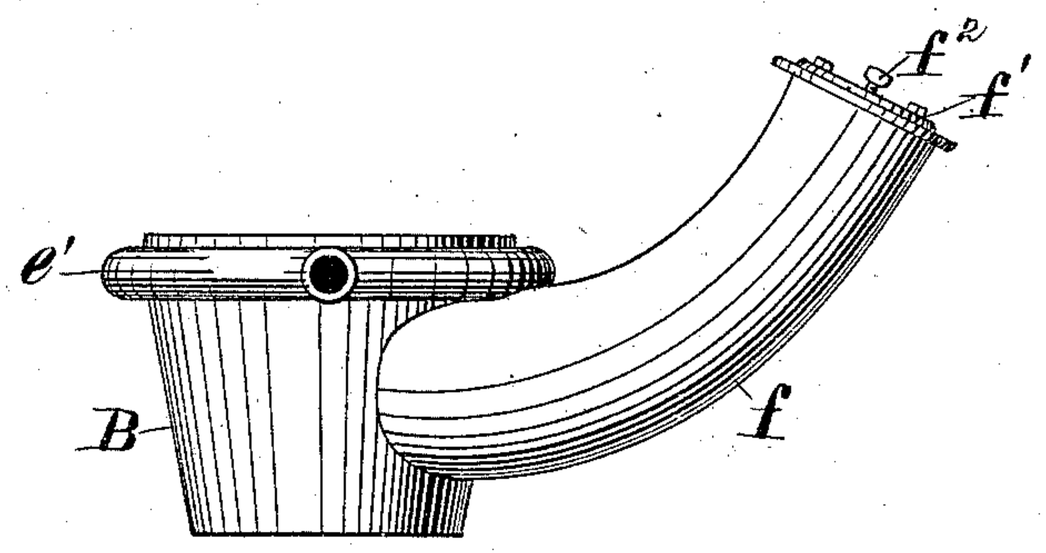


Fig. 6.

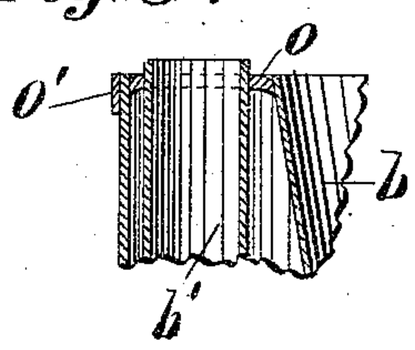


Fig. 7.

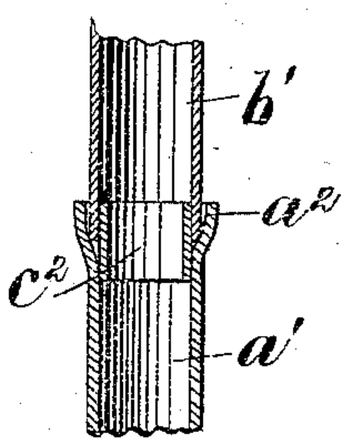
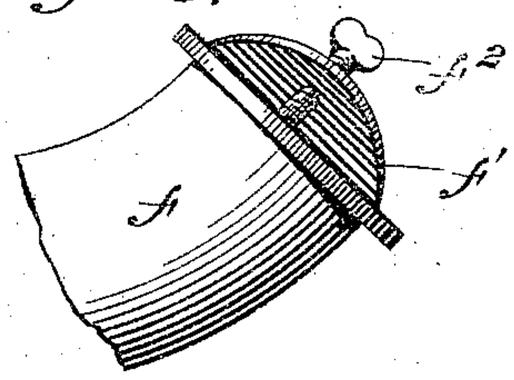


Fig. 10.



Attest
Ora Converse
G. M. Gridley

Inventor
Lewis Patric
per B. C. Converse, Atty.

UNITED STATES PATENT OFFICE.

LEWIS PATRIC, OF SPRINGFIELD, OHIO.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 317,005, dated May 5, 1885.

Application filed May 7, 1883. (No model.)

To all whom it may concern:

Be it known that I, LEWIS PATRIC, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Hot-Air Furnaces; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to certain improvements in hot-air furnaces.

My invention consists in the construction of an open fire-bowl, whereby a more direct heat is transmitted to the pipe which spans said fire-bowl and the series of vertical pipes surrounding the latter, all of which receive the cold air from below the drum and conduct it through the same; also in the combination, with the fire-bowl, of a coking-chamber by a peculiar construction of the feed-pipe leading into the same, the coal being retained in the feed-pipe near the fire-bowl until the smoke, tar, and gases are first consumed and soot or carbon deposits prevented.

My invention further consists in the manner of connecting the cast-metal pipes formed on the bottom plate with the sheet-metal pipe-sections which form the extensions of the former through the drum.

Two sheets of drawings accompany this specification.

Figure 1 is a vertical section through the furnace, with a portion of the fire-bowl and its coking and feed chamber broken away to exhibit the interior. Fig. 2 is a top view of the ash-box detached. Fig. 3 is a vertical longitudinal section through the same. Figs. 4, 5, 6, and 7 are details. Fig. 8 is a view from above of the lower half-section of the furnace. Fig. 9 is a side elevation of the fire-bowl with its coking-chamber and feed-pipe. Fig. 10 represents a detail view of the exterior end of the magazine, its cap, and means of adjustment.

A represents the drum of the furnace, B the fire-bowl of the same. C is the ash-box below the latter.

Although the air-pipes are inclosed in a sheet-metal drum, A, it is intended that the whole furnace shall be inclosed with brick-work to prevent the escape of heat, except into the proper channels.

The ash-box C, which supports the furnace, is oblong, with its rear end rounded, and it is made of heavy iron, inclosed on all sides and top, except the circular opening for the grate D. This latter is provided with a long shaft, *l*, extending from the inner rear wall forward through the front wall over the door *h*, as seen in Figs. 1, 2, and 3.

The fire-bowl B is of peculiar and novel construction, consisting of a thick conic frustum with the smaller end resting upon the top of the ash-box encircling the grate D. A complete circular chamber, *e'*, extends around the top of the bowl, which is cast in the same. There is but a single outside opening, *e''*, in it, into which the cold air is conducted by the horizontal pipe *e*, which extends outside the wall usually built around the furnace. The object of this annular chamber, as will be seen by the arrows, is to conduct the cold air into the top of the fire-bowl, over the burning fuel, through the apertures *e'''*, which open from its inner periphery directly therein. These apertures are small and numerous, extending entirely around the inside of the bowl.

On one side of the fire-bowl is seen the long curved coking-chamber and feed-pipe *f*. This curves upward and outward from the fire-bowl, extending to the outside of the furnace-wall. It is oval in cross-section, as seen in the view Fig. 10, and has an adjustable door-cover on the end *f'*, which is regulated by the thumb-screw f^2 to admit a greater or less quantity of air through the pipe *f*.

To prevent choking the pipe, it is made with gradually-enlarged diameter from its end to its connection with the bowl B, with which it is cast integral. It is but slightly inclined toward the fire-bowl for the purpose of preventing self-feeding of the fuel.

The base of the drum consists of a heavy circular plate cast with holes for the system of pipes which extend into and through it. This plate A', unlike that of any other used in furnaces of this kind, has the lower section (consisting of about one-third) of each of its vertical pipes *a'* cast integral with the plate, as seen in Fig. 1. The upper ends of these

cast-pipe sections *a'* are made flaring, to allow the heavy sheet-iron pipe-sections *b'*, which constitute the remaining (upper) two-thirds of the pipe to be driven into them, and also to allow this joint to be self-calking from the falling (accumulative) ashes which will collect therein around the male section *b'*. (See Figs. 1 and 12.) A short inner sleeve, c^2, extends down into the pipe-section *a'*, below the flaring end a^2, and covers the joint, as seen in the view Fig. 12.

This mode of constructing a self-calking joint in a furnace-pipe is an important feature in my invention. The pipes, as seen in the drum, Fig. 1, do not extend below the lower plate but a trifle as compared with those seen in my former patent, issued May 5, 1874, to Lewis Patric, hot-air furnaces, No. 150,603, on which this is an improvement in many respects. Extending from one side of the drum to the other, with its ends opening through the bottom plate, A', is seen the arch-pipe *a*, spanning the top of the fire-bowl B. It has a cylindrical top, a^3, opening at the crown, about double the diameter of its curved pipe *a*, and into this opening is driven the inverted conic frustum *b* of sheet metal. A short inner sleeve, *c*, is inserted over the joint to insure a smoke-tight connection. The lower end of the frustum *b* rests upon a shoulder, *c'*, inside the central pipe, a^3, of the arch-pipe *a*, to give it a firm seat. The frustum *b*, as well as the vertical pipes, all pass through the top head or plate of the drum, and are firmly calked to prevent any escape of smoke or gas. The top plate, *d*, is slightly arched upward, and held in place by a heavy hoop, *d''*, as seen in Figs. 1 and 12. To carry off the denser gases produced by combustion, the smoke-pipe *d* extends down through the top plate, *d'*, about one-third the depth of the drum. Owing to the number of pipes extending through and within the drum, there is in connection with the latter a very large extent of heating-surface. The air admitted through the arch-pipe *a*, which escapes upward, passes through the central pipe, a^3, into the frustum *b*.

The functions of the frustum which is shown in my former patent, before mentioned, being sufficiently described therein, it is unnecessary to mention them here. The difference, however, in the conduits which lead to it in this application from the other is obvious. Instead of the horizontal pipes extending to it from the vertical flues, as in the former patent, I use the arch-pipe *a*, as being a better form of conductor, as bringing the induction end of the frustum nearer to the top of the fire-bowl, and therefore generating more heat in the air passing through it in a given time. It also receives the cold air directly through the base-plate A', instead of indirectly through the connection with the vertical pipes, as in the former patent, before mentioned, and therefore obviates the necessity of cutting openings in said vertical pipes to make connections therewith. It also gives a much firmer seat for the frustum, and makes the system of connections stronger. An under draft can be had through the ash-box C by means of the upright cyma-reversa pipe E. (Seen in Figs. 1, 2, and 3, and in the detail Fig. 6.) This pipe stands upon the ash-box a little to one side of the feed-pipe *f*, opening into the former. Its upper end is provided with a pendant-shaped valve, *j*, the stem *j'* of which is connected by a wire or cord with the apartment over the furnace. This cord may extend over a pulley, or other means may be used to raise and lower the valve and to regulate the same. When it is desired to close up the furnace and lessen the supply of air below, this valve can be let down into its seat, and when necessary to start the fire it can be raised.

In operating my furnace, the coking-chamber *f* is filled through the door *f'* with coal, and a sufficient quantity is pushed into the fire-bowl to charge it, after which the coking-chamber is kept filled, so that the heat of the fuel burning in the bowl B will gradually coke that which is nearest it in the magazine, and the admission of air through the apertures over the latter facilitates burning the gas, smoke, and tar from it, and better prepares it for being used in the fire-bowl. By this means I obtain all the heat from the combustion of the volatile portions of the coal first, and prevent the formation and deposit of soot or carbon; and by producing a draft through the coking-chamber I throw the flame away from the body of fuel therein toward the opposite side of the fire-bowl, thus freeing the mass of coal which is being coked from the flame and smoke emitted therefrom, and consuming the latter before it ascends within the drum.

I claim as my invention—

1. In a hot-air furnace, the combination of an open frustum-shaped fire-bowl, a curved feed-pipe, and magazine slightly inclined toward the latter to prevent self-feeding of the fuel, said magazine being provided with a cap and means for adjusting the same, substantially as set forth.

2. In a hot-air furnace, the combination of an open frustum-shaped fire-bowl, a curved feed-pipe and magazine leading therein, slightly inclined toward said fire-bowl and provided with a cap and means for adjusting the same, said fire-bowl being formed with an annular recess in its top end, with an inlet-pipe, and interior apertures opening over the mouth of said magazine, substantially as and for the purpose set forth.

3. In a hot-air furnace, an open frustum-shaped fire-bowl, in combination with an arched pipe spanning the latter, a crown-pipe connecting said arched pipe centrally over said fire-bowl, with interior shoulders, an inverted conic frustum resting on the latter, a series of cold-air pipes surrounding said inverted conic frustum, and a shell inclosing

the whole, said inverted conic frustum deflecting the heat from the fire-bowl toward said cold-air pipes, substantially as set forth.

4. In a hot-air furnace, the combination, with magazine *f*, having the projecting flange at the exterior end of the same, of the hinged cap or door *f'* and the thumb-screw f^2, the latter engaging said flange, substantially as and for the purpose set forth.

5. In a hot-air furnace with interior air-pipes exposed on their outer surface to the heat of the same and to the products of combustion, a self-filling joint connecting the sections of cast and sheet metal pipe, said joint consisting of the flared end of the cast-metal section, an inner sleeve, of sheet metal, driven therein to make the joint gas-tight, and a sheet-metal pipe extending over said sheet-metal sleeve, the annular cavity around the latter being filled by the ashes escaping from the fire-bowl.

6. In an air-pipe for a hot-air furnace, a cast and a sheet metal section united, re-enforced, and made gas-tight by an internal sleeve covering the joint of said cast and sheet metal sections, said sleeve being of sheet metal and first driven into the cast-pipe section before connecting the sheet-metal section therewith.

7. The combination, with the open fire-bowl, of arch-pipe *a*, crown-pipe a^3, with inner shoulder, *c'*, and frustum *b*, the latter being supported at the lower end by said crown-pipe and arched pipe, and resting upon said inner shoulder, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LEWIS PATRIC.

Witnesses:
B. C. CONVERSE,
E. F. HILL.