

(No Model.)

E. P. EASTWICK.
BONE BLACK KILN.

No. 308,476.

Patented Nov. 25, 1884.

Fig. 1.

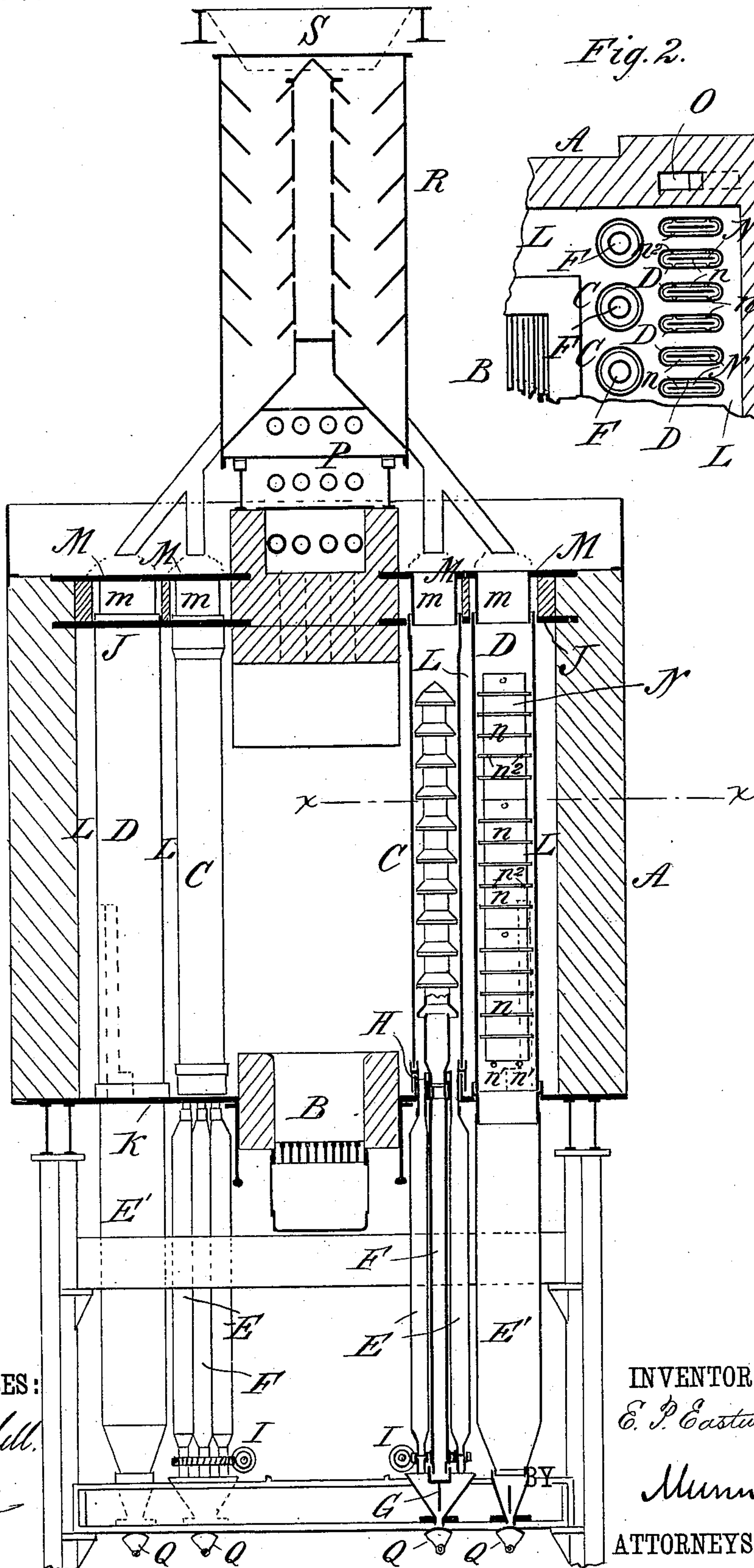
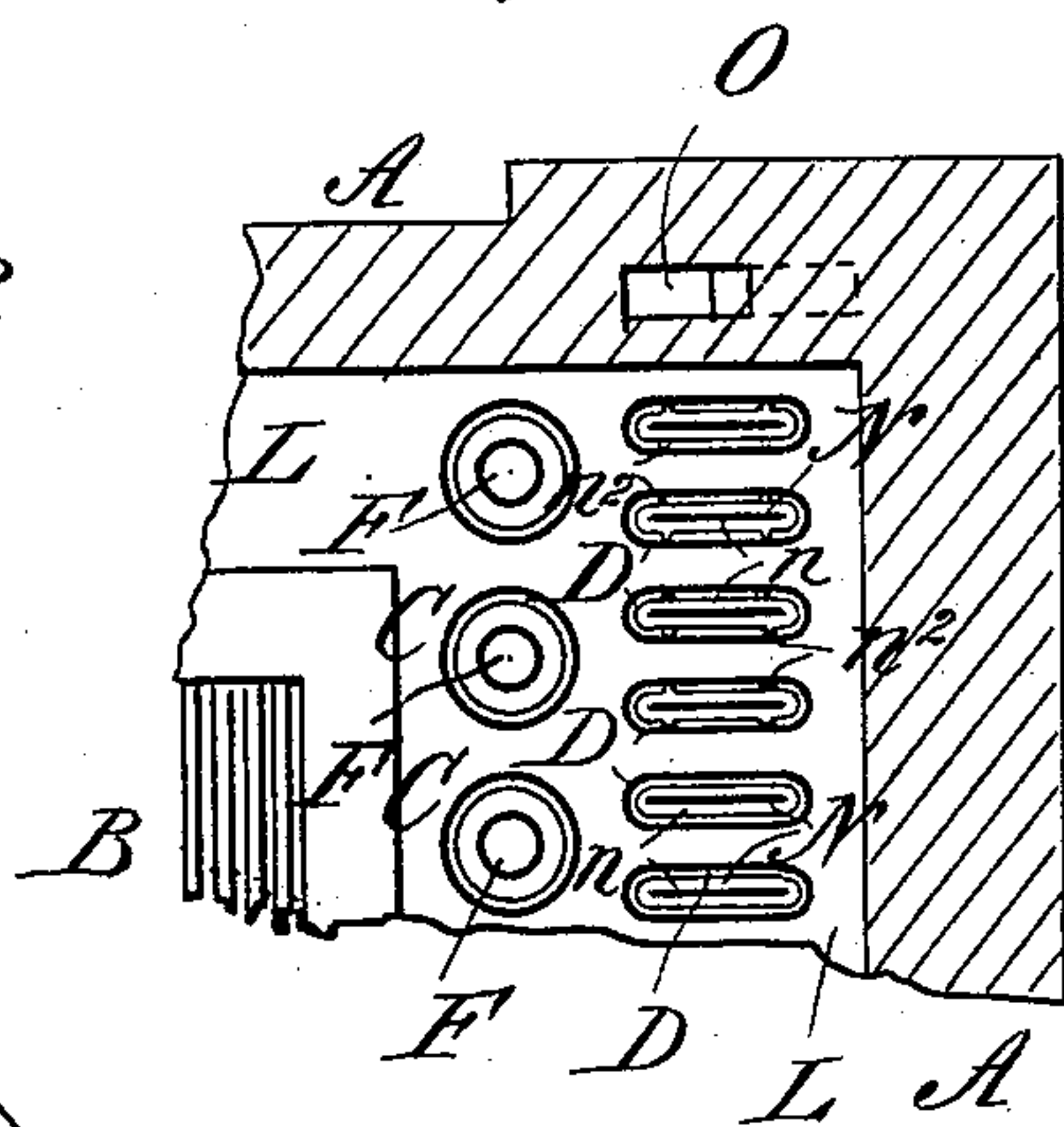


Fig. 2.



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BONE-BLACK KILN.

SPECIFICATION forming part of Letters Patent No. 308,476, dated November 25, 1884.

Application filed March 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. EASTWICK, of the city, county, and State of New York, have invented certain new and useful Improvements in Bone-Black Kilns, of which the following is a full, clear, and exact description.

This invention relates to new and useful improvements in kilns for reburning and revivifying bone-black used in refining sugar.

10 Among others two styles of kilns are most generally used for the purpose of revivifying bone-black. One of these consists of a number of stationary oval-shaped pipes varying from seven to nine feet in length, nine to
15 twenty-four inches in breadth, and from three to five inches in width, made of cast-iron and placed in two or more rows in chambers adjacent to both sides of a furnace built centrally between them. The pipes or retorts are arranged so that they stand perpendicularly,
20 having their open ends adapted to openings in top and bottom plates, which support and keep them in position. They are placed at regular distances from each other, each with
25 one of its narrow sides toward the furnace, the intervening spaces between these forming passages through which the heated gases from the furnace pass to openings in the back and lower part of the chambers, which openings
30 communicate with flues leading to the chimney. The bone-black to be revivified is introduced into the pipes at the top and passing through them is heated to a degree which is sufficient to decompose and carbonize the organic matter adherent to it. It then passes
35 from the pipes at the lower openings into closed sheet-iron receivers, called "coolers," attached to the bottom plates of the chambers, in which it loses a portion of its heat sufficient to prevent ignition when exposed to
40 the air. Thence it is discharged from the kiln by means of valves at the bottom of the coolers. The other style of kiln consists of vertical cylindrical cast-iron pipes ten to fifteen
45 inches in diameter, and of suitable length, placed in chambers and similarly located in reference to the furnace as in the first-described kiln, also having the heated gases pass between them in a similar manner. These pipes
50 pass through the upper and lower sides of the chambers, and are attached at their lower

ends on the outside and beneath the chambers to sheet-iron receivers or coolers exposed to the air outside the kiln. Hollow shafts resting on beams under the coolers and pipes pass
55 between the coolers and through the centers of the pipes, and are fastened to the latter by suitable devices. The parts of the shafts which pass through the pipes have at intervals projecting rims or hoods, which approach near the
60 inner surface of the pipes. Under the hoods are openings into the hollow centers of the shafts, which serve to carry off vapors and gases. The lower ends of the shafts have attached to them worm-wheel gears, by means of which
65 the shaft-pipes and coolers are made to rotate. The bone-black to be revivified is introduced at the top of the pipes, which are heated, and passes through them while they rotate, being completely calcined during its passage into
70 the coolers, and is discharged therefrom through openings in the gear-wheels into the open air. Each of these styles of kilns have, when compared with each other, advantages and disadvantages. The stationary oval pipes
75 present more heating-surface than the round pipes in the same space occupied; but, on the other hand, being stationary and constantly exposed to an intenser heat on one side than the other—that nearest the furnace—they are
80 unequally heated and thereby become bent and cracked by the unequal expansion. The intense radiated heat burns the iron, and in a short time the pipes are rendered useless. The effect produced by the unequal distribution of the heat over the pipes is also irregular
85 on the bone-black, a portion of the same being overheated while other portions are insufficiently burned. Not having any central shafts or plates, the bone-black is not diverted in thin
90 layers toward the sides of the retorts, but moves downward in a comparatively thick body, the center of which is only heated sufficiently after the exterior portions have been overheated. The rotating round pipes have
95 the advantage over the stationary pipes in presenting successively their entire surface to the intense radiated heat of the furnace without exposing any part for a sufficient time to cause unequal expansion or overheating of the
100 iron. They are thereby uniformly heated, and all portions of the bone-black they contain are

equally burned. The central shafts and hoods guide the bone-black toward the inner surface of the pipes, forming it into occasional thin layers, which rapidly absorb and distribute the heat. The rotating pipes are at a disadvantage as compared with the stationary oval pipes in presenting less area of heating-surface, as above stated, and also in requiring expensive machinery and power to give them motion. Both styles of kilns have generally attached driers of various forms, which serve the purpose of evaporating all or a portion of the moisture contained in the bone-black before it enters the retorts in which it is heated to redness and revived.

My invention has for its object the construction of a bone-black kiln which will combine the advantages of both styles of kilns above described, and in a great measure avoid their respective disadvantages.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 represents a vertical sectional elevation of the kiln, and Fig. 2 is a sectional plan view taken on the line *x x* of Fig. 1.

A A are the walls of the heat-chambers, built of brick. B is the furnace centrally placed. C C are the round rotating pipes. D D are the oval or elliptical shaped stationary pipes. E E are the coolers attached to the pipes C C, and E' E' are the coolers connected with the pipes D D. The shafts F F are supported on the flanged T-beams G G, and pass upward between the coolers E E and through the round pipes C C, to which latter they are fastened at H. Worm-wheel gearing (shown at I) communicates motion to the shafts F, pipes C, and coolers E. The top plates, J, and the bottom plates, K, of the chambers L L, have suitable openings in them to allow the pipes C C to pass through, and they also form bearings for the pipes to rotate in. M M are covering-plates laid over the top of the kiln, which enter the top of the retorts C D, by means of open sleeves *m*, and also form spaces beneath them for the free expansion of the heated pipes. The stationary pipes D D are placed in a line behind the rotating pipes C C, which are next to the furnace, in a manner to be shielded by the rotating pipes from the direct radiated heat of the furnace. They are kept in position by the top plates, J, through which they pass, and are supported by the bottom plates, K.

Inside the stationary retorts or pipes D are

plates N, which have ribs *n n*, extending toward and within a short distance of the sides of the retorts. These plates N are held up by pins or cores *n' n'*, and are kept in central position by projections *n² n²*, and they serve the purpose of directing the bone-black in thin layers against the sides of the retorts, thereby causing it to speedily absorb the required heat.

O O are the flues which conduct the waste gases of combustion to the pipes of the air-heater P and to the chimney.

Q Q represent an automatic oscillating discharging apparatus for drawing off regularly and in definite quantities the bone-black from the coolers.

R represents a drier, operated by means of currents of air heated by the waste gases of the kiln or other sources of heat, and into which the bone-black is introduced by a hopper, S, and where it is deprived, either partially or entirely, of the moisture it contains before entering the pipe.

The advantages which this form of kiln possesses over other kilns heretofore used are in its having more effective heating-surface in the space occupied; in controlling a more uniform action of the heat on the bone-black; in requiring less machinery for motive power than is used in the ordinary rotating-pipe kiln; and in the greater durability of the stationary pipes over those in the ordinary stationary-pipe kiln, and in costing less for construction than either when working capacity is considered. The rotating pipes intercept the direct radiated heat and shield the stationary pipes from its intensity, the heat of the furnace being thereby uniformly distributed over the surface of the pipes.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of rotating and stationary pipes in a kiln, the former being placed adjacent to the furnace, and the latter in a line behind them, substantially as and for the purpose herein described.

2. The combination, with the stationary retorts or pipes, of the plates N, held suspended within the same and provided with a series of ribs, *n*, extending around said plates one above the other, spaces being left between said ribs and the retort for the passage of the material being dried, substantially as set forth.

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Witnesses:

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