C. E. BRINEY.

APPARATUS FOR REMOVING ORE DUST FROM FURNACE GASES.

APPLICATION FILED APR. 18, 1908.

914,696.

Patented Mar. 9, 1909.

3 SHEETS—SHEET 1.

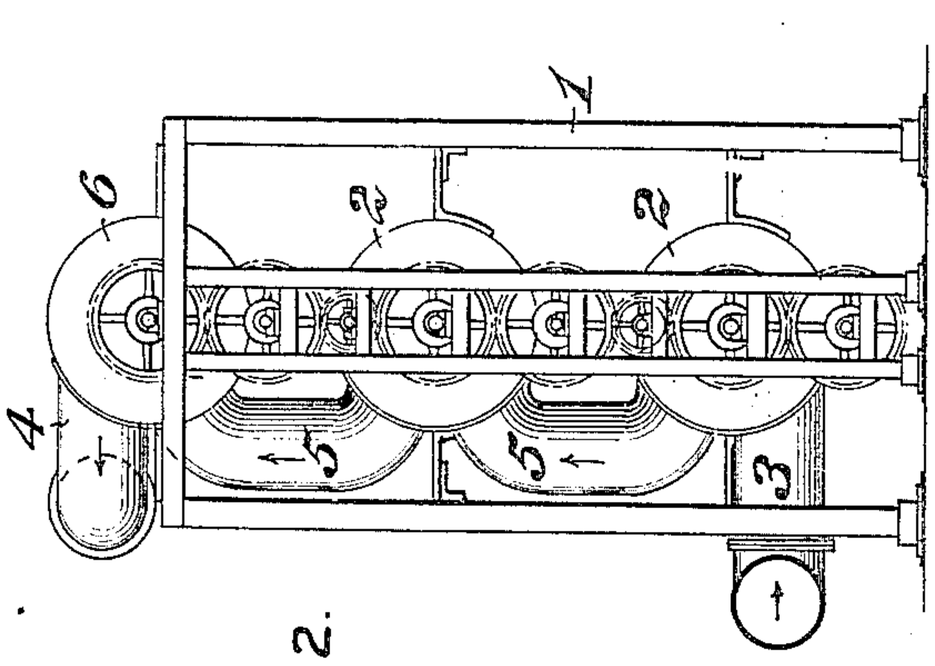

FIG. 2.

FIG. 1.

WITNESSES

James C. Herron.

W. R. Bell.

INVENTOR

Chas. E. Briney,

by Johnson Dike

Att'y.

C. E. BRINEY.

APPARATUS FOR REMOVING ORE DUST FROM FURNACE GASES.

APPLICATION FILED APR. 18, 1908.

914,696.

Patented Mar. 9, 1909.

3 SHEETS—SHEET 2.

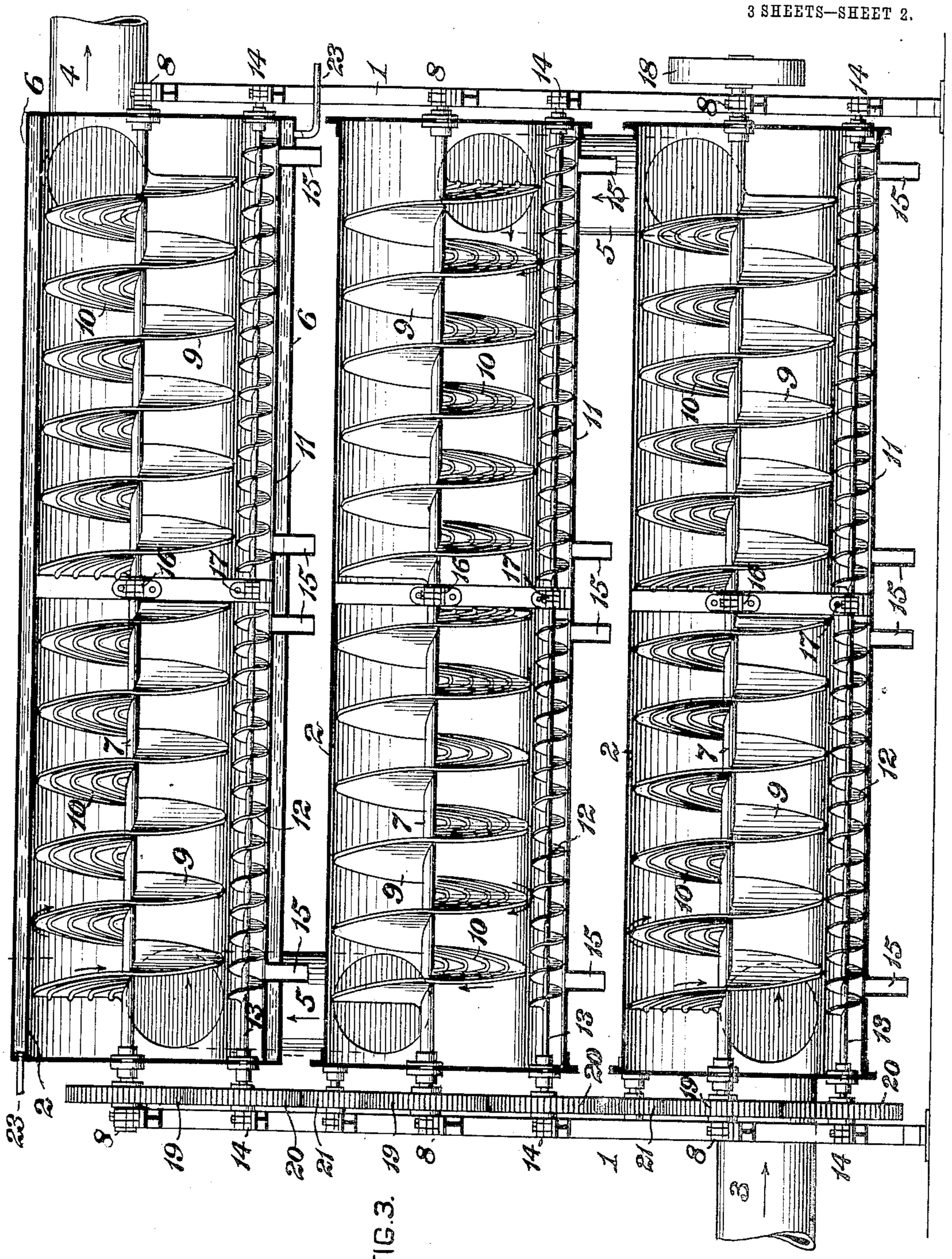

FIG. 3.

WITNESSES

James C. Herron.

S. R. Bell.

INVENTOR

Chas. E. Briney.

by J. Howden Dett.

Att'y.

C. E. BRINEY.

APPARATUS FOR REMOVING ORE DUST FROM FURNACE GASES.

APPLICATION FILED APR. 18, 1908.

914,696.

Patented Mar. 9, 1909.

3 SHEETS—SHEET 3.

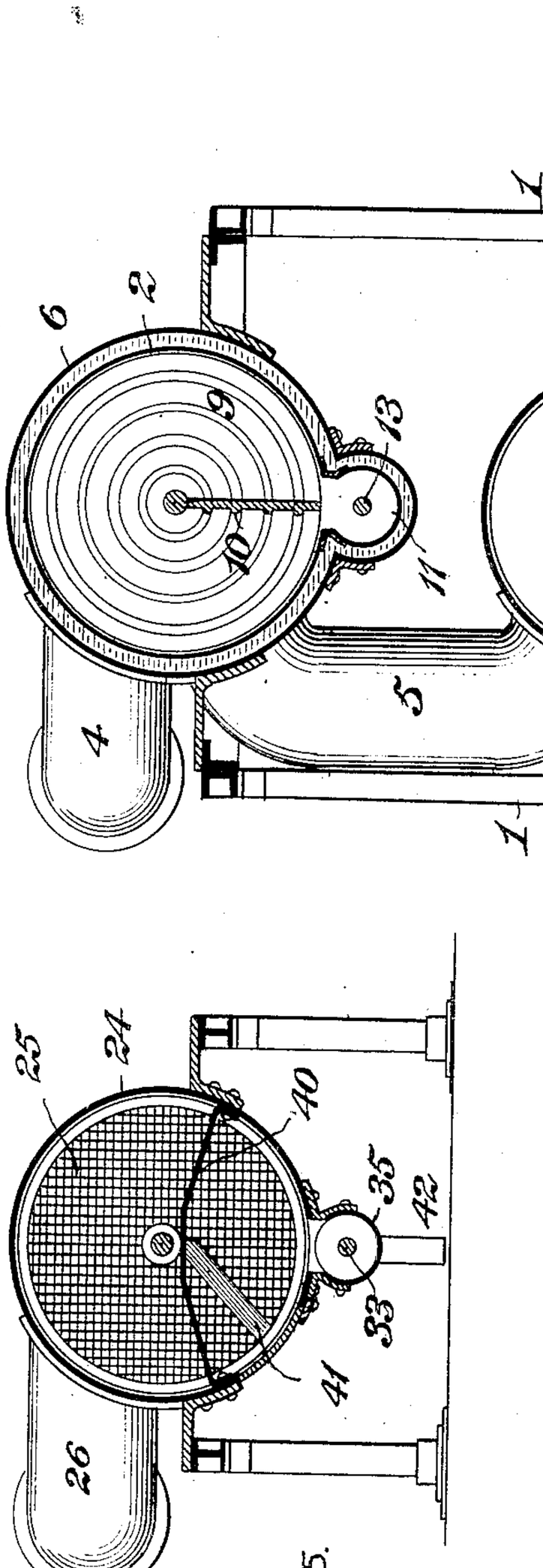

FIG. 6.

FIG. 5.

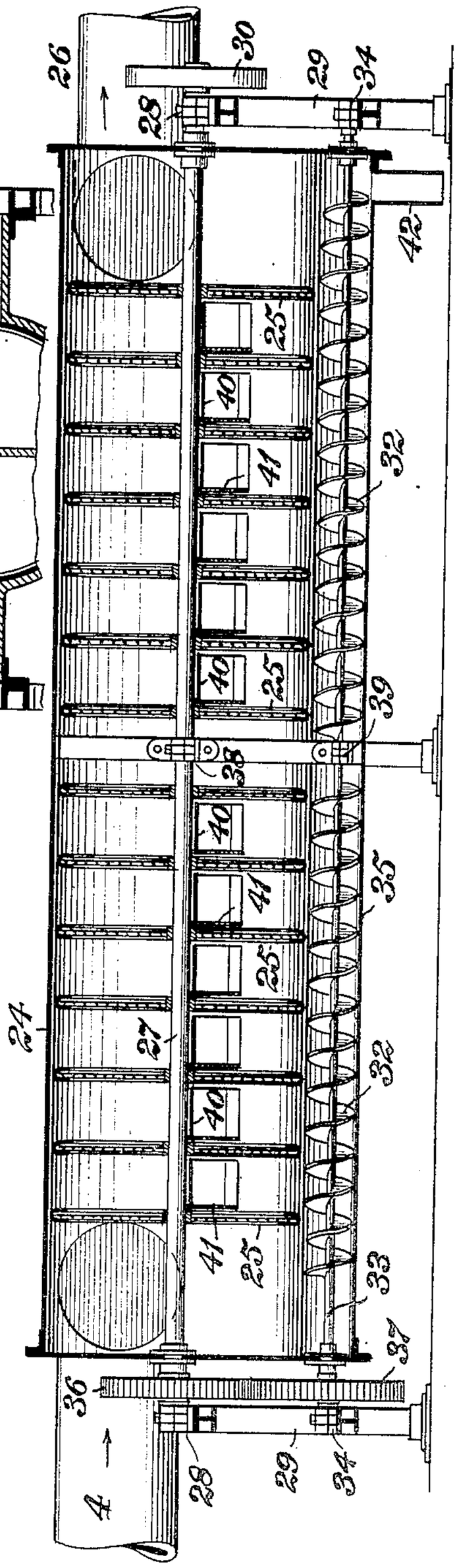

FIG. 4.

WITNESSES

James C. Herron.

L. R. Bell.

INVENTOR

Chas. E. Briney,

by Dowden & Dowden,

Att'y.

UNITED STATES PATENT OFFICE.

CHARLES E. BRINEY, OF CORAOPOLIS, PENNSYLVANIA.

APPARATUS FOR REMOVING ORE-DUST FROM FURNACE-GASES.

No. 914,696. Specification of Letters Patent. Patented March 9, 1909.

Application filed April 18, 1908. Serial No. 427,790.

To all whom it may concern:

Be it known that I, CHARLES E. BRINEY, of Coraopolis, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Apparatus for Removing Ore-Dust from Furnace-Gases, of which improvement the following is a specification.

The object of my invention is to provide a mechanism of simple construction and comparatively inexpensive cost of operation and maintenance, whereby the ore dust which is commingled with the waste gases of blast furnaces, may be separated therefrom and collected; in order to prevent the accumulation of ore dust in the hot blast stoves or other point of consumption, or its escape into the atmosphere, and to increase the efficiency of the gases for use in gas engines or for other purposes, with the further advantages of obviating the annoyance and damage to property in the neighborhood of such furnaces which has been experienced, to a substantial degree, when the ore dust is permitted to escape into the atmosphere, as well as effecting an economy in the operation of the furnace by retaining for utilization the ore dust which would otherwise be wasted.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a side view, in elevation, of an apparatus for removing ore dust from furnace gases, embodying my invention; Fig. 2, an end view of the same, as seen from the left; Fig. 3, a vertical central section, on an enlarged scale, through the preliminary separating cylinders and their conveyers; Fig. 4, a similar section through the screen cylinder and its conveyer; Fig. 5, a transverse section through the same, on the line *a a* of Fig. 4; and Fig. 6, a similar section through the two upper preliminary separating cylinders.

In the practice of my invention, I erect, in convenient proximity to a blast furnace, a substantial supporting frame, 1, which is preferably formed of suitably connected vertical, horizontal, and inclined members of structural steel shapes, and upon which is secured a plurality of preliminary separating cylinders, 2, which are disposed one above another, and, in the instance shown, are three in number, although a greater or less number may be used, in the discretion of the constructor. A gas supply pipe, 3, leads from the downcomer of the furnace into the lowest of the cylinders, 2, adjacent to one of its ends, and a gas discharge pipe, 4, leads out of the uppermost of the set of cylinders, adjacent to one of its ends. The cylinders, 2, are connected one to another by gas transfer pipes, 5, 5, which open into the cylinders near alternately opposite ends thereof and near the ends opposite those which are adjacent to the gas supply pipe and gas discharge pipe, respectively. The uppermost preliminary separating cylinder is preferably, as shown, inclosed in a water jacket, 6.

A shaft, 7, passes centrally through each of the preliminary separating cylinders, 2, and is journaled in bearings, 8, fixed upon the supporting frame, 1, opposite the ends thereof. An agitator and retarder, 9, which is in the form of a helical blade, of such diameter as to fit freely in the cylinder, and having ridges or projections, 10, upon its forward or leading side, is formed upon, or fixed to, each of the shafts, 7. A longitudinal conveyer casing, 11, is located below each of the cylinders, 2, with the bottom of which it is in continuously open communication, through openings in its top and in the bottom of the cylinder, extending throughout the length of both, and a screw conveyer, 12, is fixed upon a shaft, 13, extending longitudinally through each conveyer casing and journaled in bearings, 14, on the frame, opposite the ends thereof. Dust discharge pipes, 15, lead from the bottoms of the conveyer casings, 11, to points where it may be desired to deposit the ore dust. It will be ordinarily advisable as shown in Fig. 2, to divide the agitators and retarders, and the screw conveyers, into two sections, and to provide their shafts with intermediate bearings, 16 and 17, respectively, in order to obviate liability of the springing of the shafts, and the binding of the members which they carry, in the cylinders and conveyer casings.

A driving pulley, 18, for the reception of a belt passing around a pulley on a shaft (not shown) which is rotated by any suitable and preferred prime mover, is secured upon one end of the agitator and retarder shaft, 7, of the lowest of the preliminary separating cylinders, 2, and said shaft, as well as the shafts, 7, of the other cylinders, carries upon its opposite end a spur gear, 19, which meshes with a similar gear, 20, fixed on the shaft, 13, of the screw conveyer located below it. Idle

spur gears, 21, are interposed between the gears, 19, of the cylinders, and the gears, 20, of the conveyer shafts next above them, so that, when rotation is imparted to the shaft, 7, of the lowest cylinder, the shafts, 7, of all the cylinders, will be rotated in alternately opposite directions, and each of the conveyer shafts, 13, will be rotated in opposite direction to the shaft, 7, of the cylinder immediately above it.

The uppermost of the cylinders, 2, is as before stated, preferably inclosed in a water jacket, 6, through which a circulation of water is maintained by inlet and outlet pipes, 22 and 23, in order to reduce the temperature of the furnace gases if it should be unduly high, or sufficiently high to injuriously affect the magnets hereinafter described, and, if desired, one or all of the other cylinders of the set may also be water jacketed.

Under certain conditions, and with certain grades of ore, the separation of the ore dust from the furnace gases may be effected, with sufficient completeness for practical purposes, by the mechanism above described, but in cases where it is necessary or desirable that this operation should be performed to the fullest degree practicable, I supplement said mechanism by a screen cylinder, 24, within which a plurality of screen disks, 25, are rotated, the gases passing out of the uppermost of the cylinders, 2, being led into one end of said cylinder by the gas discharge delivery pipe, 4, and being finally discharged therefrom to the hot blast stoves, or other location of delivery, by a final gas discharge pipe, 26, leading out of the opposite end of the cylinder. The screen disks, 25, which are of grated or perforated metal, are secured upon a shaft, 27, passing centrally through the screen cylinder, 24, and journaled in bearings, 28, supported on frames, 29, adjacent to its ends. A pulley, 30, is fixed upon one end of the screen shaft, 27, to which rotation is imparted by any suitable prime mover, which is shown in Fig. 1, as an electric motor, 31, and a screw conveyer, 32, is fixed upon a shaft, 33, which is journaled in bearings, 34, below the bearings of the shaft, 27, of the disks, and rotates in a conveyer casing, 35, located below and open at its top to, the screen cylinder, 24. Rotation is imparted to the conveyer shaft by means of a spur gear, 36, secured upon it near one of its ends, said gear engaging a corresponding gear, 37, on the shaft 33. The shafts, 27 and 33, are, similarly to those of the preliminary separating cylinder mechanism, provided with bearings, 38 and 39, respectively, located near the middle of their length, and a set of screens and a conveyer section are located on each side of these intermediate bearings.

The screen disks, 25, are disposed at intervals in the length of the shaft 27, between the inlet and outlet pipes, 4 and 26, of the furnace gases, and a transverse baffle plate, 40, is interposed between each screen disk and the next succeeding one. Brushes, 41, (Fig. 5) are fixed to the baffle plates adjacent to the screens, and, by their contact with the latter during their revolutions, act to clean off the ore dust that may adhere to them, the dust dropping into the conveyer casing, 35, from which it is conveyed to a suitable receptacle through a pipe, 42. A greater or less number, or all of the screen disks, are magnetized, so as to serve as screen magnets, which will attract the particles of ore dust, these being subsequently removed and caused to drop into the conveyer casing, by the brushes, 41.

Instead of using a single screen cylinder as above described and shown in Figs. 4 and 5, two of said cylinders may be located one above the other, the screens of one cylinder being magnetized and the other unmagnetized, and the cylinders being connected by gas transfer pipes, similarly to the preliminary separating cylinders.

In the operation of the apparatus, the furnace gases, charged with ore dust, enter the lowest of the preliminary separating cylinders, 2, through the pipe, 3, and traverse to the opposite end of the cylinder, in opposite direction to the direction of rotation of the helical bladed agitators and retarder, 9, thereof, and thence pass successively to and through the remaining preliminary cylinders. By the action of the agitators and retarders upon the gases, in their traverse through the cylinders, the ore dust is separated from the gases and drops into the conveyer casings, 11, from which it is discharged through the dust discharge pipes, 15. After their traverse through the cylinders, the gases pass out of the gas discharge pipe, 4, and may be either led to the hot blast stoves or other location of utilization, or be passed into the screen cylinder, 24, if it is considered to be necessary or desirable to separate from them the inconsiderable quantity of ore dust which may not have been removed in the separating cylinders. In their passage through the screens and by the action of the screen magnets, this small quantity of ore dust will be practically completely separated, and is carried by the conveyer, 32, to the pipe, 42, through which it passes to a suitable receptacle, and the gases are discharged through the pipe, 42.

I claim as my invention and desire to secure by Letters Patent:

1. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, agitators and retarders fitted to rotate in alternately opposite directions in said cylinders successively, and pipes providing for the traverse of furnace gases successively through the several

cylinders, oppositely, in each of them to the direction of rotation of the agitators and retarders therein.

2. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, agitators and retarders fitted to rotate, in alternately opposite directions in said cylinders successively, pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely, in each of them to the direction of rotation of the agitators and retarders therein, and means for withdrawing separated ore dust from each of said cylinders.

3. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, agitators and retarders fitted to rotate, in alternately opposite directions in said cylinders successively, pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely, in each of them to the direction of rotation of the agitators and retarders therein, means for withdrawing separated ore dust from each of said cylinders, and means for water cooling the cylinder from which the gases are finally discharged.

4. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, a shaft fitted to rotate in each of said cylinders, agitators and retarders fixed upon said shafts, gearing for rotating said shafts in alternately opposite directions, and pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely to the direction of rotation of the agitators and retarders.

5. In an apparatus for removing ore dust from furnace gases, the combination of a supporting frame, a plurality of superposed separating cylinders fixed thereto, a shaft fitted to rotate in each of said cylinders and journaled in bearings on the supporting frame, agitators and retarders fixed upon said shafts, gearing for rotating said shafts in alternately opposite directions, and pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely to the direction of rotation of the agitators and retarders.

6. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, a shaft fitted to rotate in each of said cylinders, agitators and retarders fixed upon said shafts, gearing for rotating said shafts in alternately opposite directions, pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely to the direction of rotation of the agitators and retarders, and conveyers for withdrawing separated ore dust from each of said cylinders.

7. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, a shaft fitted to rotate in each of said cylinders, agitators and retarders fixed upon said shaft, conveyer casings located below and communicating with the separating cylinders, conveyers fixed upon shafts fitted to rotate in said casings, gearing for rotating the agitator and retarder shafts in alternately opposite directions and for rotating each of the conveyer shafts, and pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely to the direction of rotation of the agitators and retarders therein.

8. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, agitators and retarders in the form of helical blades fitted to rotate in said cylinders, pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely to the direction of rotation of the agitators and retarders therein, and means for withdrawing separated ore dust from each of said cylinders.

9. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, agitators and retarders fitted to rotate in said cylinders, pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely to the direction of rotation of the agitators and retarders therein, means for withdrawing separated ore dust from each of said cylinders, a screen cylinder, a plurality of screen disks fitted to rotate therein, a pipe for the discharge of furnace gases from the separating cylinders into the screen cylinder, and means for withdrawing separated ore dust from the screen cylinder.

10. In an apparatus for removing ore dust from furnace gases, the combination of a plurality of separating cylinders, agitators and retarders fitted to rotate in said cylinders, pipes providing for the traverse of furnace gases successively through the several cylinders, oppositely to the direction of rotation of the agitators and retarders therein, means for withdrawing separated ore dust from each of said cylinders, a screen cylinder, a plurality of magnetized screen disks fitted to rotate therein, a pipe for the discharge of furnace gases from the separating cylinders into the screen cylinder, and means for withdrawing separated ore dust from the screen cylinder.

11. In an apparatus for removing ore dust from furnace gases, the combination of a screen cylinder, a furnace gas inlet pipe leading to one end of said cylinder, a furnace gas discharge pipe leading from the opposite end of said cylinder, a shaft fitted to rotate in said cylinder, a plurality of magnetized

screen disks fixed upon said shaft, and means for withdrawing separated ore dust from said cylinder.

12. In an apparatus for removing ore dust from furnace gases, the combination of a screen cylinder, a furnace gas inlet pipe leading to one end of said cylinder, a furnace gas discharge pipe leading from the opposite end of said cylinder, a shaft fitted to rotate in said cylinder, a plurality of screen disks fixed upon said shaft, means for detaching ore dust from the screen disks, and means for withdrawing separated ore dust from said cylinder.

13. In an apparatus for removing ore dust from furnace gases, the combination of a screen cylinder, a furnace gas inlet pipe leading to one end of said cylinder, a furnace gas discharge pipe leading from the opposite end of said cylinder, a shaft fitted to rotate in said cylinder, a plurality of screen disks fixed upon said shaft, a conveyer casing located below and communicating with the screen cylinder, and a conveyer fixed upon a shaft fitted to rotate in said casing.

14. In an apparatus for removing ore dust from furnace gases, the combination of a screen cylinder, a furnace gas inlet pipe leading to one end of said cylinder, a furnace gas discharge pipe leading from the opposite end of said cylinder, a shaft fitted to rotate in said cylinder, a plurality of screen disks fixed upon said shaft, a plurality of stationary brushes abutting against the screen disks and acting to detach particles of ore dust therefrom, and means for withdrawing separated ore dust from said cylinder.

CHARLES E. BRINEY.

Witnesses:
B. R. BRINEY,
FRED WALDSCHMIDT.