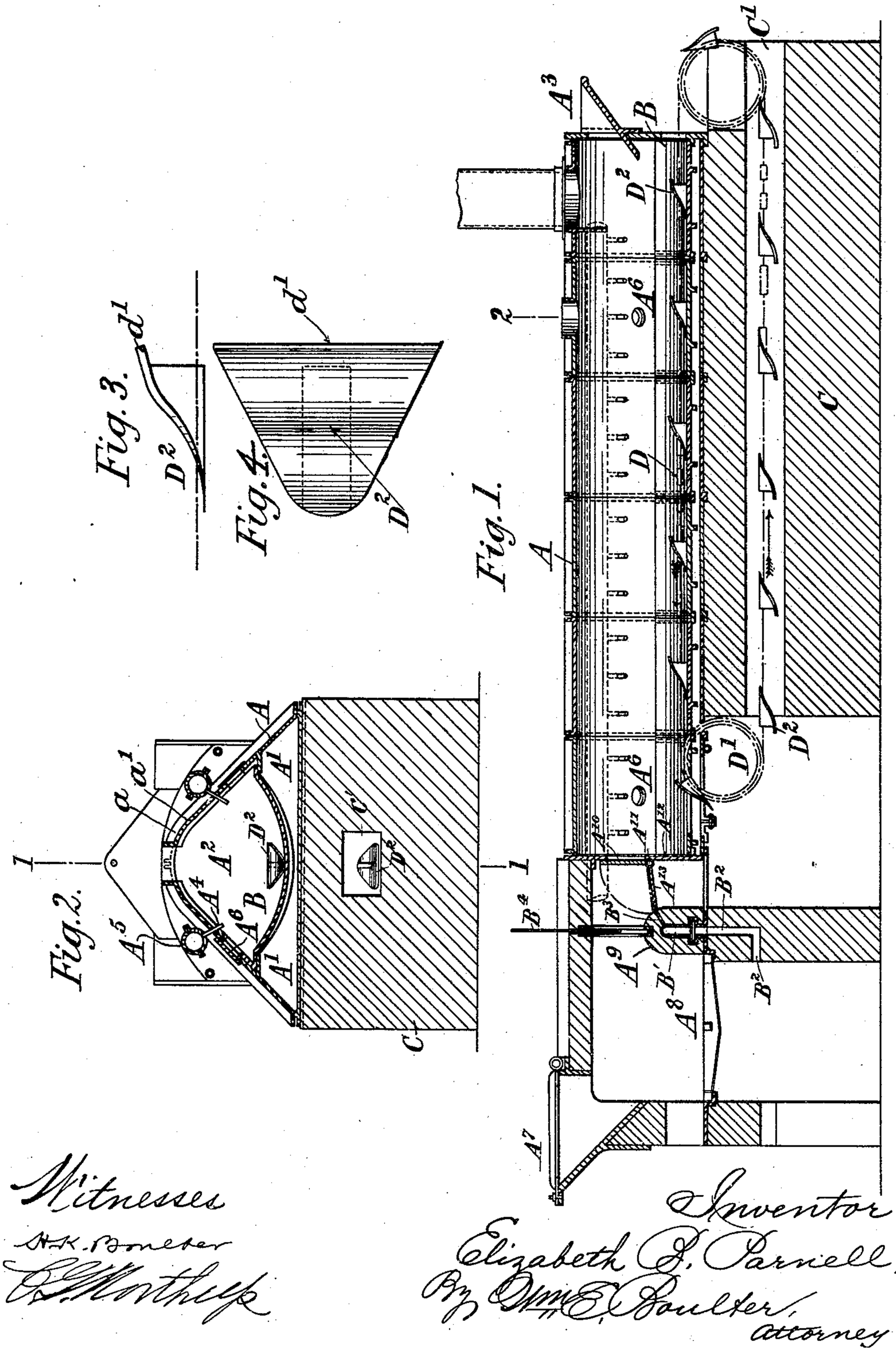
No. 685,344. Patented Oct. 29, 1901.

E. B. PARNELL.

ROASTING FURNACE.

(Application filed May 16, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

ELIZABETH BARNSTON PARNELL, OF CARSHALTON, ENGLAND.

ROASTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 685,344, dated October 29, 1901.

Original application filed January 3, 1898, Serial No. 665,381. Divided and this application filed May 16, 1899. Serial No. 717,044. (No model.)

To all whom it may concern:

Be it known that I, ELIZABETH BARNSTON PARNELL, a subject of the Queen of England, residing at Carshalton, county of Surrey, England, have invented a certain new and useful Roasting-Furnace, of which the following is a specification.

This invention relates to an improved construction of furnace for use in roasting ores for the recovery therefrom of metals, and this application is a division of my pending application, filed January 3, 1898, Serial No. 665,381.

The furnace according to this invention is so constructed as to be capable of being employed as well either as a muffle or a reverberatory furnace, or simultaneously as a muffle and a reverberatory furnace.

The furnace may be constructed from iron plates bolted together and arranged, preferably, to form a triangle in section (though I do not confine myself to this form) and adapted to carry a half-muffle hearth. The upper angle forms a flueway for the fumes evolved from the roasting ore. The two lower angles form flues for the fire, which thus passes on each side to the stack.

The furnace can be converted to a reverberatory by directing the flame over instead of beneath the hearth.

Figure 1 is a longitudinal section of a furnace on the line 1 1 of Fig. 2; Fig. 2, a transverse section of the furnace shown in Fig. 1 on the line 2 2 of Fig. 1; Fig. 3, an elevation, and Fig. 4 a plan, of a plow used in conjunction with the furnace.

With reference first to Figs. 1 and 2, A is a shell, built conveniently of cast-iron, forming a housing, triangular in cross-section, for the hearth, a fire-grate and bridge being provided at A^8 and A^9, respectively. The hearth is shown at B, extending for the greater part of the length of the housing A, and is preferably of curved form in transverse cross-section, as shown in Fig. 2. The hearth thus divides the space within the shell into long compartments or flues—three in this case—and one of the most important features of this construction is that the furnace can be made to act as either a muffle or a reverberatory furnace by directing the fire either along the two flues marked A′ or along the upper one marked A^2; or the furnace may be used simultaneously as a muffle and a reverberatory furnace—*i. e.*, the flame may be directed over the charge at the same time that heat from the fire is being directed under the hearth along the two lower flues. I have found this last method of using the furnace of very great efficacy in the roasting of ores giving off arsenical and other volatile or easily-oxidizable fumes. The direction of the heat or flame from the fire along the upper flue may be effected by opening a damper A^{10}, hinged at A^{11} to a support A^{12}, the lower flues A′ being closed by a damper A^{13}, similarly pivoted at A^{11}. It is thus obvious that to pass the heat or flame from the furnace along the flues A′ it is only necessary to open the damper A^{13} and close the damper A^{10} and that by opening both dampers together the heat or flame may be caused to pass through the flues A′ A^2 simultaneously. Between the fire-grate and the flues is the usual chamber B′ for supplying heated air to perfect combustion at the rear of the furnace. The air enters the chamber by the passage B^2 and makes its exit at B^3. Above this chamber is arranged a vertical damper B^4 for regulating the draft of the furnace in the usual well-known manner. The shell, whose iron walls are lettered at *a*, has preferably a suitable lining, as shown at *a*′, and the whole shell may be conveniently mounted on brickwork, such a mounting being shown in the drawings and lettered C. The charge of ore already treated, say, with chromic acid is fed onto the hearth B through a hopper A^3 (seen in Fig. 1) and is caused to slowly travel the whole length of the hearth, on reaching the end of which it is discharged into wagons or other receptacles provided. Suitable sight-holes are provided at intervals in the length of the furnace, as are shown at A^6. The means adopted to convey the charge through the furnace may be of any well-known kind; but I prefer a conveyer of the following special construction.

One or more endless chains, preferably of cast-iron and having plows or conveyers attached, pass along the hearth from end to end. One such chain is shown at D. At each end where the chain emerges from the fur-

nace it passes over a chain-wheel D′, one of which is caused to rotate and drag the chain in a direction from the hopper end to the delivery end of the hearth. A return-way for the chain is provided in the brickwork at C′, during passage through which it becomes well cooled. The chain has attached to it at various points plows or conveyers adapted to thoroughly stir and "turn" the charge without carrying it too rapidly through the furnace. The plows are shown at D^2 in Figs. 1 and 2, and one is shown to a larger scale in Figs. 3 and 4. In these two figures *d′* designates "wings" of the plow, which are the most effective part of the device in bringing fresh portions of the charge to the surface. The speed at which the plows move through the charge may be varied to suit different kinds of ores requiring roasting for different periods, the usual time required when the ore has been prepared as hereinbefore described being eight to ten hours.

Provision is made in this furnace for the copious admission of wet steam through nozzles or holes placed as near to the hearth as conveniently possible, so that the steam can play upon the charge during the process of roasting, the steam being required for the formation of sulfates. One form of nozzle is shown in the drawings, Figs. 1 and 2, at A^4, being connected to a steam-pipe A^5, extending along both sides of the shell on the outside. The ore should not be heated to a higher temperature than is necessary for the formation of sulfates. When the roasted ore has been discharged into the wagons or other receptacles, it may be ground and again roasted or may be at once treated with alkali, if requiring such treatment, and transferred direct to an extractor. The triangular form of furnace is of value as lending itself to transport, it being capable of being packed in small space. The most important feature, however, in the construction of the furnace and to which particular attention is directed is that the sides *a a′* are flat and inclined toward one another, so that an apex is formed which may be either a sharp angle or, as shown in the drawings, slightly rounded. The object of this construction is to give a greater depth to the zones or layers of different temperatures known to exist in furnaces. It is easily understood that in a furnace with vertical sides connected at the top by an arch or even in the case of a furnace built in the form of a semicircle from the hearth the different zones of heat must be very much contracted in depth, as they will all occupy the space at the extreme top of the oven; but by contracting the upper part of the furnace, as in the arrangement described, the separate zones will be forced to take a position below one another, each occupying a distinct part of the furnace. This has been found of great advantage in dealing with ores containing arsenic, in that as fumes rise from the ore they pass through the different zones of heat until, reaching the highest point of the furnace, where the hottest gases are collected, they are thoroughly purified, and when drawn off may be readily condensed.

I claim—

1. In a roasting-furnace, the combination of a longitudinal housing A, of triangular transverse section rounded at the top or apex, a hearth B dividing the housing throughout its length into upper and lower chambers A^2 A′ respectively, means of communication between one end of each flue and a common source of heat and a chain conveyer arranged along the length of the hearth, substantially as set forth.

2. In a roasting-furnace, the combination of a longitudinal housing A of triangular transverse section having a rounded top or apex, a hearth B dividing the housing throughout its length into upper and lower chambers or flues A^2 A′ respectively, means of communication between one end of each flue and a common source of heat, a damper between the end of the flue A^2 and the source of heat, a damper between the flue A′ and the source of heat, and a chain conveyer arranged along the length of the hearth, substantially as described.

In testimony whereof I have hereto set my hand in the presence of the two subscribing witnesses.

ELIZABETH BARNSTON PARNELL.

Witnesses:

HAROLD WADE,

HARRY S. RIDGLY.