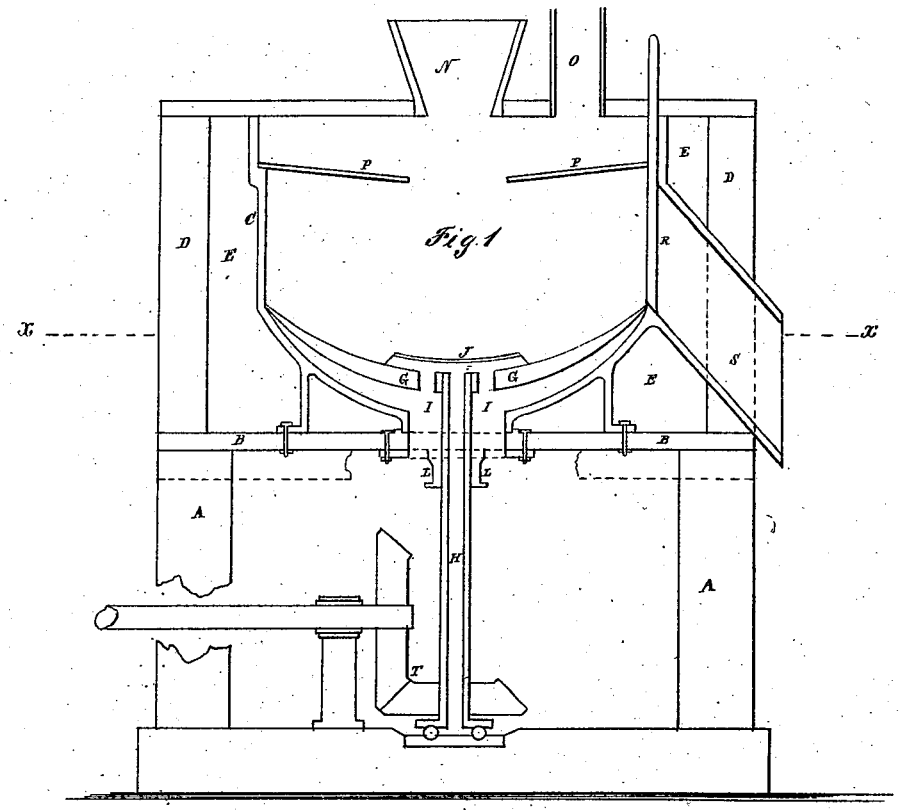
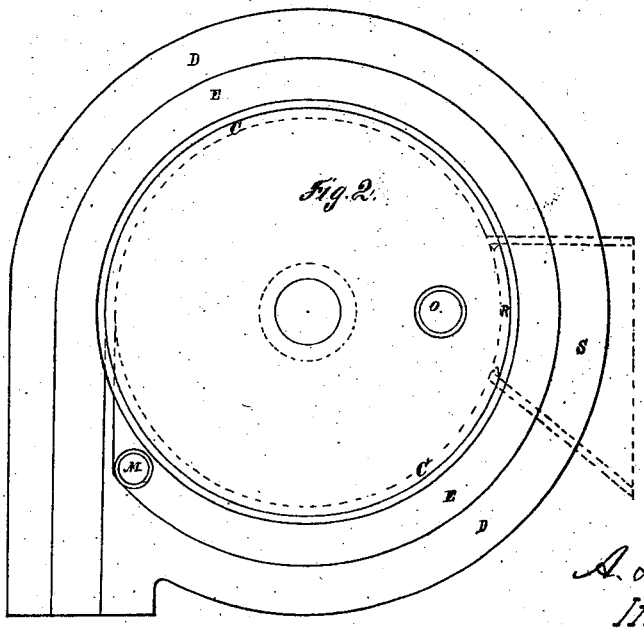
No. 107,600. PATENTED SEPT. 20, 1870.

A. DUVALL.

APPARATUS FOR ROASTING AND DRYING ORES AND OTHER MATERIALS.

2 SHEETS—SHEET 1.





Witnesses:
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2 SHEETS—SHEET 2.

Fig. 3.

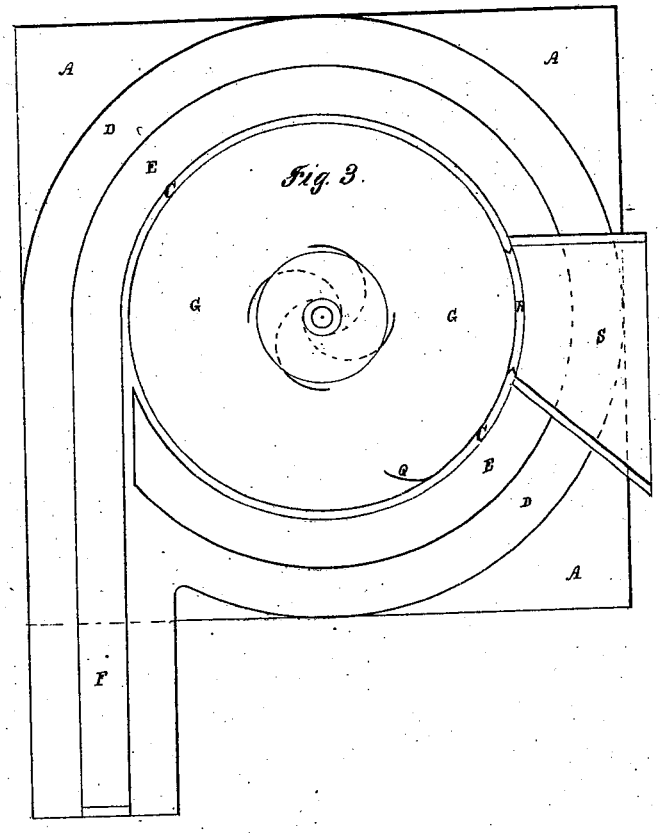


Fig. 4

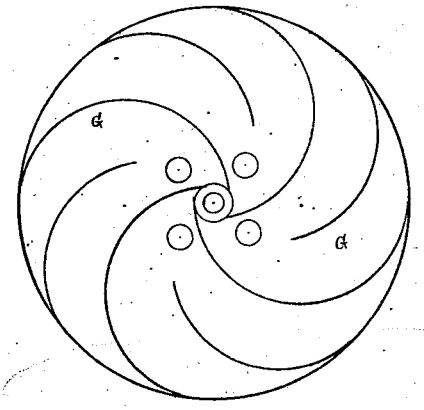
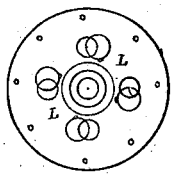


Fig. 5.



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ALFRED DUVALL, OF BALTIMORE, MARYLAND.

Letters Patent No. 107,600, *dated September* 20, 1870; *antedated September* 12, 1870.

IMPROVEMENT IN APPARATUS FOR ROASTING AND DRYING ORES AND OTHER MATERIALS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ALFRED DUVALL, of the city and county of Baltimore, State of Maryland, (now temporarily residing in the city and county of Philadelphia, State of Pennsylvania,) have invented a new and useful Machine, in connection with a furnace, for the purpose of desulphurizing ores, drying grain, and other analogous uses; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawing making a part of this specification, in which—

Figure 1 is a cross-section in elevation;

Figure 2, a plan of the covering;

Figure 3, a horizontal section on the line X, fig. 1;

Figure 4, a plan of the bottom of the revolving section of a hollow sphere, showing the flights or vanes; and

Figure 5, a plan of journal-box, showing openings with valves.

The same letters are used in all the figures to indicate the identical parts.

My invention relates to desulphurizing ores, drying grain, and other analogous uses.

My invention consists in a section of a hollow sphere, hollow cone, or plain disk, (fastened on a hollow or solid vertical shaft,) revolving within a stationary vertical cylinder of iron, fire-clay, or other suitable material, and surrounding which cylinder is an outer casing, of fire-brick, or other suitable material, resting on the same base, and rising to the same horizontal plane with the inner cylinder, and being built around the inner cylinder at a proper distance from the same, thereby forming a flue around the inner cylinder, and having a fire-place in the flue thus formed, on a line of a tangent from the inner side of the outer casing and the outside of the inner cylinder. The furnace and flue thus formed are covered with iron, or other suitable material, having an escape for smoke. The inner cylinder has also a tight covering, with a charging-funnel, with a stopper or valve, and also an escape-pipe, for conducting off the gaseous matter to be utilized or discharged. The heating or drying may be done by forcing in heated air through a hollow shaft, or into the chamber under the revolving section of a hollow sphere or disk.

A further and more full description will be had by referring to the following description and accompanying drawing with letters of reference thereon.

A is a frame-work of iron, or structure of brick-work, supporting the bed-plate B, which is of iron or fire-clay, and on which rests the cylinder C; also, the outer cylinder or casing of brick-work D, forming the flue E, having a furnace or firing-place with grate-bars at F.

G is a section of a hollow sphere, within the cylinder C, fastened on and revolving with the shaft H, which shaft may be either hollow or solid.

The section of a hollow sphere, G, is made with flights or vanes on the under side, for the purpose of keeping up or throwing up, by centrifugal force and and a blast of air, any fine particles that might fall through between the periphery of the section of a hollow sphere, G, and the cylinder C. It is intended to work the revolving section of a hollow sphere as close as practicable to the cylinder C.

When operating on material of great specific gravity, a pressure-blast of hot or cold air may be admitted into the chamber I, under the revolving section of a hollow sphere, G.

When the shaft H is hollow, a blast of hot or cold air may be admitted through the same into the cylinder C, under the guard-plate J, and between the vanes K, which guard-plate J and vanes K are fastened to the revolving section of a hollow sphere, G, thereby forming a fan, for the equable distribution of the blast in the chamber formed by the cylinder C. There are also openings in the section of a hollow sphere, G, near the shaft H, by which air is admitted into and through the fan J K.

The journal-box L, through which the upper part of the shaft H revolves, is made with a flange with openings and valves, as shown by fig. 5, and which flange is fastened to the bottom of the bed-plate B, thereby forming the chamber I.

In the cover of the flue E is a smoke-stack at M.

In the center of the covering of the cylinder C is a charging-funnel, N, with a valve or stopper, through which the material to be operated on is charged into the chamber C, falling on the guard-plate J. Also, in the covering of the cylinder C, at O, there is an escape-pipe, through which the gases, generated in the cylinder C, are passed off, to be utilized or discharged.

Within the cylinder C is a cover, P, with an opening in the center, the object of which cover is to prevent, when desulphurizing ores, the finer particles from passing off too readily into the gas-escape.

Q is a guide-piece, fastened to the cylinder C, and extending into the chamber C, and rising from the section of a hollow sphere, G, to the cover P, the object of which guide-piece Q is to throw back, or partially throw back, to the center of the revolving section of a hollow sphere, G, the material being treated.

At R in the cylinder C is a discharge-gate or valve, opening into the discharge-spout S, which valve is intended to be tightly fitted, and may be operated by hand, by a lever, or by means of a screw, or two screws geared together, or by an automatic arrangement of a screw

and screw-wheel, in connection with a combination of levers, springs, and catches, so as to open periodically and quickly, and to remain open a stated time, and then to close instantly; and the same combination may be used to open and close the valve in the charging-funnel N.

T is a beveled gear, for communicating motion to the shaft H, or motion may be communicated to the same by any convenient arrangement.

Operation.

A fire being built in the furnace F, and raising the heat to the desired temperature in the cylinder C, (or such temperature being obtained by the forcing in of heated air,) motion is communicated to the shaft H, which causes the section of a hollow sphere, G, to revolve at such speed as desired. Then the material to be operated on is charged through the funnel N, and, falling on the guard-plate J of the section of a hollow sphere, G, is thrown out, by the centrifugal force generated by the revolutions of said section G, to the sides of the cylinder C. The curvature of the upper side of the section of a hollow sphere, G, is made so that when the material is thrown out to the sides of the cylinder C, it will strike at an angle of about forty-five degrees, thereby tending to raise the material higher and in a thinner strata, as it is carried around against the sides of the cylinder C by centrifugal force, and comes in contact with the guide-piece Q, by the reaction against which it is thrown nearly or quite back to the center, to go over and over again the same operation, whereby the particles are being constantly separated in their revolutions. When the matter being treated is sufficiently operated on, the discharge-gate R is opened, and, by the operation of centrifugal force, the material operated upon is thrown out. The same operation described is then repeated indefinitely.

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

The combination for the purposes intended, as substantially set forth in the aforegoing specification, and shown by the accompanying drawing, or any modification thereof, involving the same general principles of construction and operation.

ALFRED DUVALL.

Witnesses:

LEONIDAS DUVALL,

A. LESLIE DUVALL.