A. DEAN.

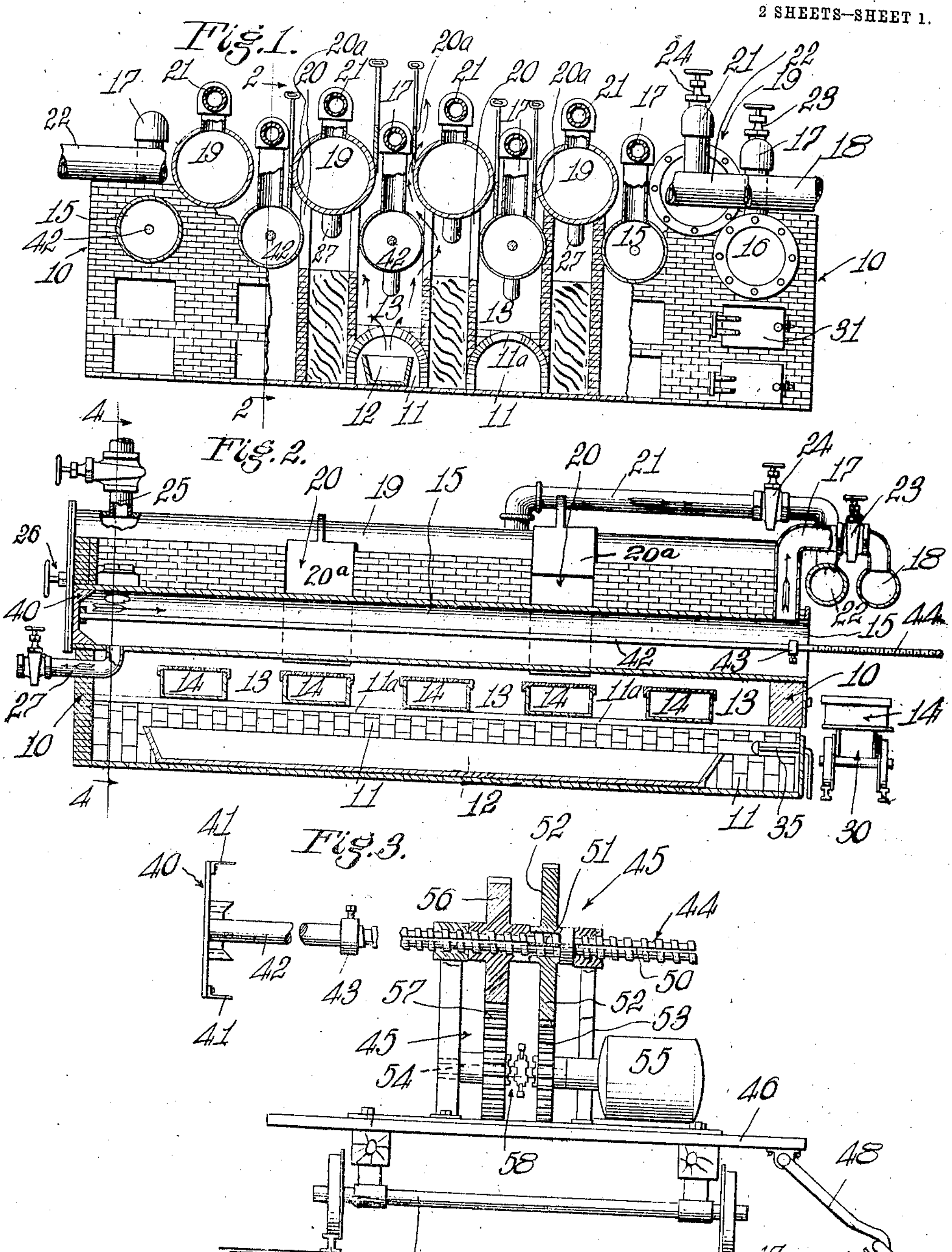
DEVICE FOR REFINING AND COKING OIL.

APPLICATION FILED MAY 25, 1912.

1,053,282.

Patented Feb. 18, 1913.

2 SHEETS—SHEET 1.



Witnesses.
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2 SHEETS—SHEET 2.

Fig. 5.

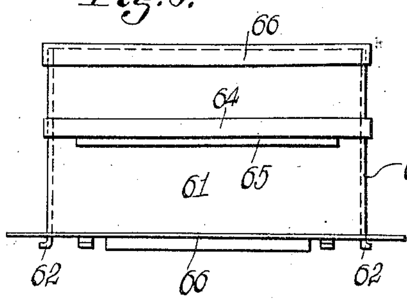


Fig. 6.

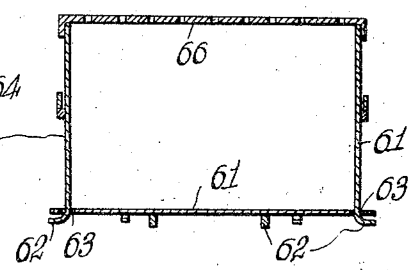
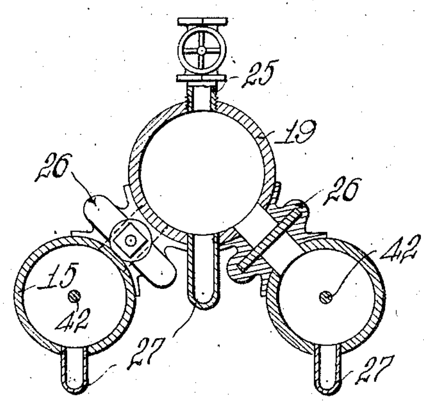


Fig. 4.



Witnesses.

Inventor,
Alexander Dean
by
his Attorney.

UNITED STATES PATENT OFFICE.

ALEXANDER DEAN, OF LOS ANGELES, CALIFORNIA.

DEVICE FOR REFINING AND COKING OIL.

1,053,282. Specification of Letters Patent. **Patented Feb. 18, 1913.**

Application filed May 25, 1912. Serial No. 699,656.

To all whom it may concern:

Be it known that I, ALEXANDER DEAN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Devices for Refining and Coking Oil, of which the following is a specification.

This invention relates to an apparatus in which ordinary crude oil may be refined—separated by distillation into its various components—and the residue formed into commercial coke; and the chief object of the invention is the provision of a suitable apparatus which will carry on such process in a simple commercially workable manner, and which provides for the carrying on of other and subsidiary operations, such as the smelting of black sand iron or other ore.

My apparatus consists in suitable furnaces having primary and secondary stills arranged thereabove; and there are certain spaces directly above and also within the combustion chambers of the furnaces where a high temperature may be obtained for the final coking of my product and for melting and reducing ores under conditions similar to those in a reverberatory furnace. My process, as carried out in this apparatus, consists in first passing the crude oil into the upper or primary still, where it is heated and the lighter distillation products given off; the residue is then passed into the secondary stills and the heavier distillation products driven off. The residue of the secondary stills may be of a consistency varying between heavy pitch and an almost solid coke-like substance. This residue is removed from the secondary stills by a device of my own invention and is put into coking boxes of peculiar design. These coking boxes are then placed in the coking compartment of the furnace and the gases driven off add their fuel values to the furnace fuel. When the residue has been thoroughly coked the boxes are removed from the furnace; and these boxes are of a construction to be easily opened out so that the coke may be removed therefrom without difficulty. The object and result of this arrangement is to handle the residue in an efficient manner. The residue is taken from the secondary stills while semi-liquid (thus obviating any necessity of breaking up the solid deposit which commonly collects in stills), and the coking operation in the boxes causes the formation of coke in lump or brick form. I will describe these features and my apparatus in detail in the following specification, reference being had to the accompanying drawings of which:

Figure 1 is a partial front elevation and vertical section illustrating a preferred form of my apparatus. Fig. 2 is a longitudinal section taken as indicated by line 2—2 of Fig. 1. Fig. 3 is a view illustrating my improved mechanism for removing the heavy residue from the secondary stills. Fig. 4 is a section taken as indicated by line 4—4 of Fig. 2. Figs. 5 and 6 are details illustrating the preferred construction of my coking boxes.

In the drawings 10 designates a suitable brickwork or other structure which incloses the various compartments of my apparatus. I provide lowermost reverberatory furnace compartment 11, in which I may place suitable ore boxes 12. Immediately above compartment 11 I arrange suitable coking compartments 13 in which coking boxes 14 are placed with their heavy residues. Above coking compartment 13 the longitudinal horizontal secondary stills 15 are arranged. These secondary stills have removable covers or heads 16 on their forward ends and have distillation outlets 17 leading to a manifold pipe 18, through which outlets and pipe the distillation products find exit to suitable condensing apparatus. The primary stills 19 are arranged above the spaces between the secondary stills 15, and open spaces or passages 20 serve to conduct the heated gases of combustion into contact with the primary stills; but it is an object of my construction that the primary stills be heated to a temperature lower than that to which the secondary stills are heated. Dampers 20^a are provided for more or less cutting off the passage of flame and heated gases through the passages 20. The primary stills have distillation outlet pipes 21 leading to a suitable manifold 22. Outlet pipes 17 and 21 are each individually controlled by a valve 23 or 24. Each of the primary stills is provided with inlet means 25; and each primary still has a valve controlled connection 26 to two adjacent secondary stills 15. Each primary and secondary still has a valve controlled outlet 27 through which samples of the interior contents may be drawn from time to time and through which the stills may be emptied if desired.

Along the front of my apparatus I preferably provide a movable car 30 on which a coking box 14 may be carried to a position in front of and below any one of secondary stills 15. The heavy residue taken from secondary stills is preferably directly packed into the residue boxes 14, the residue either falling, or being directed from the front end of the stills to the boxes; and these coking boxes are then shoved through doors 31 into the coking compartments 13. (There are, however, occasions when the residue is not put directly into the box; as when it is first mixed with ore, the ore and residue being then put into the furnace and the ore thereby reduced). The movable car 30 facilitates this coke handling operation. A suitable burner, preferably using crude oil, is shown at 35; and the flame from this burner will be projected rearwardly through the combustion chamber 11 and the heated gases of combustion will rise through passage 11^a up into the coking chamber 13. The coking boxes 14 are arranged so that they bridge portions of the opening 11^a, and are thereby more or less directly exposed to the heat in the combustion chamber.

For removing the heavy residue from the secondary stills 15 I employ a novel apparatus which cuts and forces the material from the still. I utilize a preferably circular cutter 40 having cutting members 41 which rotatably scrape the interior surface of the still so that the residue is cleanly removed therefrom. A shaft 42 extends longitudinally through the still from its forward end, the cutter 40 being normally at the rear end of the still. At its forward end the shaft 42 connects, by means of a releasable socket 43, to a screw shaft 44 which is operated by a suitable gearing and power device 45 mounted on a truck 46 movable along a track 47 to a position in front of any of the secondary stills. A releasable anchor device 48 provides for securely holding the truck in position before any of the secondary stills. The screw shaft 44 has a keyway 50 which is engaged by a key 51 in the hub of a gear 52. Gear 52 meshes with a gear 53 loosely mounted on shaft 54 of motor 55. Another gear 56 engages the screw theads of shaft 44; and this gear meshes with a gear 57 also loosely mounted on shaft 54. Either of gears 53 or 57 may be connected with the motor shaft through the medium of a suitable clutch mechanism 58. It will be seen that connecting the gear 53 with the motor shaft will cause the rotation of screw shaft 44 and of cutter 40; while the connection of gear 57 with the motor shaft will cause the longitudinal movement of the cutter 40. Thus, the cutter may be rotated to cut the material from the walls of the secondary stills and may be moved longitudinally to move the material out of the still and into the coking boxes.

The construction of the coking boxes is shown in Figs. 5 and 6. I employ a suitable base plate on which vertical side plates 61 are mounted. These side plates have prongs 62 which project through openings 63 in the base plate and thus hold the lower ends of the side plates 61 in position. The upper ends of the side plates are held together by means of a loose band 64 resting on ledges 65 on the side plates. A perforated cover 66 is provided, the perforations allowing the passage of gases from the material in the coking boxes.

In the operation of my device I first place within the primary still a suitable quantity of crude oil, filling the stills approximately to two thirds of their capacities. When the lighter distillation product has been vaporized and driven off, and the specific gravity of the residue in the still correspondingly increased, the residue is then passed into the lower or secondary stills. The heavier distillation products are there driven off until the residue is of very heavy consistency. This residue is then removed from the secondary still as hereinbefore described and placed in the coking boxes. The coking boxes are placed in the coking compartment; and the gases given off add to the fuel from furnace 35. When the coking operation is completed the boxes are withdrawn and the tops 66 and the bands 64 removed, when the sides may be laid outwardly and downwardly and the coke easily removed from the box in lump or cake form—which form is commercially most desired.

I may mention here that I may use the heavy residue from the secondary stills as a binder, flux or reducing agent for ore which I may melt or reduce in the box 12. This operation may be carried on continuously along with the others described; it being understood that the operation of my apparatus is continuous, the stills being preferably charged in rotation rather than simultaneously.

Having described my invention, I claim:

1. In combination, a furnace structure having a suitable coking chamber therein, a still arranged above the coking chamber, and a movable coking box adapted to receive the residue from the still and to be placed in the coking chamber.

2. In combination, a furnace structure having a suitable coking chamber therein, a still arranged above the coking chamber, a movable coking box adapted for placement in the coking chamber, and means for removing distillation residue from the still and placing it in the coking box.

3. In combination, a furnace structure having a combustion chamber and a coking chamber above said combustion chamber

with a passage between the two, a still arranged above the coking chamber over the passage leading thereto, and means to remove distillation residue from the still and place it in the coking box.

4. In combination, a furnace structure having a combustion chamber and a coking chamber above said combustion chamber with a passage between the two, a still arranged above the coking chamber over the passage leading thereto, means for carrying the coking box to a position before the still, and means for removing distillation residue from the still into the coking box.

5. In combination, a furnace structure having a combustion chamber and a coking chamber above said combustion chamber with a passage between the two, primary and secondary stills arranged above the coking chamber, vapor outlets from said stills, connecting means between said primary and secondary stills, collapsible coking boxes adapted for placement in the coking compartment, means for carrying said boxes to a position in front of and below the secondary still, and means for removing distillation residue from said secondary still into said box.

6. In combination, a furnace structure having a suitable coking chamber therein, a still arranged to be heated by said furnace, and a disjointable container adapted to receive the residue from the still and to be placed in the coking chamber.

7. In combination, a furnace having a combustion chamber and a suitable heating compartment directly connected therewith, a still arranged to be heated by said furnace, and a container adapted to receive the residue from the still and to be placed in said heating chamber.

In witness that I claim the foregoing I have hereunto subscribed my name this 16th day of May 1912.

ALEXANDER DEAN.

Witnesses:

JAMES T. BARKELEW,

ELWOOD H. BARKELEW.