

(No Model.)

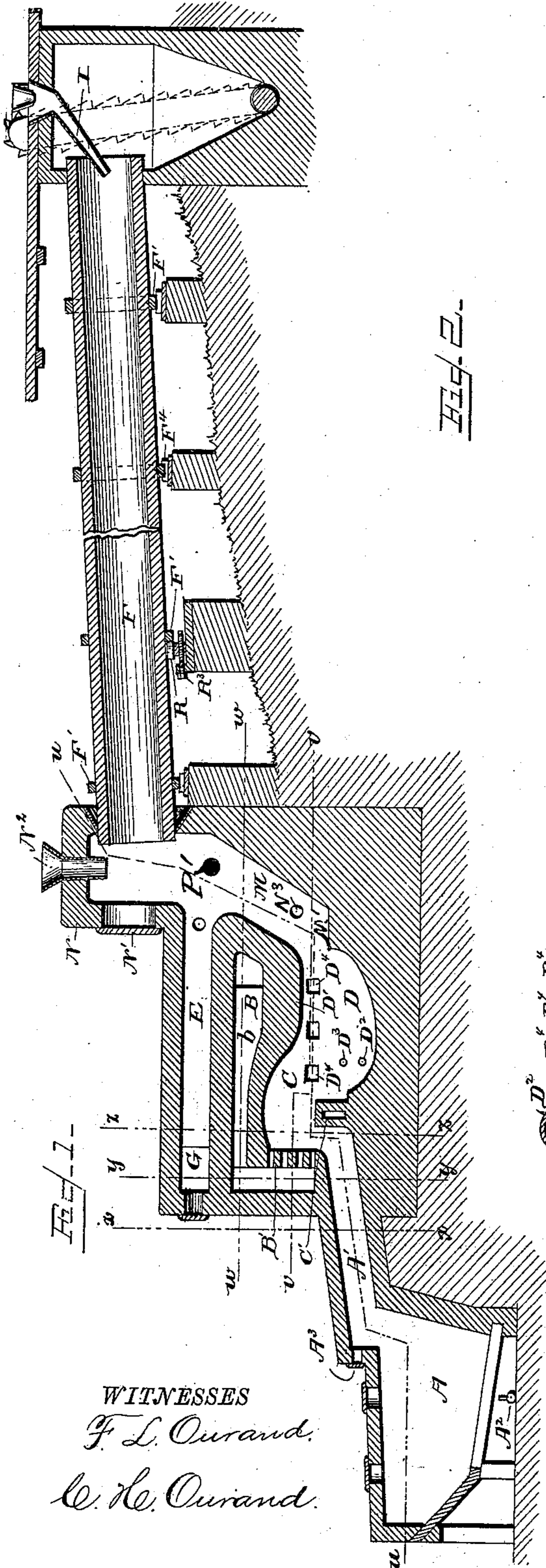
2 Sheets—Sheet 1.

B. F. HAMBLETON.

FURNACE FOR ROASTING AND SMELTING ORES.

No. 332,894.

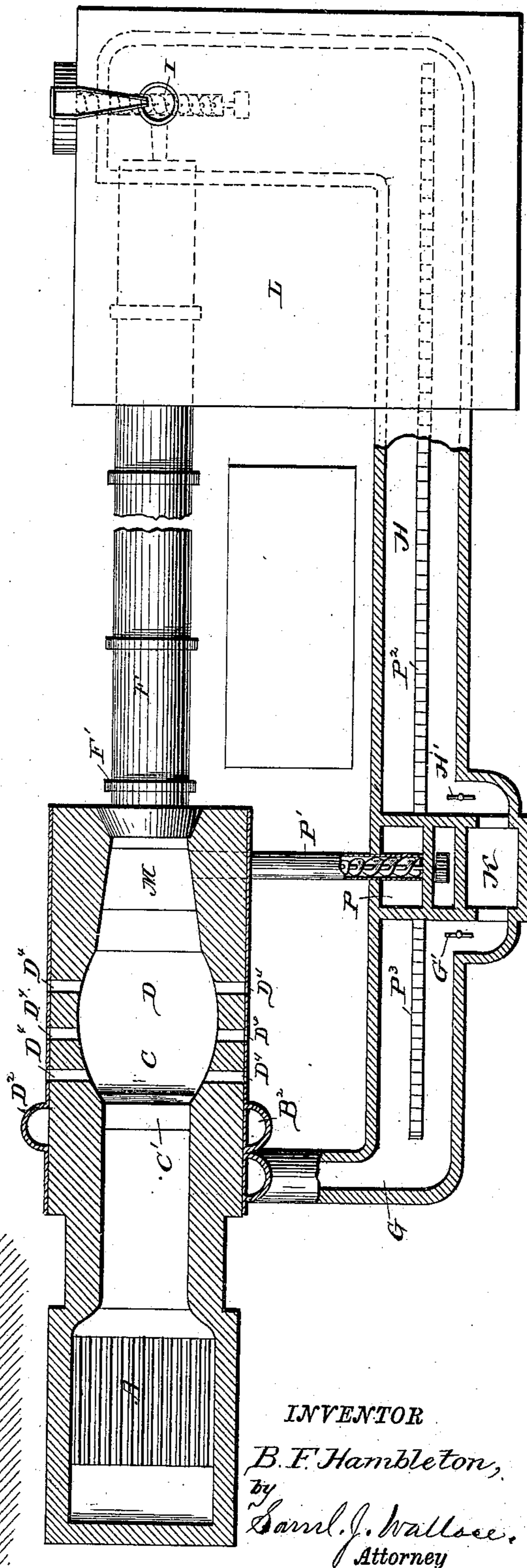
Patented Dec. 22, 1885.



WITNESSES

F. L. Ourand.

C. H. Curand.



INVENTOR

B. F. Hambleton,

by
Sam'l. J. Wallsee.
Attorney

(No Model.)

2 Sheets—Sheet 2.

B. F. HAMBLETON.

FURNACE FOR ROASTING AND SMELTING ORES.

No. 332,894.

Patented Dec. 22, 1885.

Fig. 3.

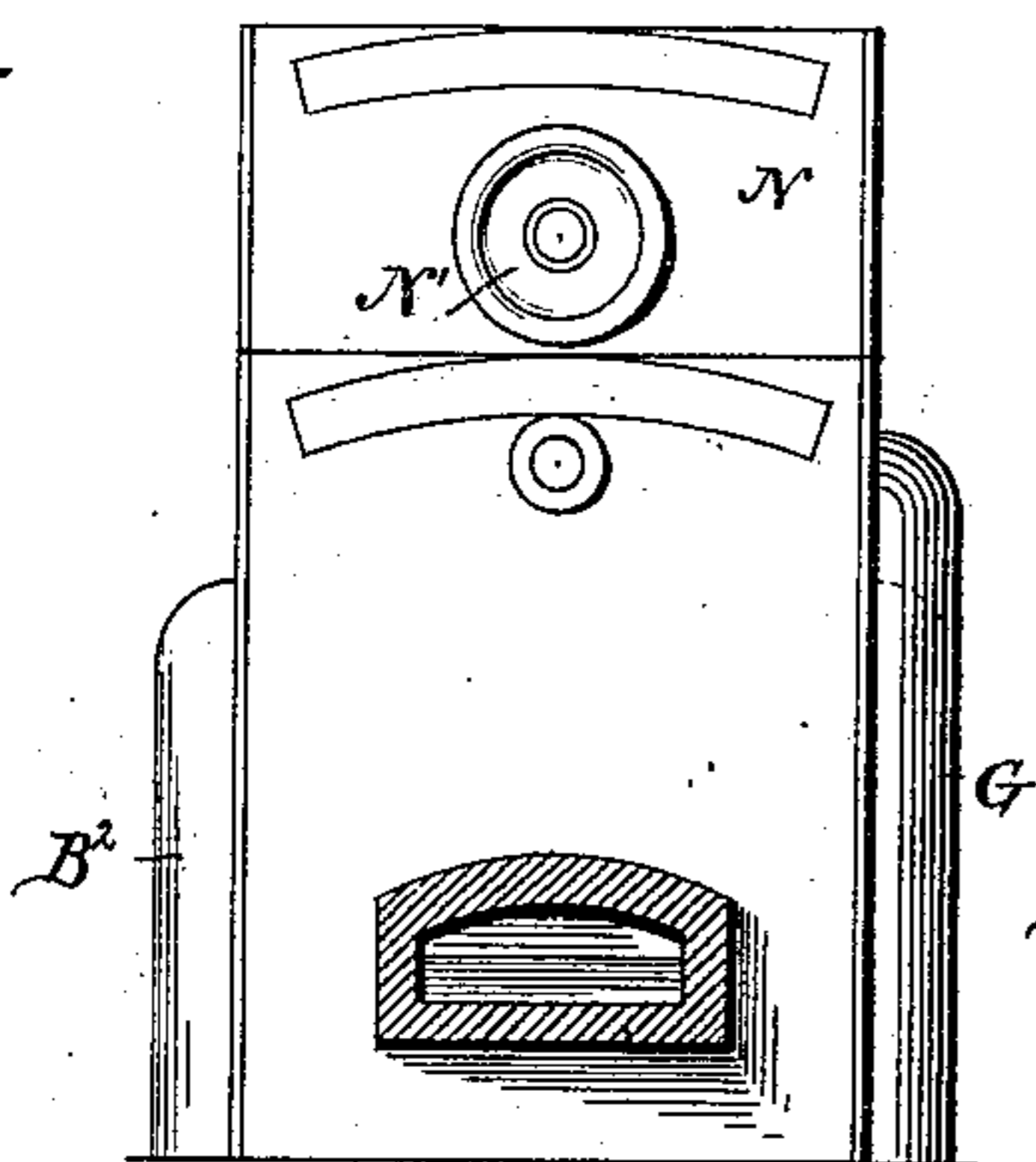


Fig. 4.

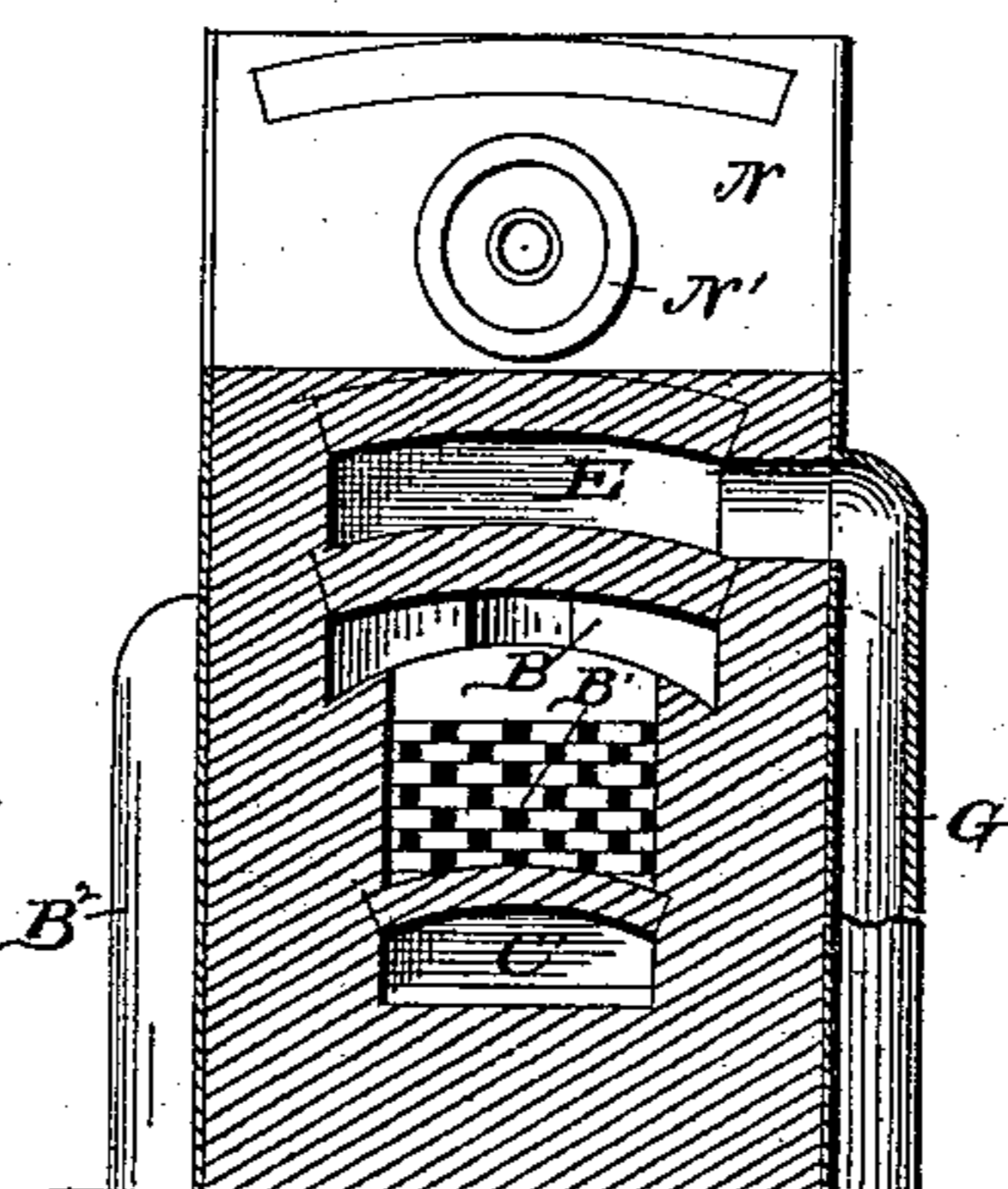


Fig. 5.

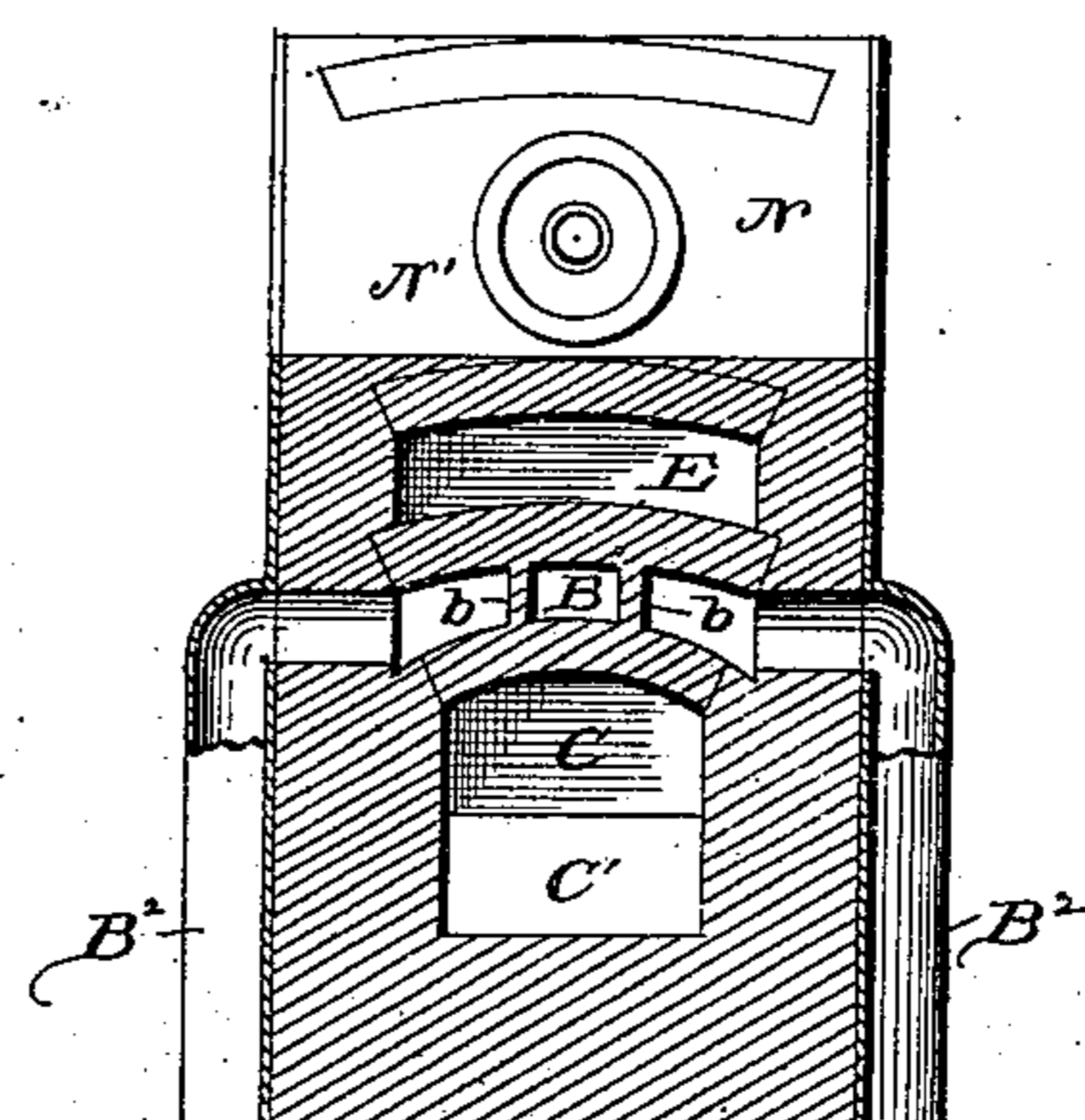


Fig. 6.

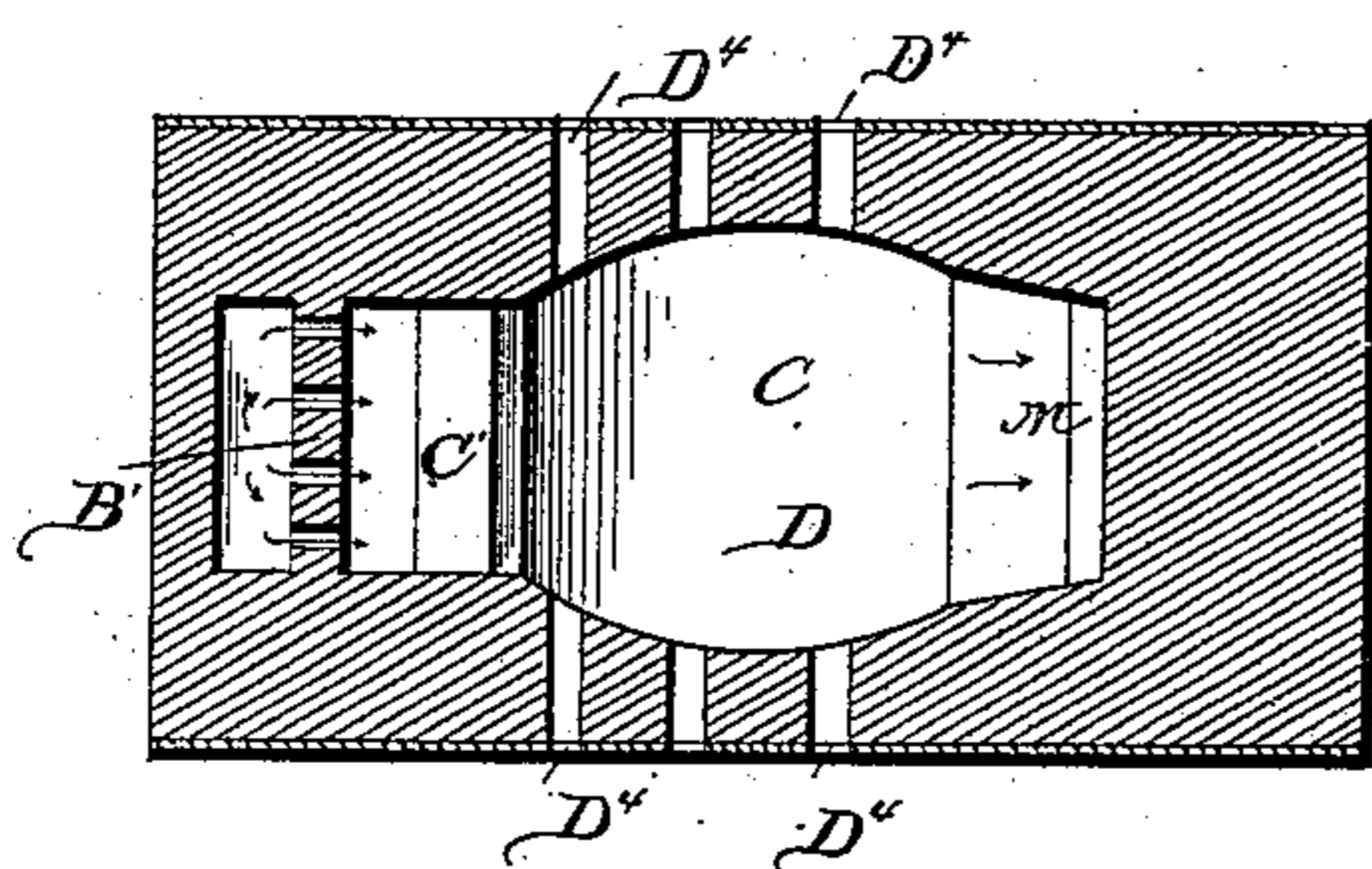


Fig. 7.

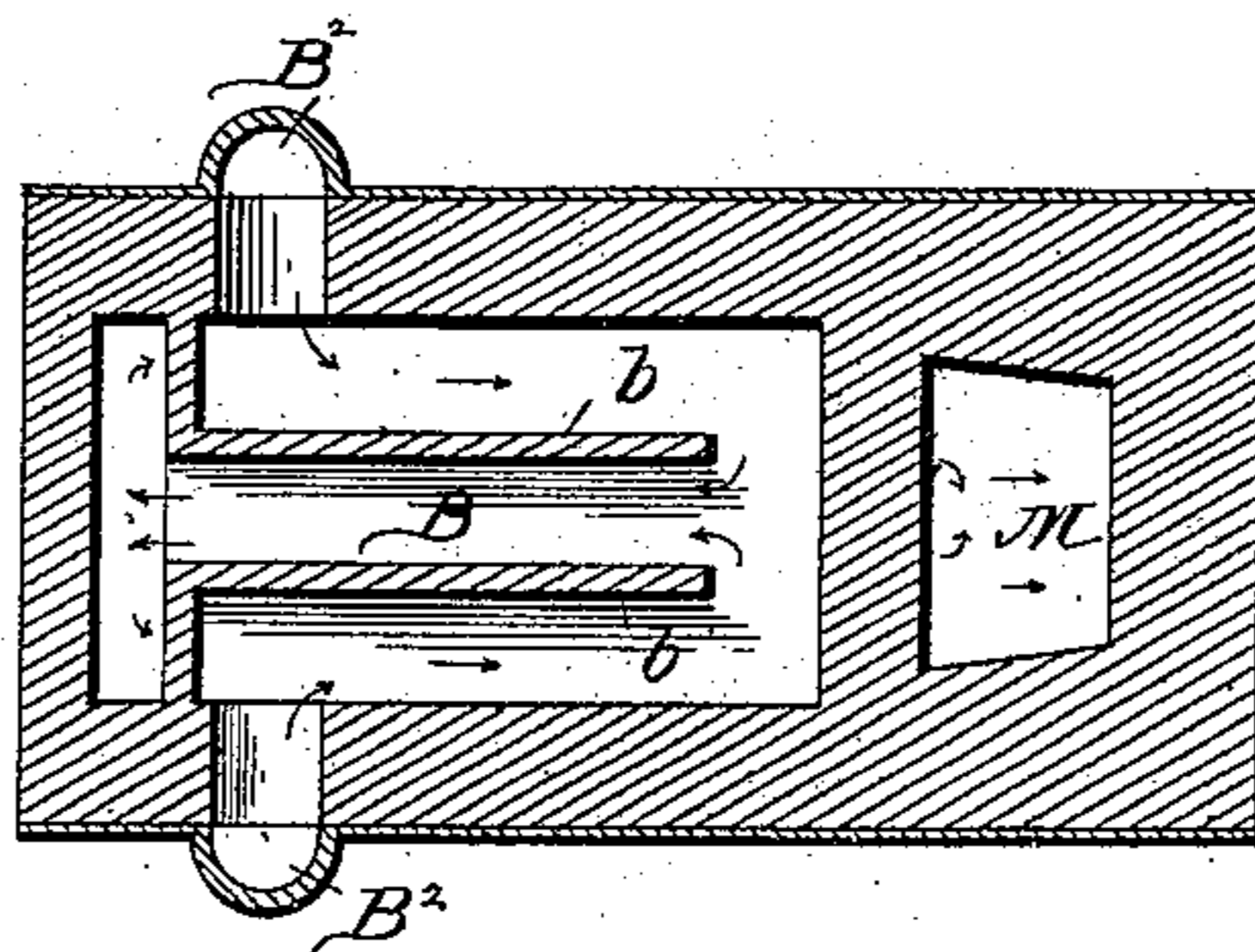


Fig. 8.

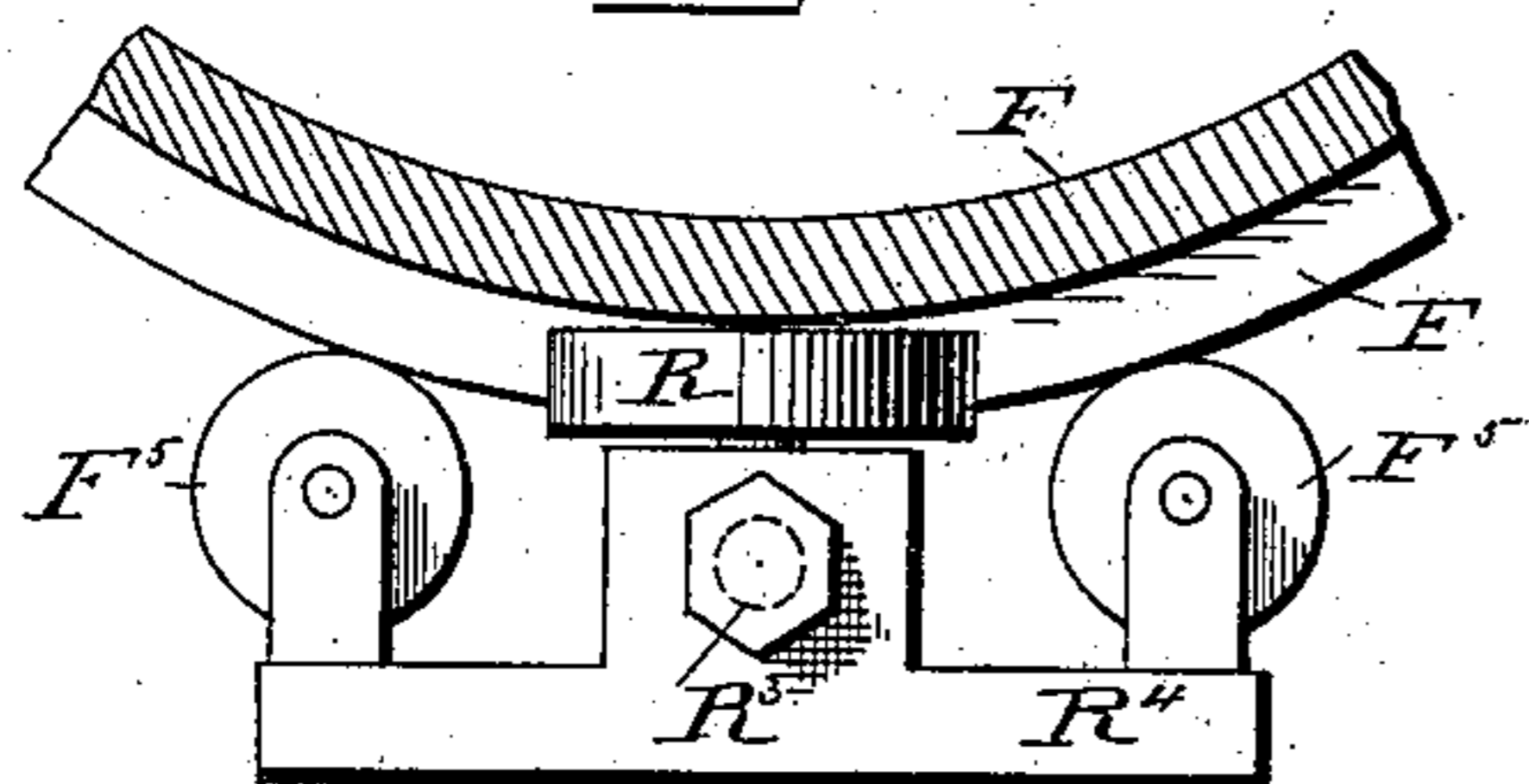
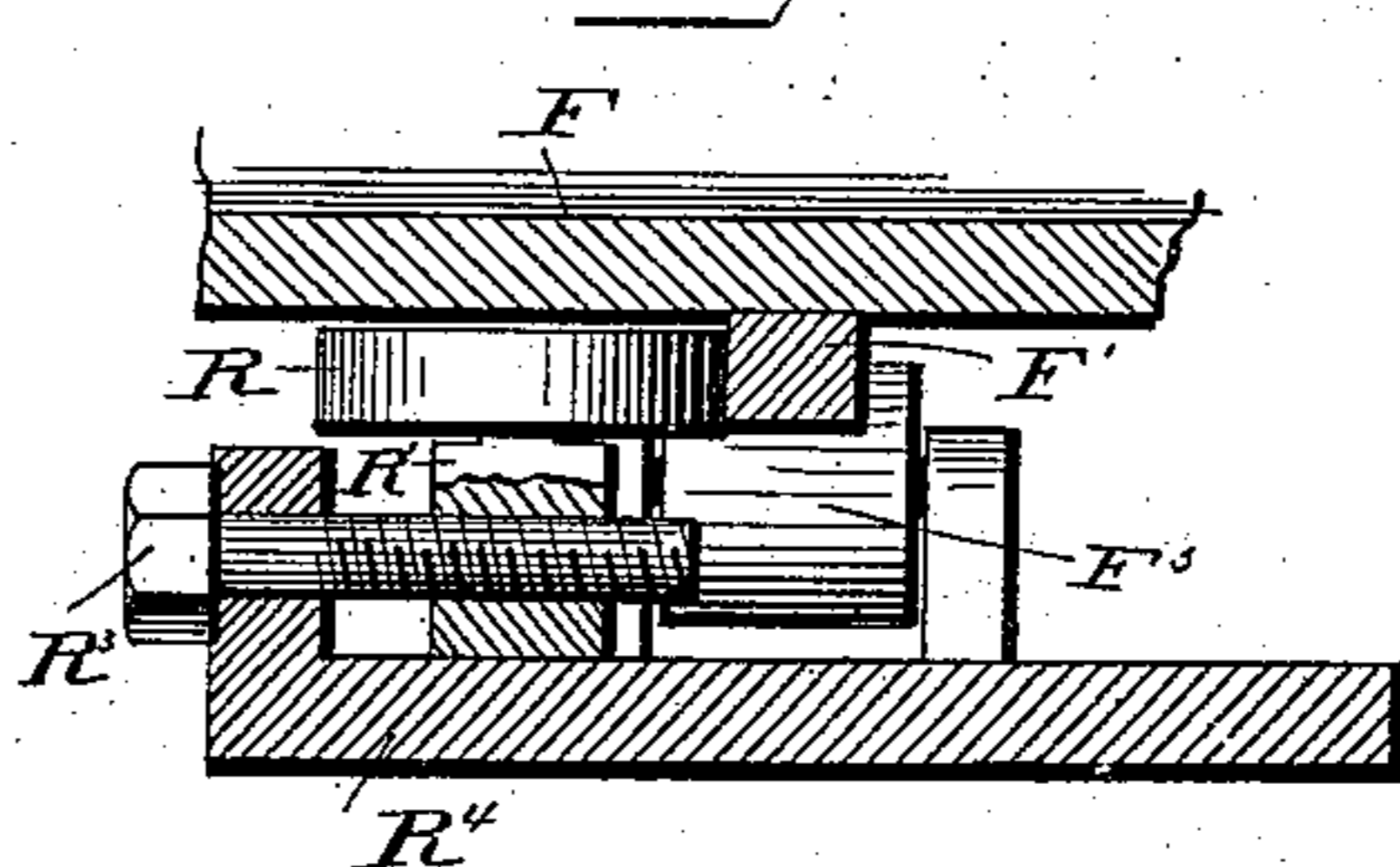


Fig. 9.



WITNESSES

F. L. Ourand.

C. H. Ourand.

INVENTOR

B. F. Hambleton,

by Sarah J. Wallace,
Attorney

UNITED STATES PATENT OFFICE.

B. FRANKLIN HAMBLETON, OF KEOKUK, IOWA.

FURNACE FOR ROASTING AND SMELTING ORES.

SPECIFICATION forming part of Letters Patent No. 332,894, dated December 22, 1885.

Application filed October 12, 1885. Serial No. 179,644. (No model.)

To all whom it may concern:

Be it known that I, B. FRANKLIN HAMBLETON, of Keokuk, in the county of Lee and State of Iowa, a citizen of the United States, have invented a new and useful Improved Furnace for Roasting and Smelting Ores, which is made, practiced, and used substantially as set forth hereinafter, and as shown in the accompanying drawings, in which—

Figure 1 is a vertical lengthwise section of the apparatus. Fig. 2 is a ground plan of same, partly in section, on line U of Fig. 1. Fig. 3 is a detail vertical cross-section on line X. Fig. 4 is a like section on line Y of Fig. 1. Fig. 5 is a like section on line Z. Fig. 6 is a plan section on line V. Fig. 7 is a like section on line W. Fig. 8 is a detail showing adjusting-wheel. Fig. 9 is a detail of same at right angles.

The purpose of this invention is to smelt and reduce metals—such as lead, copper, silver, and gold—from their ores, from sulphides, oxides, and other ores, using suitable mixtures and fluxes.

To this end the invention consists in an improved furnace for roasting, desulphurizing, and otherwise preparing the ores and fluxes, and then smelting and extracting the metal or a matte therefrom.

The apparatus includes a gas-producer, A, and air-heater B, a combustion-space, C, a smelting hearth or sump, D, a by-passage, E, for the gases from combustion, a rotary-cylinder roaster, F, a feed-inlet, I, dust-collecting flues or chambers G H, and the chimney K, together with feed-floor L and other useful parts and accessories, arranged for use substantially as shown. The ores and fluxes are received in a suitably granulated state on floor L, and are fed in by hopper I to the rotary cylinder F through the hood over its upper end. They are mixed in suitable lots and proportions for smelting, and are subjected to heat and mechanical admixture therein in the presence of hot free oxygen in the gases passing through to the chimney K, to roast and burn out the sulphur and other matters, as the cylinder rotates slowly, to prepare them for smelting, and are discharged, when properly prepared, into uptake M. The cylinder F forms a passage-way for materials to smelting-bed D, and a passage-way from

bed D for the gases of combustion. It has tread rings or projections F', and is mounted on wheels F⁵, and has gearing-wheel F⁴, by which it is rotated at a suitable speed to mechanically stir and intermix the ores and fluxes for roasting. It is set at such an inclination that it will discharge the material after a due degree of treatment into the uptake M for smelting. The end of cylinder F is set into a hood, N, over the uptake M, and provided with joint parts and water-jets, as shown in Sackett's patent, No. 293,676. The inclination of the cylinder causes it to press toward the lower end and keep this joint closed. It is adjusted and held back to keep it free for turning by a horizontal wheel, R, which bears against the side of ring F', and is held and adjusted by a set-screw, R³, in a sliding carriage-block, R'. The hood N incloses the end of the cylinder F and uptake M, and has a man-hole door, N', in front of the end of the cylinder to admit access thereto for repairs, &c., and for use as a peep-hole, and to admit the use of a rod in the cylinder when needed in use, and the inlet of air to burn sulphur and other matter from the ore in roasting. This door has a suitable shutter adapted for adjustment as required. The roasted ores and fluxes from cylinder F are discharged continuously into the uptake M, which has an inclined wall or hearth on which they fall, and which holds them for a short period exposed to high heat from the outgoing gases, so as to heat and further prepare them for smelting. A step or supporting-bed, M', is made in the hearth of uptake-passage M to catch the materials which are continuously prepared in and discharged from cylinder F. The back wall of uptake-passage M is built inclined to form a hearth, over which the ores as they fall from cylinder F will slide down thereon slowly while subjected to great heat from the flames and gases from the smelting-hearth, which are thrown against them by the configuration of the passage, so as to be highly heated and softened preparatory to smelting in bed D. The step or bed M' is offset at an angle from the hearth of the uptake M, and of such form as to catch and hold the ores thereon till removed. The materials on the smelting-bed D are treated in intermittent portions, when desired, and removed wholly

or partly at suitable intervals, after which the accumulation on step M' is pushed into bed D, for finishing, by tools inserted through a passage, N³, therefor. This serves to avoid admixture of the ores as admitted with those ready for removal while using the preparatory apparatus continuously. An adjustable portion of the heat and gases of combustion is deflected and carried away from cylinder F by by-passage E, so as to keep the ores and flux materials in the cylinder at the proper heat for roasting and preparation and to prevent overheating. The smelting-hearth is made with a depressed bed, D, to receive the ores and flux materials from the uptake M for smelting. It has an arched and suitably-curved roof, D', to throw the heat down upon the bed D to smelt the materials therein. Suitable outlets, D² D³, are made for discharging metal or matte and slag from bed D, and a number of holes, D⁴, are made along the sides for peep-holes and to admit tools for working therein. The side walls are built in panels separate from the roof-arches to admit repairs. The roof D' curves up without sharp corners at the back end, to allow the hot gases to turn up the uptake M without liability to overheat and injure the roof. A by-passage, E, is made from uptake M to the front end to connect, by way of passage G, with the chimney K, to draw off a part of the hot gases to regulate the heat in cylinder F. A valve, G', is used to regulate this, and the flue G acts as a dust-flue to collect dust from the gases. An interspace, B, is made between roof D' and flue E, with two walls, b, dividing it into three flues united at the rear end, but separate in front. Air-pipes B², having valves to regulate the inlet of air by them, connect with the closed front ends of the side flues and supply them with air. This air passes back and then forward by the central flue, so as to be highly heated. It then passes down by a downtake, and escapes forward through the open checker-work B' into the hot gases from the gas-producer A, so as to intermix with and burn the gases in the combustion space C over and in front of the wall C', and over smelting-bed D to heat it. The by-passage flue E serves as a heating-flue over the air-passage B, to assist in heating the ingoing air, and to act thus as a regenerator to take heat from the waste gases. The gas-producer A is made of any suitable construction, and connects by an extended flue, A', to supply gas to the combustion-space C for burning, to heat the smelting-bed D and the cylinder F. This flue A' rises by an offset, A³, to a certain height above the top of the producer-chamber, and has a door in the side of this offset, opposite the flue, which may be opened to admit a long brush or scraper to clean it out. The producer has steam admitted by pipe A'' in adjustable quantities to urge the fire and draft and to produce rich water-gas for burning in the furnace. The cylinder F has a stationary hood at and inclosing each end. The hood over the back

or upper end extends to a distance as a dust-setting flue, H, to collect rich dust and fumes carried back by the gases from the ores. This flue connects with chimney K, to produce draft, and has a valve, H', to regulate it. This valve has a lever-arm and a wire-connection to the furnace, arranged so the operator can regulate it as may be required from time to time. The by-passage flue G is provided with similar dust-flues and regulating arrangements. The dust-flues G H are provided with suitably-formed bottoms and with drag-belt conveyers P² P³, to remove and carry the dust as it accumulates to hopper-chamber P, from which a pipe, P', and a feed-screw therein, force it into the uptake M, so as to be highly heated therein and carried forward for smelting with the ores from cylinder F on smelting-bed D. Any portions of the ores and flux materials which do not need treatment in the cylinder F are fed in with the dust by pipe P', or may be fed into the uptake M by hopper N². Any portions of the ores or slag which are not fully reduced in the first passage may be fed in a like way for further reduction; or the dust and any such materials may be fed in with the ores at hopper I, so as to pass through cylinder F by means of elevator and spout, as shown, or otherwise.

I am aware that various furnaces have been made having features which resemble mine somewhat; but these each differ from this in important particulars, which have been learned and made in several years' patient experience by the expenditure of great labor and expense, and which are important to success.

I claim—

1. A furnace having the air-heating flue B interposed between and combined with the heating-chamber C and the return-flue E, substantially as and for the purpose set forth.
2. The by-passage flue E, combined with the smelting-hearth D and the rotary roasting-cylinder F, and adapted to regulate the heat in the cylinder.
3. The combination of air-heating flues B with the heating-flue E in the roof of the furnace, and with the checker-work outlet B', gas-producer A, and the smelting-furnace bed D.
4. In a smelting-furnace provided with a roasting-passage, the combination of two passages, E F, and their extensions to chimney for the gases of combustion, each provided with valve for regulating draft, adapted to regulate the heat of roasting.
5. The combination, with a smelting-bed, D, of a roasting-passage and a flue dust-chamber provided with apparatus for feeding dust therefrom to the smelting-bed separate from the roaster.
6. The combination of a rotary furnace-cylinder having a ring or projection around it with a wheel acting against the side thereof and borne by a sliding carriage having a screw or means of adjustment adapted to adjust the position of the cylinder lengthwise.

7. An ore-reducing apparatus provided with a gas-producer, air-heater, combustion-space, smelting-bed, rotary roasting-cylinder, a by-passage for gases from a point in front of the
5 roaster-passage to regulate the heat therein, regulating by -passage for gases, flue dust-chambers, draft-chimney, and dust conveyer and feeder, as set forth.

8. In a metallurgic furnace, the combination
10 of a rotary-cylinder roaster, F, with a step or supporting-bed, M', in a communicating up-

take-passage, M, at an angle from the hearth thereof, and with a smelting-bed, D, all provided with an inclosed flue-passage through them, and adapted for preparing ores continu- 15
ously and smelting them in intermittent portions.

B. FRANKLIN HAMBLETON.

Witnesses:

SAML. J. WALLACE,
GEO. M. LOCKWOOD.