

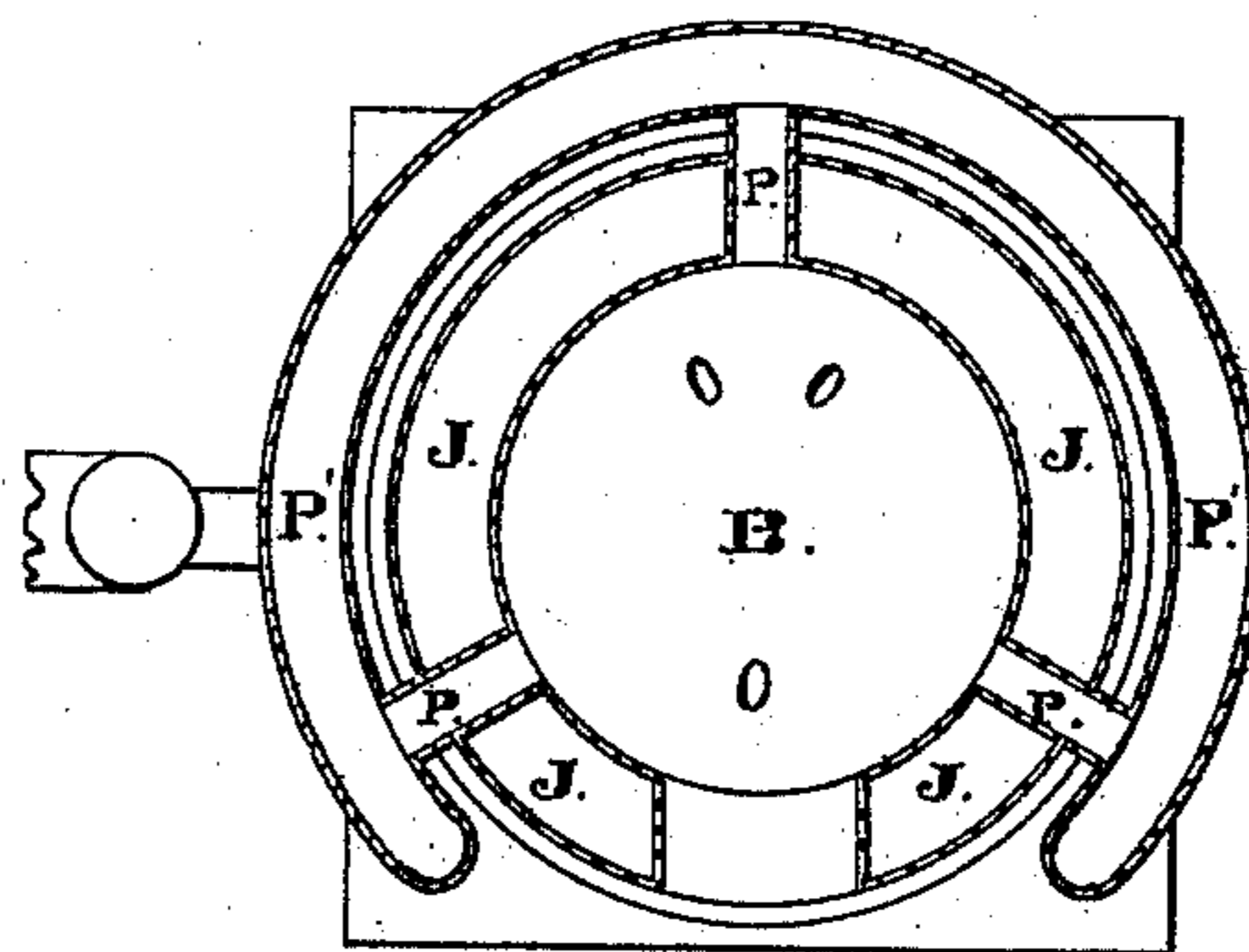
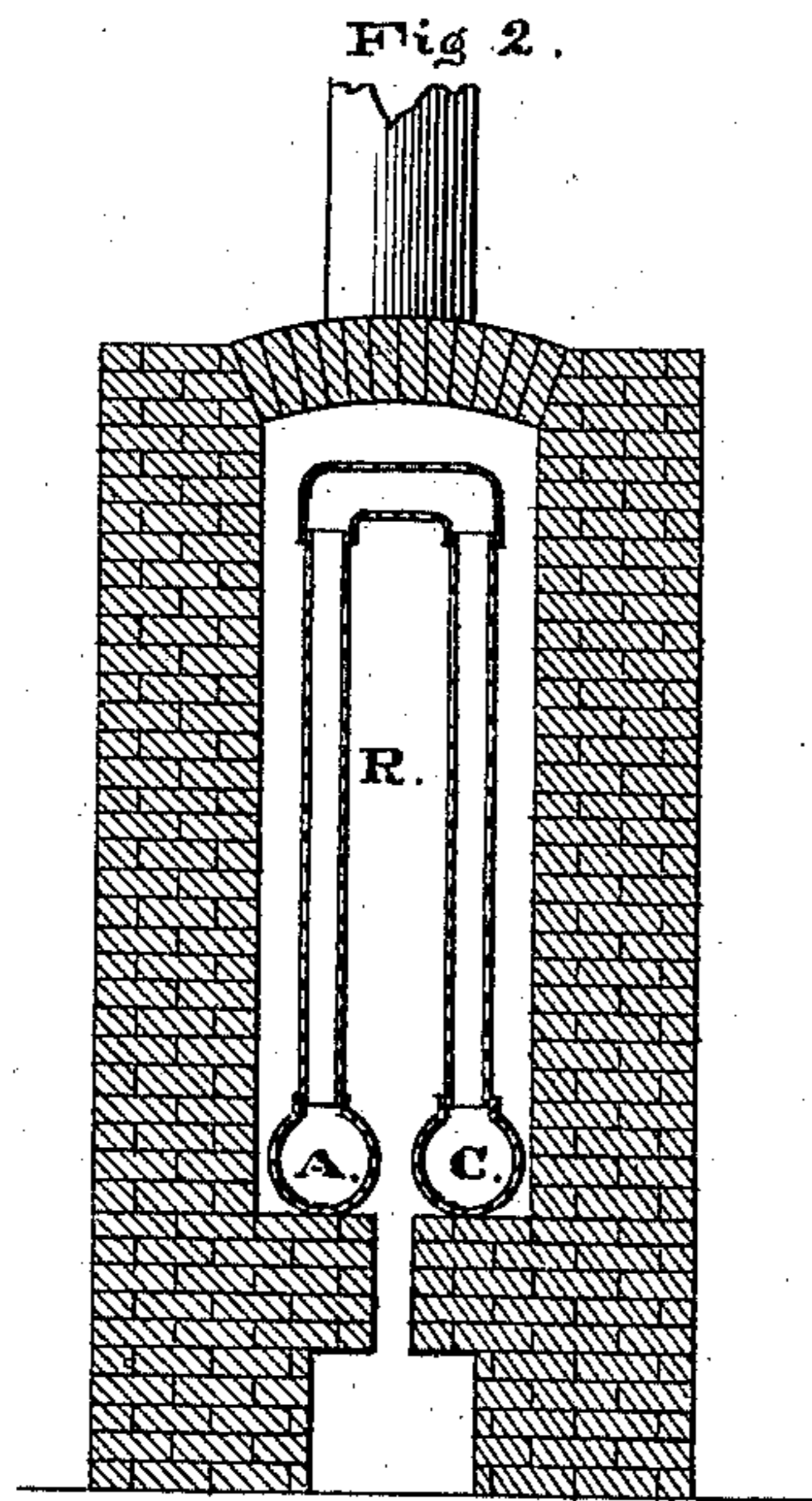
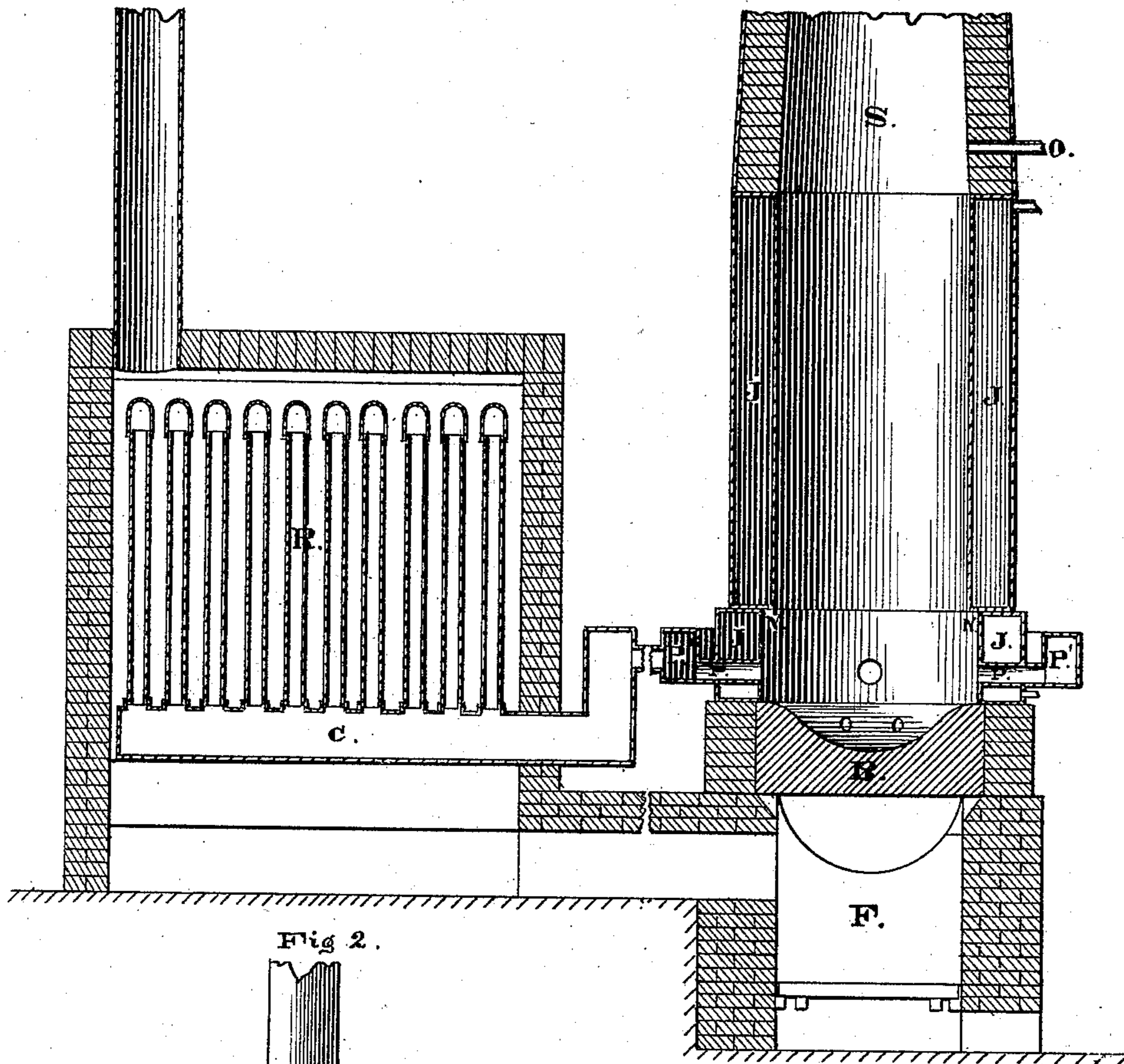
(No Model.)

2 Sheets—Sheet 1.

E. G. SMITH & C. BELL.
SMELTING FURNACE.

No. 316,669.

Patented Apr. 28, 1885.



WITNESSES.
Wm H Hamilton.
Ed C Humphrey

INVENTORS.
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PER B. B. Brewer
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(No Model.)

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Fig. 5.

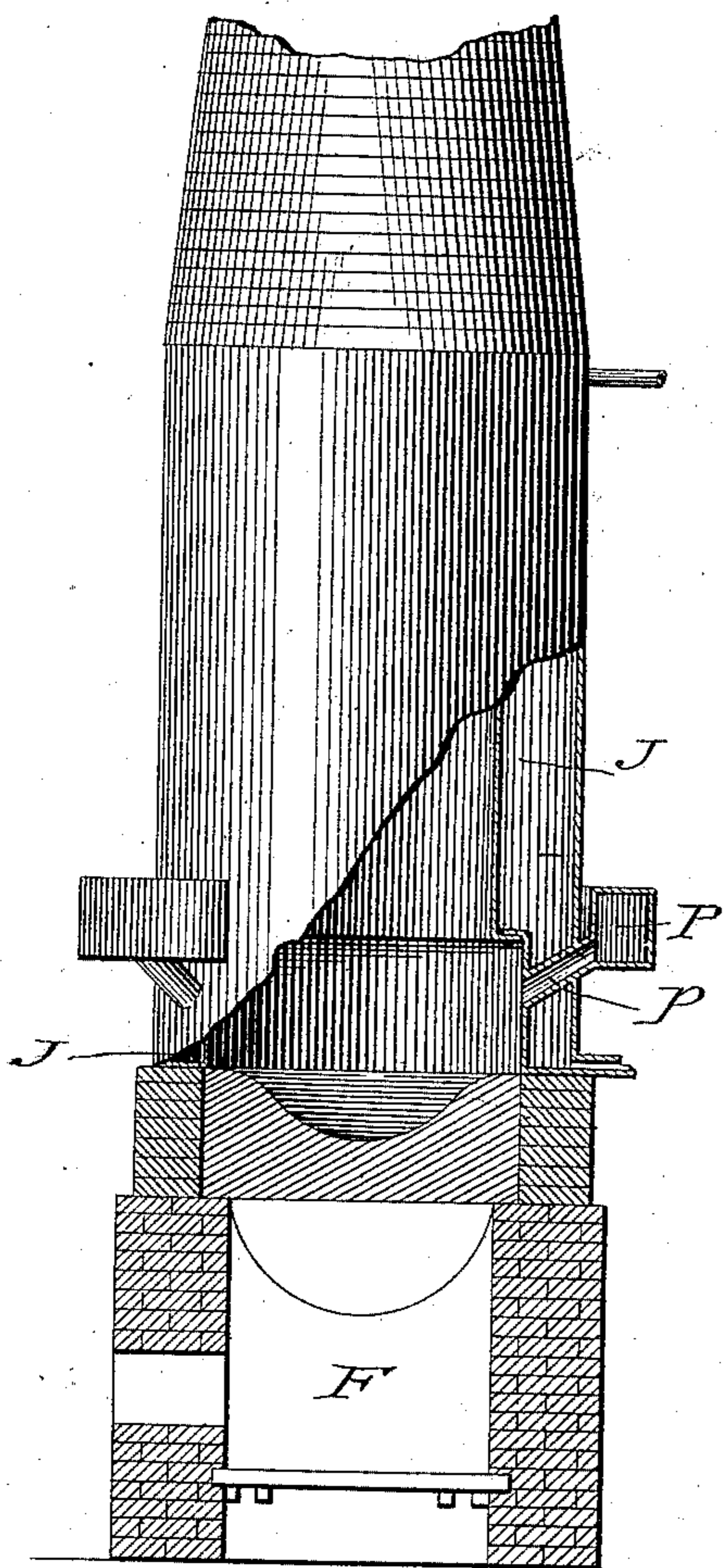
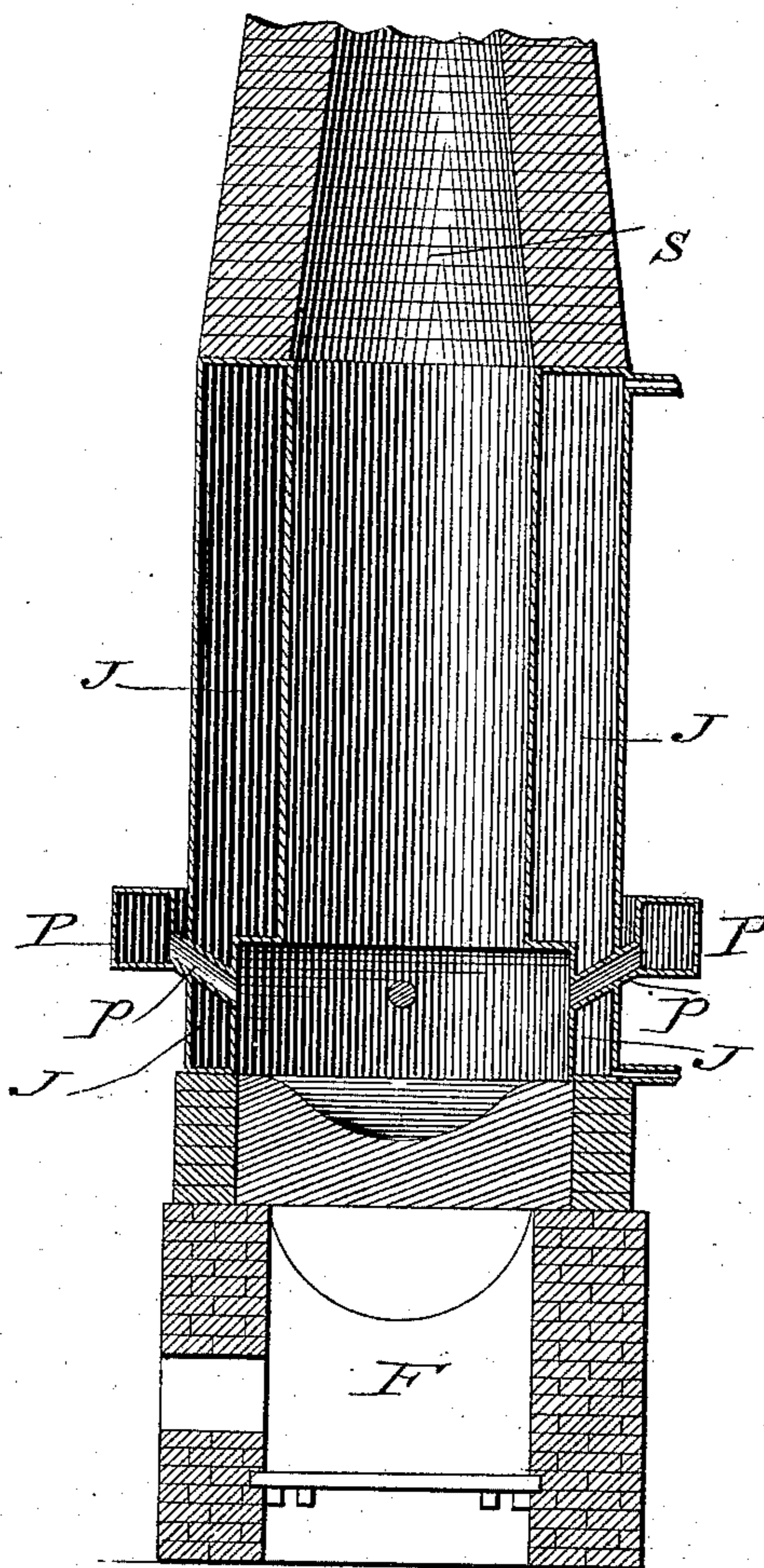


Fig. 6.



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UNITED STATES PATENT OFFICE.

EDWIN G. SMITH AND CHARLES BELL, OF SACRAMENTO, CALIFORNIA,
ASSIGNORS OF ONE-THIRD TO B. B. BREWER, OF SAME PLACE.

SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 316,669, dated April 23, 1885.

Application filed March 22, 1884. (No model.)

To all whom it may concern:

Be it known that we, EDWIN GUY SMITH and CHARLES BELL, both of the city of Sacramento and State of California, have invented a new and useful Improvement in Smelting-Furnaces, of which the following is a specification.

The invention relates to that class of furnaces used for smelting and reduction of ores and metals, wherein coke, coal, or other carbonaceous substances are used, and we use hot air instead of cold air, and for the purposes hereinafter mentioned.

The object of this invention is to construct a furnace so as to use the combustible material to the best advantage and to obviate the difficulty of furnaces freezing or clogging up.

The invention consists in the construction of an independent or auxiliary furnace or fire box under the main crucible or smelting-furnace, an independent bottom to the main crucible composed of fire-clay or other suitable substance, and a water-jacket made in two sections or circular rings, the lower section of which is a little larger in diameter than the upper, or made in one section with a projection formed on the inside plate of which the water-jacket is made, thereby producing an overhanging edge or projection which serves to protect the tuyeres or air-passages from being clogged up by the material in the furnace, being crowded against them. It also allows the mass in the furnace to loosen up a little, and makes it easier for the air to penetrate and render more perfect combustion, consequently more intense heat. The lower furnace being directly under the bottom of the main furnace, heats the same to a high temperature and keeps the metal in a molten state and in good condition to draw off when necessary, and thereby obviating the necessity of a lead-well, as in the ordinary silver-smelting furnace. The fire from this furnace passes into an adjoining chamber or oven, in which are pipes for the purpose of heating air to a high temperature before it enters the smelting-furnace. We also introduce steam into the stack at a suitable point to aid in oxidizing the ore before it reaches the melting-point in the crucible. It also controls the heat in the upper part of the furnace, and the moisture

assists in precipitating any of the precious metals that might otherwise pass off in fumes by volatilization.

In the description of the accompanying drawings, showing different forms and parts of our invention, Figure 1 is a sectional elevation of a furnace. Fig. 2 is a sectional view of heating-chamber. Fig. 3 is an end elevation showing one section of pipe in heating-chamber, Fig. 2. Fig. 4 shows a cross-section of furnace. Fig. 5 (supplementary drawing) shows side elevation of furnace, side cut away, showing water-jacket made in one section, the inside made from tubes of different diameters, with a lip turned outward on the lower part of the upper tube and turned inward on the upper part of the lower tube, and the two joined by rivets or welded, the difference in their size making the necessary projection over the tuyeres. Fig. 6 shows side elevation of water-jacket made in one section, with the lower part of the inside shell expanded by swaging or rolling sufficiently to produce the necessary projection, and thereby avoid the use of rivets as far as possible on the fire-surface, which is especially desirable.

Fig. 1 represents a smelting-furnace composed of stack S, water-jacket J, projection N, bottom B, auxiliary furnace F, tuyere-pipes P, distributing-pipe P', and steam-pipe O, said parts being operated as follows: The ore to be smelted is fed in at a suitable point in stack S, accompanied by a suitable quantity of coke, coal, or other fuel, and the necessary flux, and as the fuel is consumed the mass constantly presses downward and is warded off by projection N, thereby preventing a possibility of pipes P becoming clogged or stopped up by the ore or slag from pressing against them. As the mass passes the projection N, the space being larger in the lower section of water-jacket J, it is allowed to loosen up, thereby affording the air-blast entering through pipes P a better opportunity to permeate the mass, rendering combustion more complete and the heat more intense, making the slag thin and thoroughly separating the metal from it, and the slag in better condition to be drawn off.

A fire is maintained in furnace F for the double purpose of, first, heating the bottom

B, which forms the basin of the main furnace, to a degree sufficient to keep the metal in a molten state after it has been separated from the ore, and in good condition to draw off when necessary to do so; second, the heat from furnace F passes into an oven or heating-chamber, (shown in Fig. 2,) which will hereinafter be described. Pipe O in Fig. 1 connects with a steam-boiler, through which steam enters into the furnace for the purpose of assisting the oxidization of the ore before it reaches the melting-point, and keeping down the heat from the upper part of the furnace; also keeping the mass in a moist condition, serving to condense any of the precious metal that might otherwise pass off in fumes by volatilization.

Fig. 2 shows a side elevation of heating-oven, showing pipes R, through which the air passes from the blower before entering the furnace. The air enters pipe A, Fig. 3, passes through pipes R into large pipe C, into which the U-shaped pipes R are connected, and, passing through R, is conveyed by pipe C through the tuyere-pipes P in Fig. 1 into the furnace, having been heated to a high degree while in R, thereby overcoming the cooling effect produced on the melted metal by the cold blast, which is the great cause of ordinary furnaces freezing up, together with the absorption of heat by the usual solid bottom and lead-well.

Fig. 3 shows one section of pipe in heating-oven, just described in Fig. 2.

Fig. 4 shows a cross-section of furnace. B is the bottom, heated by the fire in the furnace F, Fig. 1. J is the water-jacket, through which water is allowed to pass or circulate at all times, preventing the destruction of the surrounding parts by the intense heat.

Figs. 5 and 6 show forms of water-jacket made in one section, with the projection formed on the inner plate for protection of tuyeres, &c.

We do not presume the use of hot-air or a water-jacket furnace to be new or an invention, and we do not confine ourselves to any particular form of heating-oven or arrangement of pipes. Any form best suited to the purpose may be used; but

What we do claim, and wish to secure by Letters Patent, is—

1. A water-jacket in a smelting-furnace, the internal diameter of which at the lower part is greater than that of the upper, the difference forming a shoulder or projection above and for protecting the tuyeres or air-passages from being clogged by the descending mass in the furnace, substantially as and for the purposes described.

2. An independent or auxiliary furnace, in combination with a water-jacket of different internal diameters, an independent bottom, hot-air oven, and pipe O, for the introduction of steam into the stack, substantially as and for the purposes set forth.

3. An independent bottom in a smelting-furnace, in combination with auxiliary furnace, water-jacket with projection over tuyeres, hot-air oven, and pipe O, for the introduction of steam into stack, substantially as and for the purposes described.

4. A water-jacket with projection over tuyeres or air-passages, in combination with the independent bottom, auxiliary furnace, hot-air oven, and pipe O, for the introduction of steam into the stack, substantially as and for the purposes described.

5. Pipe O, in combination with water-jacket with projection over tuyeres, independent bottom, auxiliary furnace, and hot-air oven, substantially as and for the purposes described.

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Witnesses:

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