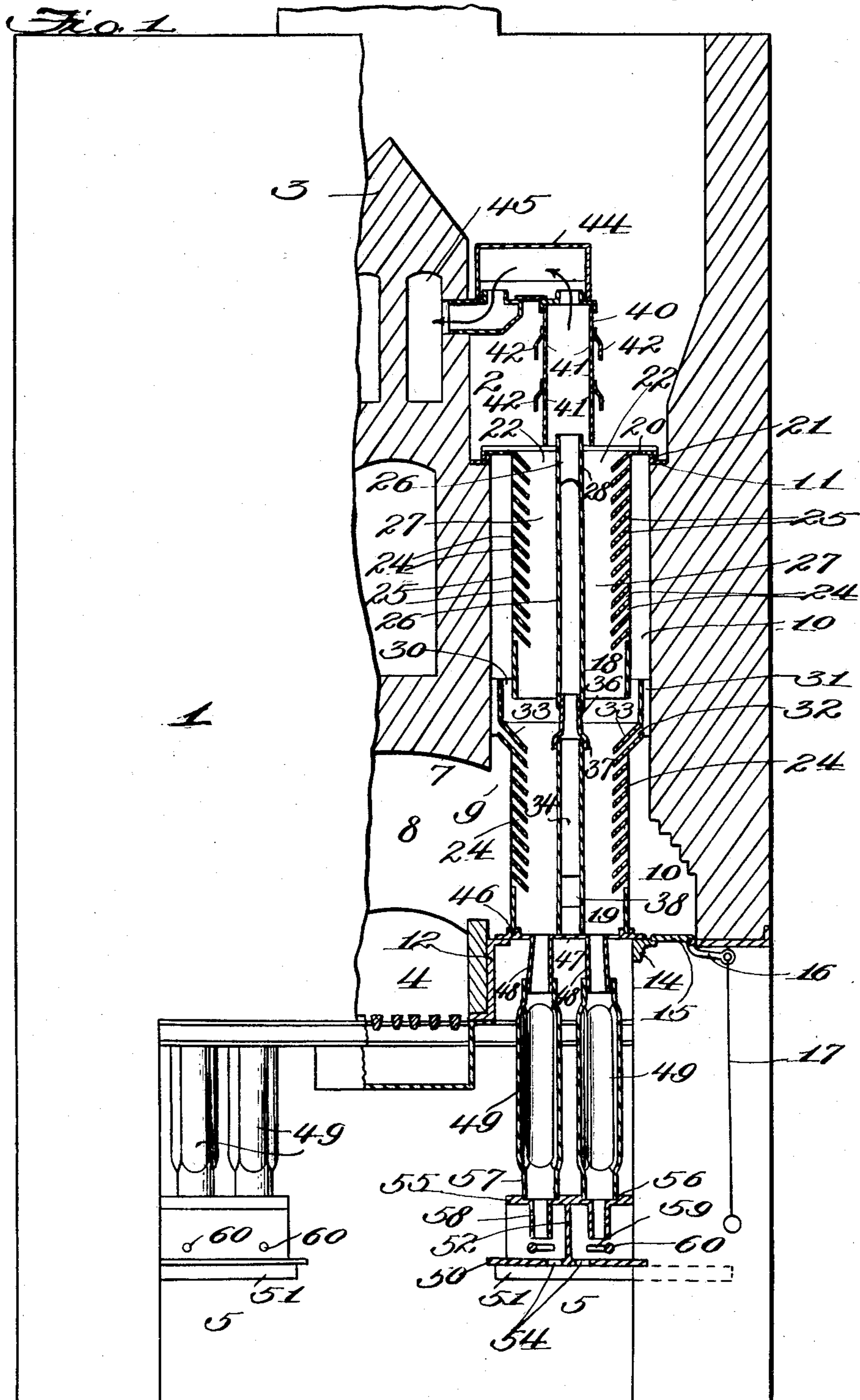


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B. EBA.
BONE BLACK KILN.
APPLICATION FILED MAY 13, 1909.

Patented Nov. 16, 1909.
3 SHEETS—SHEET 1.



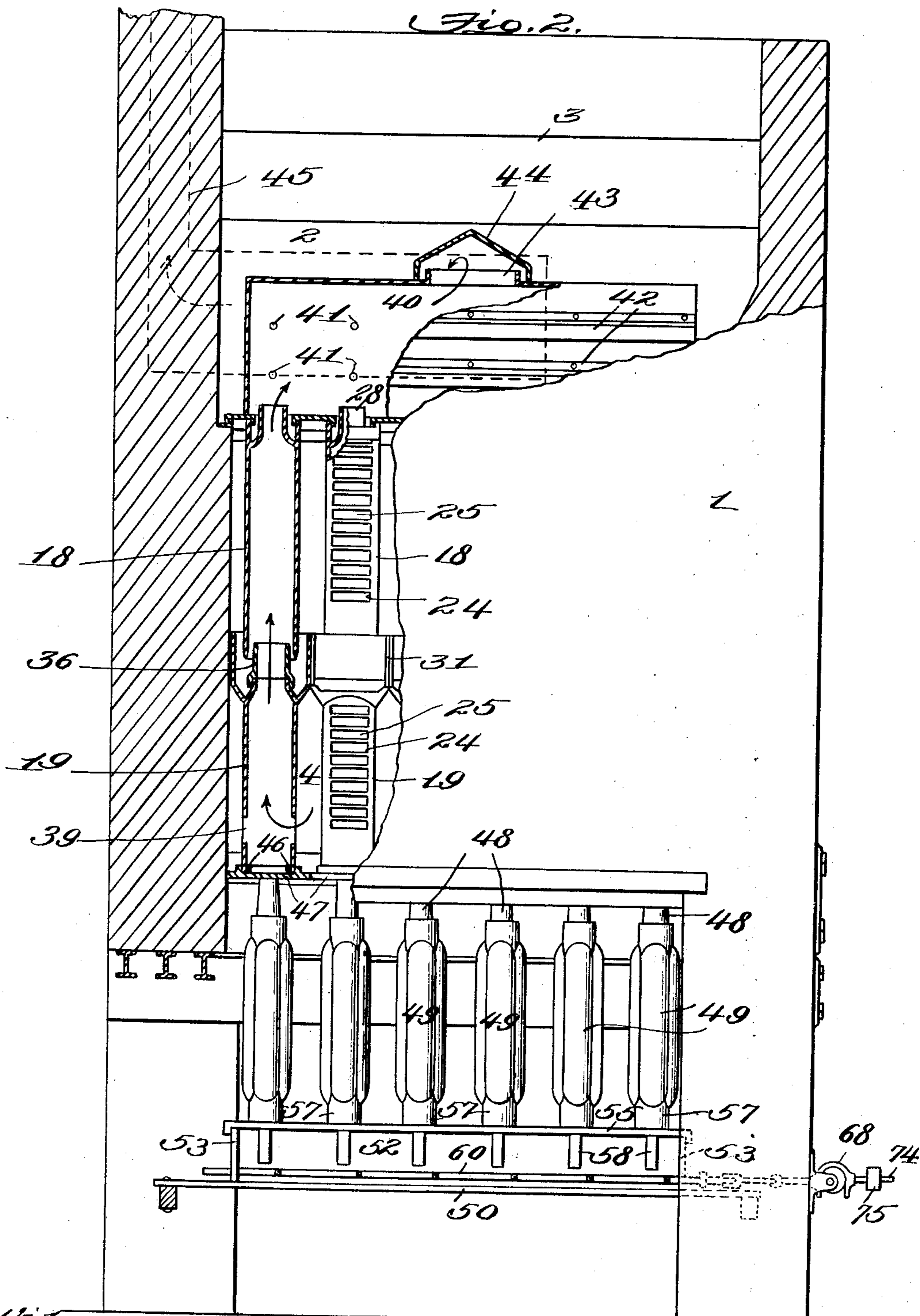
Witnesses:
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Inventor
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John Kessler

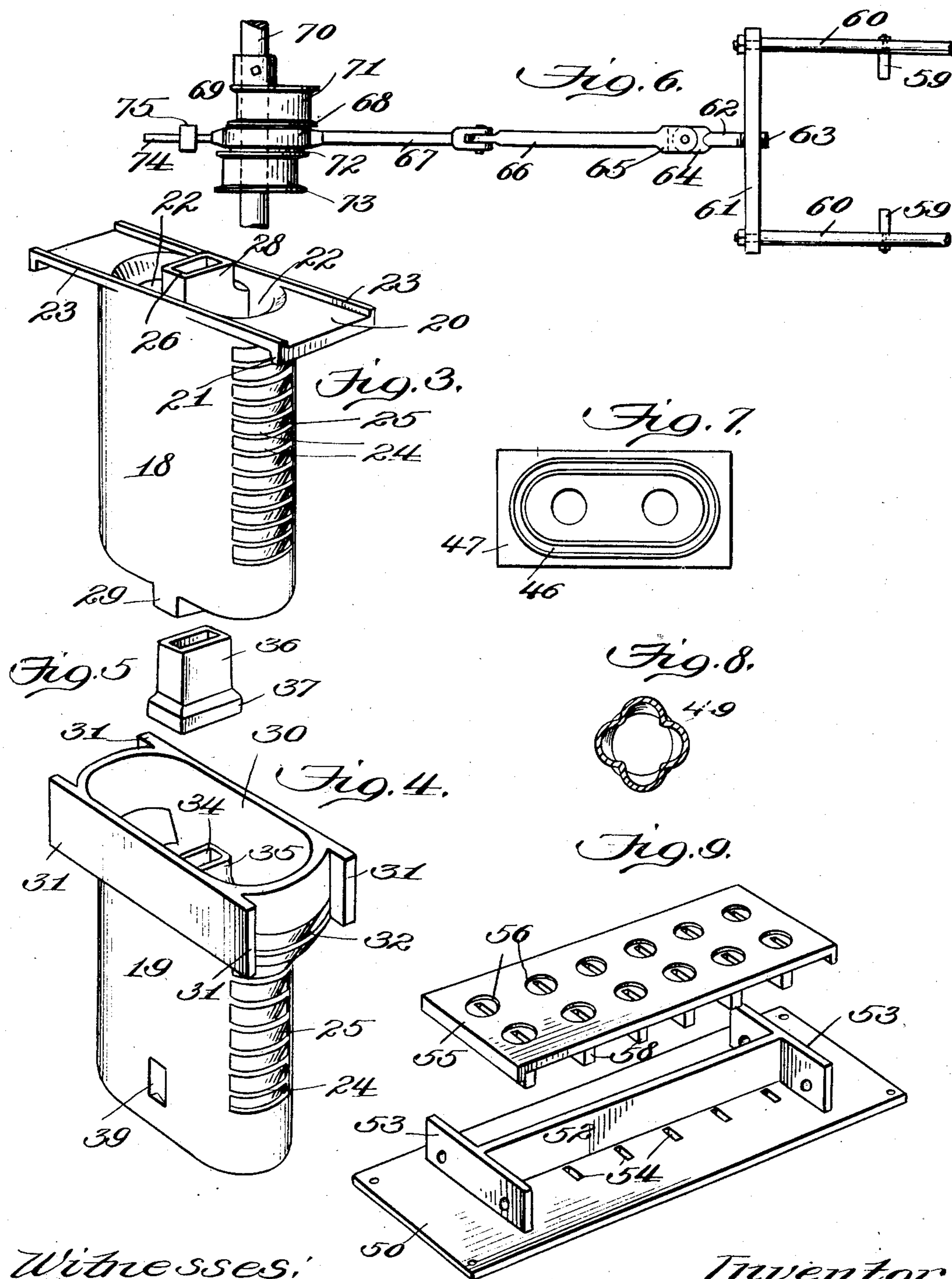
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

BERNHARDT EBA, OF NORTH WARREN, PENNSYLVANIA.

BONE-BLACK KILN.

940,520.

Specification of Letters Patent.

Patented Nov. 16, 1909.

Application filed May 13, 1909. Serial No. 495,713.

To all whom it may concern:

Be it known that I, BERNHARDT EBA, a citizen of the United States, residing at North Warren, in the county of Warren and State of Pennsylvania, have invented new and useful Improvements in Bone-Black Kilns, of which the following is a specification.

This invention relates to an apparatus or kiln for calcining or revivifying bone-black, fullers' earth, or analogous materials, wherein are employed a series of retorts supplied with the bone-black or other material from a feed-hopper and communicating at their lower extremities with cooling chambers or cylinders which reduce the temperature of the bone-black or other material sufficiently to permit a safe discharge in contact with the atmosphere.

The present invention consists in improvements on a number of features disclosed in my prior patents and particularly in Patent No. 796,303, granted August 1, 1905. The improvements consist particularly in separably associated retort sections with flues or conduits therein connected by a tubular coupling; also in superimposed retort sections each having a plurality of openings in the side wall from which deflectors extend inwardly; also a flue extension over the upper extremity of the projected flue of the uppermost section of each retort communicating with flue means connected to a chimney; also particular supporting means and outlets for the cooling chambers and the retorts, and a novel arrangement of drawing mechanism cooperating with the outlets of the cooling chambers to shift the released material and positively adjustable to vary the stroke of the drawing mechanism in accordance with the outlet feed that may be desired.

The invention still further consists in the details of construction and arrangement of the several parts which will be more fully hereinafter specified.

In the drawings:—Figure 1 is a sectional elevation of an apparatus embodying the improved features of the invention, the furnace or fireplace being shown in transverse section as well as portions of one of the retorts. Fig. 2 is a longitudinal sectional elevation of the apparatus. Fig. 3 is a perspective view of one of the upper sections of

the retorts. Fig. 4 is a similar view of one of the lower retort sections which cooperates with the upper section shown by Fig. 3. Fig. 5 is a detail perspective view of the tubular coupling for the flues extending through the sections shown by Figs. 3 and 4. Fig. 6 is a plan view showing the mechanism for operating the drawing means for the outlets of the cooling chambers. Fig. 7 is a top plan view of a hopper-shaped coupling between the lower retort section and cooperating cooling chambers. Fig. 8 is a horizontal section through one of the cooling chambers. Fig. 9 is a detail perspective view of the bottom support for the cooling chambers and the outlet means from the cooling chambers.

The furnace of fireplace structure 1 may be of any suitable brickwork form mounted on a base or supported by any other means and has at its upper extremity a hopper or feeding chamber 2 in communication with the gangs or oppositely disposed series of retorts, said hopper or feeding chamber being centrally divided at the bottom by an angular bridge or deflector 3 for effectively directing the bone-black or other material to be treated into the several retorts. This furnace or fireplace includes a suitable firebed means 4 having a grate which is accessible at the front of the apparatus through the medium of a suitable door, and including also an ash pit for obvious reasons as well as any preferred type of draft dampers. In the lower portion of the furnace or fireplace 1 the cooling chambers are located and will be more fully hereinafter referred to, and below the cooling chambers spaces are provided as at 5 into which cars or other portable receptacles may be run to directly receive the cooled bone-black or other material subsequent to the revivification or calcining operation, an outlet hopper in the present construction being dispensed with as it has been found that the cooled bone-black or other material may be directly deposited in cars or other receptacles as just explained. The general organization of the furnace is similar to that disclosed in my prior patents, but may be varied at will without departing from or modifying the salient features of the invention, and with the exception of the particular improved constructions may be single or double in its effect in

accordance with the number of gangs or series of retorts utilized therewith. The firebed 4 has an arch 7 at a distance thereabove to provide a chamber 8 having opposite side openings 9 communicating with side circulatory chambers 10 in which the retorts are disposed, the retorts being in the main materially less in diameter than the said circulatory chambers. The upper terminals of the circulatory chambers 10 extend through the bottom of the hopper 2, one of the said chambers being located on opposite sides of the fire-bed and each chamber having at its upper terminal a marginal supporting plate 11. The bottom of each chamber 10 is provided with or defined by a metal plate 12, the said plate 12 being supported by the side wall of the fire-bed 4, and cooperating with the upper extremity thereof as a supporting means at the opposite side of the bottom of the chamber is a suitable metallic ledge 14. Access to the lower portion of each chamber is gained through the medium of a gate or door 15 having an operating arm 16 to which a pull-wire or analogous device 17 is attached. It is unnecessary to enter into explanation of this door or gate 15 as the same is fully set forth as to its operation and advantage in one of my prior patents.

As before indicated, a number of retorts are arranged in each chamber 10 and outlet to or have communication with cooling chambers. As all of the retorts are of like construction, only one will be particularly described. Each retort comprises an upper section 18 and a lower section 19, the upper section being formed with a hanger or support 20 provided with depending terminal flanges 21 to fit over the angular-plate 11 surrounding the upper terminal or forming the margin for the chamber 10. The hangers of the opposite end retort sections have corresponding side flanges which engage the angular plate ends at such points. The upper section 18 is similar in all respects to the upper retort section shown by my Patent No. 796,303 and has two feeding openings 22 communicating with the bottom of the hopper or feeding chamber 2, the hanger 20 having upstanding side flanges 23, see Fig. 3, which materially assist in directing the material to be treated into the openings 22. The upper section 18 and likewise the lower section 19 of each retort are preferably oblong in cross section and the rounded ends of both sections from the upper extremities of the latter downwardly to a distance above the lower extremities of the same are formed with a plurality of openings 24 from which deflectors 25 extend inwardly and downwardly for a short distance into the interior of each section. The upper section 18 also has a central flue or conduit 26 which in the main is rectangular in cross section and projects above the upper

and lower extremities of its section, the projecting extremities of this flue being reduced.

The flue or conduit 26 extends transversely across the section 18 and provides a central partition which divides the section 18 into two passages 27. The upper reduced extremity 28 of the flue 26 is adapted to be connected to an auxiliary cross-flue in a manner which will be more fully hereinafter explained, and the lower reduced extremity 29 of the said flue projects into the lower section 19. The lower section 19 has an upper enlarged extremity or coupling head 30 to snugly receive the lower end of the section 18, the said lower end of the latter section being fully open, as shown. At opposite ends of the upper extremity or coupling head 30, flanges 31 project outwardly and bear against the opposite end walls of the chamber 10 to avoid obstructing circulation of the gases or other material passing out from the retort into the chamber 10 and from the said chamber passing to the fire-bed for utilization as fuel. Between the flanges 31 the upper extremity or coupling head 30 also has outlet openings or short flues 32, see Figs. 1 and 4, which are guarded by downwardly inclined interior deflectors 33 having such projection toward the center of the section 19 as to prevent any of the material treated escaping or passing out through the openings 32. Extending centrally through the interior of the section 19 is a flue or conduit 34 having its upper extremity reduced and adapted to aline with the lower extremity 29 of the flue 26 of the section 18 when the two sections 18 and 19 are assembled, the lower extremity 29 of the flue 26 and the upper reduced extremity 35 of the flue 34 being connected by a tubular coupling 36 having an enlarged lower extremity 37 to fit over the upper extremity 35 of the flue 34 and an upper reduced extremity to fit in the lower extremity 29 of the flue 26. The advantage of this construction is that the difficulty in practically producing a retort section having a flue therein is reduced to a minimum and breakage of the upper extremity of the flue of the said lower section is prevented. It was found in the construction of flue as shown by my Patent No. 796,303, and wherein the upper extremity of the flue of the lower section was projected high enough to directly engage the lower extremity of the flue of the upper section, that the upper projecting extremity of the lower flue was liable to become broken and the structure was rendered complex in order to obtain a fitting alinement of the projecting extremities of the two flues of the two sections. The use of the tubular coupling 36 obviates these disadvantages and results in a more satisfactory and efficient means of connecting the two flues. The flue 34 of the lower section 19 has its side wall in

this instance imperforate except at its lower extremity where an opening 38 is formed and serves as an outlet which is in communication with an opening 39 in one side of the body of the section 19 and whereby communication between the interior of the flue 34 and the chamber 8 is established, and by this means any gas or other material passing off from the bone-black at the center of the lower section 19 may escape through the openings 24 into the chamber 10 and from the latter into the chamber 8 and be consumed by the fire-bed, and products of combustion or unconsumed material passing off from the fire-bed are permitted to escape through the chamber 8 and connected openings 39 and 38 into the flue 34 and from the latter into the flue 26. These flues 26 and 34 also serve as a heating means at the center of the retort sections with material advantages in treating bone-black, fullers' earth, or other material, by reason of the passage of the products of combustion and other heated material through the said flues.

Over the upper projecting extremities of the flues 26 of the upper retort sections a flue box or hollow escape means 40 is applied and has in opposite sides openings 41 at different elevations shielded by outer depending guards 42, the flue box or escape means having a closed top with a central outlet opening 43 over which is applied a peaked cross-flue 44 of hood-like form communicating with an escape flue or chimney 45, see Figs. 1 and 2. The flue box or hollow escape means 40 permits the gas and fumes from the bone-black or other material deposited in the hopper 2 to escape into the common escape flue or chimney 45 before the said bone-black or other material passes downwardly into the retorts, but it is obvious that not all of the gas and fumes will thus escape, as a great portion of the gas and fumes will be liberated or set free as the bone-black or other material becomes heated in the retorts and will escape through the openings 24 into the chamber 10 and from the latter pass to the fire-bed 4 and become consumed and serve as fuel to heat the retorts. This utilization of the escaping gas and fumes as fuel will materially economize in the treatment or revivification of the bone-black or other material.

The lower extremities of the lower sections of the retorts are held in flanged seats 46 of beds 47 of hopper-shaped couplings or unions supported on the plate 12 and ledge 14. This coupling or union has two depending hoppers 48 communicating with each lower retort section 19 and opening into the passages of the latter on opposite sides of the flue 34. The hoppers 48 fit into the upper reduced ends of a pair of cooling chambers 49, the latter being regularly disposed in pairs by preference under each retort,

and to increase the heat radiating surface and more effectively set up a cooling action the surrounding wall of each cooling chamber has the contour shown in horizontal section by Fig. 8. This increased surface of each cooling chamber which is fully exposed exteriorly will result in facilitating the cooling operation or in reducing the temperature of the bone-black or other material to such a degree that it may be safely discharged or exposed to the atmosphere by being deposited in cars or other receptacles to run under the cooling chambers, as hereinbefore explained. The cooling chambers 49 may be supported by any preferred means beneath the retorts, but it has been found that the outlet controlling mechanism may be conveniently used for this purpose. It will be understood, however, that any framework found necessary in maintaining the cooling chambers in proper position, such for instance as interposed beams, may be employed if desired. The outlet controlling mechanism comprises a base plate 50 suitably secured or held by ledges or analogous means 51 and having a vertical partition 52 extending partially over the length thereof and intersected at opposite terminals by upright supports or heads 53 at right angles thereto. The base plate 50 on opposite sides of the partition 52 is formed with a plurality of regularly spaced outlet openings 54 between the projecting portions of the heads 53, and fitted over and bearing upon the partition 52 and heads 53 is a feed-plate 55 having a plurality of seats 56 in the upper side thereof to receive the lower reduced extremities 57 of the pairs of cooling chambers 49 to prevent displacement of said chambers.

Depending from the under side of the feed-plate 55 and opening through the center of the seats 56 are pairs of outlet nozzles or tubes 58 which do not aline with the openings 54, but stand to one side of the latter far enough to permit the bone-black or other material to flow downwardly onto the base plate 50 in piles adjacent to the openings 54 until drawn toward the latter openings by means which will be presently explained. This outlet or liberation from the cooling chambers of the bone-black or other material has been found by experiment preferable to the deposit of the bone-black or other material into a common hopper as disclosed by my Patent 796,303, and as will be readily understood, the outflowing bone-black or other material resting on the base plate 50 will, if undisturbed, operate to choke the outlets or tubes 58 and obstruct undue escape of the material. The lower terminals of the outlet tubes or nozzles 58 are normally located at a distance above the base plate 50, as clearly shown by Fig. 1, so as to permit the outflow of the material

treated as just explained, and as the said outlet tubes or nozzles are disposed out of alinement with relation to the openings 54 any material such as pieces of casting from the retorts or other substance not reduced to a palpable form falling through the outlet tubes and nozzles will not occlude the openings 54, for if such pieces of castings or other lump material pass through the tubes or nozzles 58 they will fall through the base plate 50 and be dragged away from below the lower terminals of said tubes or nozzles by projections or draw-teeth 59 projecting inwardly toward the partition 52 from draw-bars or rods 60 at regular intervals. These draw-teeth or projections 59, when the rods or bars 60 are reciprocated alternately in opposite directions, force the material deposited on the base plate 50 to the openings 54 and such material passes through the latter openings into the cars or receptacles beneath. The rods or bars 60 are movably mounted in the heads 53 on opposite sides of the partition 52 and are connected at one extremity of each to a cross-head or bar 61 having a coupling member 62 attached to the center thereof. This coupling member has a screw-shank 63 engaging the head 61 and a socketed head 64 to receive a corresponding head 65 on the inner end of a link rod or bar 66 to form a hinge joint for the latter and permit lateral movement in opposite directions of the link in accordance with an adjustment which will be hereinafter explained. A drive rod or bar 67 is pivotally attached to the outer end of the link 66 and said drive rod has a yoke 68 to operatively fit over either one of three members of a compound eccentric 69 fixed on a shaft 70 driven from a suitable source. The compound eccentric includes three members 71, 72 and 73 arranged successively in relation to the shaft 70 to gradually increase the stroke of the drive rod 67 and link 66 from the minimum movement imparted by the eccentric member 73 to the maximum movement instituted by the eccentric member 71. The yoke 68 is readily separable from the eccentric members and may be dropped over either one of the latter in accordance with the length of stroke desired or to establish a variation in the movement of the draw teeth 59 over the base plate 50 between the heads 53. The yoke 68 has a rearwardly projecting shank or grip 74 provided with a weight 75 which operates to hold the yoke downwardly in place. The hinge joint between the coupling 62 and the link 66 permits the drive rod 67 and its yoke to be shifted laterally to engage either of the eccentric members 71 or 73 and also compensate for the position of the drive rod 67 off center when in engagement with said eccentric members 71 and 73. The yoke 68 is also of such shape,

as shown by Fig. 2, as to be effectively operated by the eccentrics.

The retorts can be readily removed from the chamber 10 for repair or replacement by others, or the sections 18 and 19 may be readily separated and new sections introduced and in some instances when it is desired and found necessary one section may remain or be replaced in the retort after removal and a new section associated therewith when it is found that one section may be further used and another section unfit for further use. The retorts and the cooling chambers, as well as the other parts brought into direct contact with the heat or subjected to an intense heating action are constructed of suitable metal, preferably by casting, and when the lower end of the upper section of each retort is fitted in the upper enlarged end of the lower section the expansion of the metal, due to its subjection to heat, will tighten the joints to such a degree as to resist accidental separation during the treatment of the bone-black or other material. If the retort is allowed to cool down from disuse of the kiln the subsequent starting operation consists in first heating the retort to tighten the joints by expansion previous to permitting a full feed of the bone-black or other material thereto; but during this preliminary operation a little of the bone-black or other material is permitted to pass through the retort and will settle or pack to a certain extent around the united ends of the flues 26 and 34 and which preliminarily fed bone-black or other material will eventually and regularly pass through the retort into the cooling chambers. The purpose of this limited feed of bone-black or other material to the retort in the preliminary operation is to overcome any tendency of separation of the retort sections before they have become sufficiently expanded to establish a tight joint by heavy packing or settling of the bone-black or other material at the joint of the two sections and under normal conditions or when the operation of treating the material is being pursued, the bone-black or other material will pack closely around the several joints.

From the foregoing the operation will be readily understood and in the present improved construction the liberation of the gases from the retorts ensues rapidly and explosions are avoided and at the same time the treatment of the bone-black or other material can be more effectively and expeditiously pursued.

What is claimed is:

1. In an apparatus of the class set forth, a furnace, a chamber communicating with said furnace, retorts disposed in the chamber and composed of separable sections, and separable coupling devices interposed between and

located within the contiguous ends of the said sections and providing communicating means between portions of the latter.

2. In an apparatus of the class set forth, a furnace, a chamber communicating with the furnace, and retorts disposed in the chamber and composed of separable sections each having interiorly guarded openings in opposite portions thereof.

3. In an apparatus of the class set forth, the combination of heating means, retorts composed of separable sections having interiorly located flues also separably united and having communication with the heating means, and tubular couplings connecting the said flues.

4. In an apparatus of the class set forth, the combination of heating means, and retorts having interiorly located flues terminally connected by tubular couplings.

5. In an apparatus of the class set forth, the combination of heating means, a chamber communicating with said heating means, retorts disposed in the chamber and composed of separable sections having interiorly located flues, and tubular coupling means for separably connecting the terminals of the flues.

6. In an apparatus of the class set forth, a heating means, a series of retorts disposed adjacent to said heating means, cooling chambers having communication with the retorts, a bottom frame means with fixed outlets for the cooling chambers, and a reciprocating draw-means for moving the material escaping from the cooling chambers from one portion to another of the outlets, the said draw means being located between the fixed outlets and the lower extremities of the chambers.

7. In an apparatus of the class set forth, a heating means, a series of retorts disposed adjacent to said heating means, cooling chambers having communication with the retorts, a fixed bottom outlet means on which the cooling chambers are disposed, the bottom outlet means being provided with depending nozzles and openings out of aline-

ment with relation to said nozzles, and a reciprocating draw means between the lower ends of the nozzles and the said openings.

8. In an apparatus of the class set forth, a heating means, a series of retorts disposed adjacent to said heating means, cooling chambers in communication with the retorts and having bottom outlet means, and means for drawing the material at the bottom outlets and consisting of reciprocating heads having a laterally movable link attached thereto a drive rod movably attached to the link and having a yoke, and a shaft having a compound eccentric secured thereto with members varying in eccentricity for removable engagement by the yoke to vary the stroke of the drawing means.

9. In an apparatus of the class set forth, a heating means, a series of retorts disposed adjacent to said heating means, cooling chambers in communication with the retorts and having bottom outlet means, means for drawing the material at the bottom outlet means, a shaft having a compound eccentric with members varying in eccentricity with relation thereto, and reciprocating means adjustably engaging the compound eccentric and connected to said drawing means.

10. In an apparatus of the class set forth, a furnace having a feed hopper and a heating chamber, a series of retorts disposed in said chamber and having interiorly located flues which are projected above the upper portions of the retorts, a hollow flue means arranged in the hopper over the upper extremities of the said flues and provided with guarded openings in opposite sides and a top escape opening, and other flue means applied to the said hollow flue means and communicating with the chimney of the furnace.

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

BERNHARDT EBA.

Witnesses:

FLORENCE SANDBLADE,
JOHN A. SWANSON.