

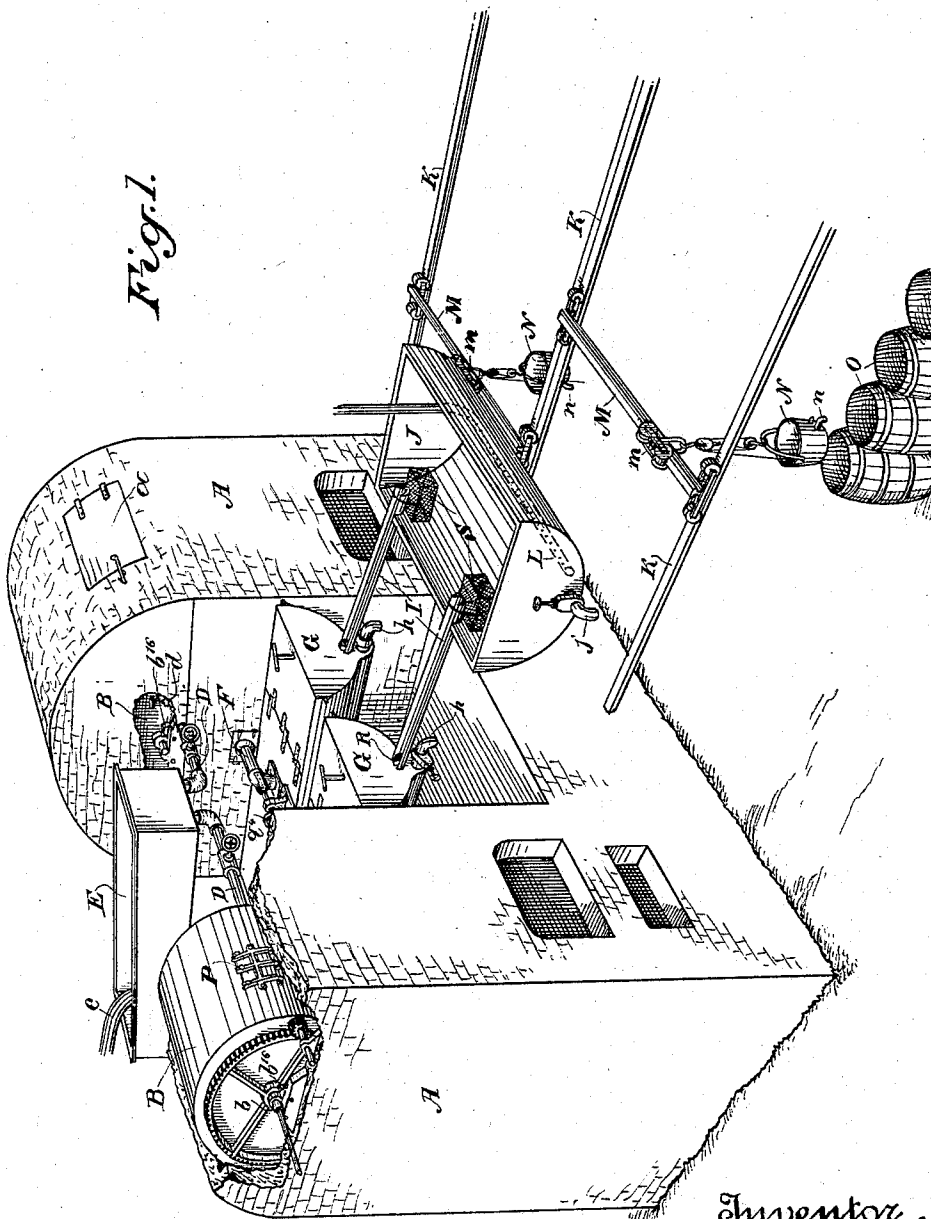
(No Model.)

3 Sheets—Sheet 1.

A. F. L. BELL.
APPARATUS FOR REFINING ASPHALTUM.

No. 580,592.

Patented Apr. 13, 1897.



Witnesses,
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Inventor,
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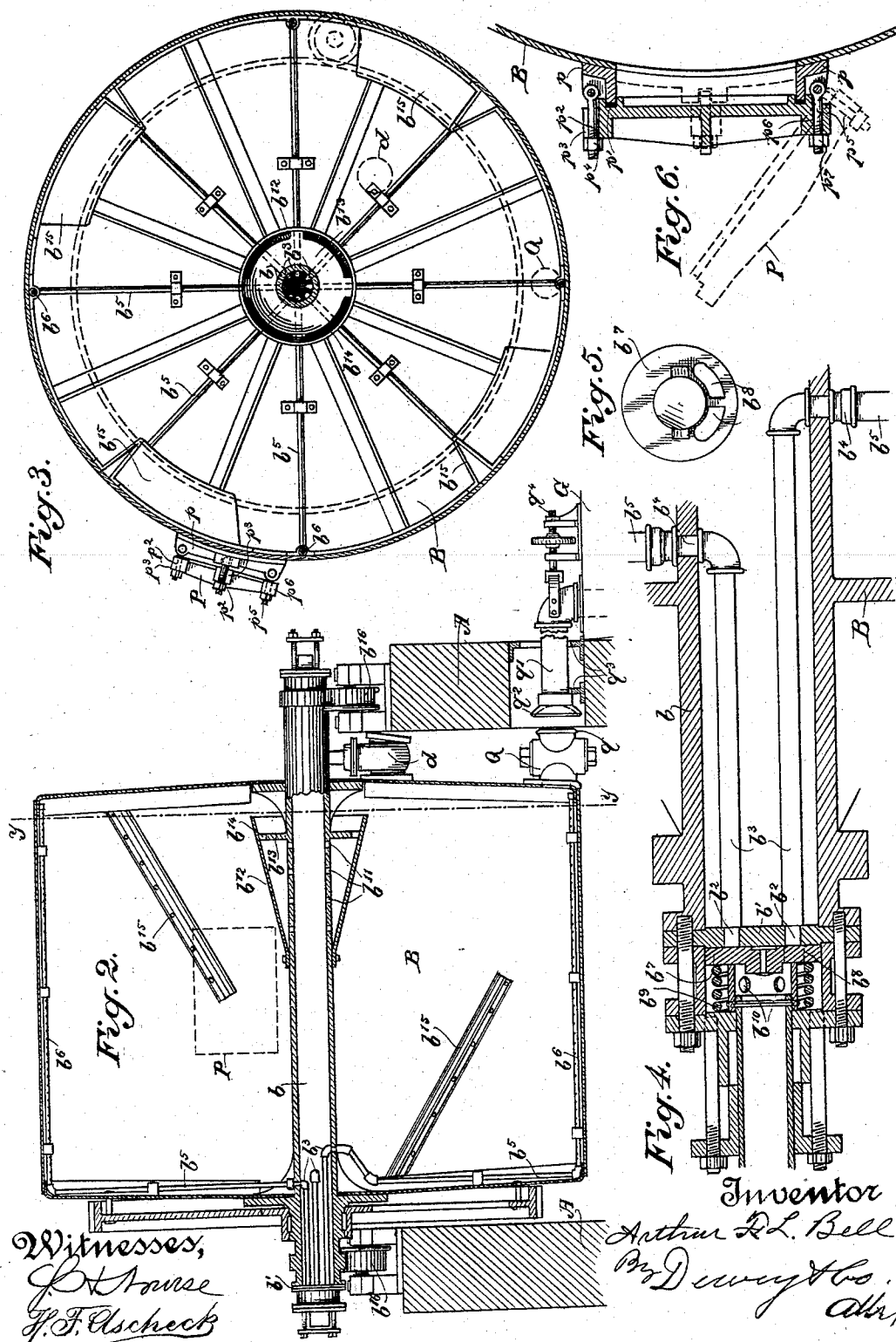
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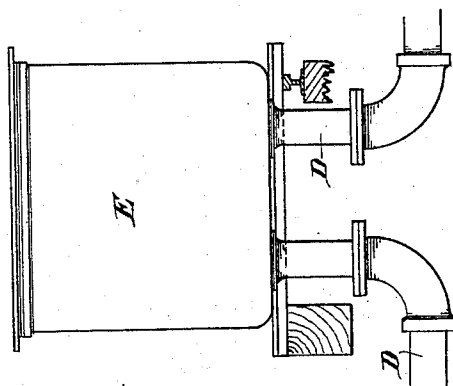


Fig. 7.



Fig. 9.

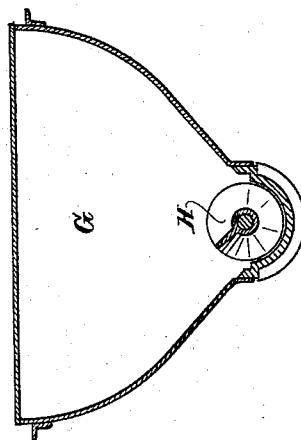
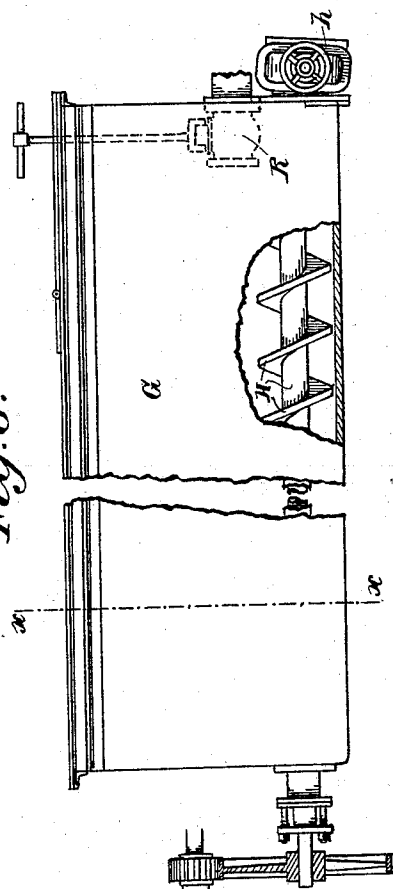


Fig. 8.



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UNITED STATES PATENT OFFICE.

ARTHUR F. L. BELL, OF CARPENTERIA, CALIFORNIA, ASSIGNOR TO THE
ALCATRAZ ASPHALT COMPANY, OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR REFINING ASPHALTUM.

SPECIFICATION forming part of Letters Patent No. 580,592, dated April 13, 1897.

Application filed October 21, 1895. Serial No. 566,402. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR F. L. BELL, a citizen of the United States, residing at Carpenteria, county of Santa Barbara, State of California, have invented an Improvement in Apparatus for Refining Asphaltum; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the general class of refining apparatus, and particularly to apparatus for refining asphaltum; and it consists of the parts and the constructions and combinations of parts hereinafter described and claimed.

Referring to the accompanying drawings, Figure 1 is a general view of my apparatus. Fig. 2 is a section of the reducing or mixing drum in the plane of its axis. Fig. 3 is a cross-section of said drum on the line *y y* of Fig. 2. Fig. 4 is an enlarged detail of the air or steam admission mechanism. Fig. 5 is an elevation of the valve itself. Fig. 6 is a section showing the charge-gate upon the reducing or mixing drum. Fig. 7 is a detail of the measuring-tank. Fig. 8 is a side elevation of one of the settling-tanks, a portion being broken away to show the screw conveyor in its bottom. Fig. 9 is a cross-section on the line *x x* of Fig. 8. Fig. 10 is a cross-section of the steam-jacketed conveying-trough between the settling-tank and the cooling-tank.

A in Fig. 1 are the furnaces by which the necessary heat is supplied, although in some cases I may make the drum steam-jacketed and dispense with direct fire.

B is the reducing or mixing drum. There are two of these, one on each side, the one on the left in Fig. 1 being exposed by the breaking away of the arch of the brickwork, while the one on the right is not shown, being covered by the arch of the brickwork and access being had to it through an iron door *a*. This drum, which is a closed or tight one, is mounted upon journals, so that it may be rotated, and to it, through a door P, is supplied the charge of crude asphaltum, and through a pipe D in Fig. 1 is supplied the charge of liquid asphaltum or other solvent from a measuring-tank E, which receives its supply from a suitable source through the

pipe *e*. In these drums the crude asphaltum is reduced and is thoroughly mixed by means of interior devices, to be presently described, with the liquid asphaltum, and also in these drums the moisture is driven off and the objectionable gases and oils allowed to escape by means to be presently described, so that in due time when these results are accomplished the now mixed asphaltum, with all its contained impurities—sand, silt, and other foreign matters—is run off through connections F (shown in Fig. 1) from each drum into a pair of settling-tanks G. In the bottom of these tanks are screw conveyers H, (see Figs. 8 and 9,) by which the sand, silt, and other foreign matters which settle to the bottom are removed from the tanks and discharged from the controllable outlets *h*, Fig. 1, into suitable cars. (Not here shown.)

From the settling-tanks G issue troughs or connections I, which communicate with a cooling-tank J. In this cooling-tank, in its bottom, is a pipe L, having a connection with air under pressure and having perforations, so that the air is forced into the tank and keeps the material therein agitated, so that when it is drawn off it shall be of the same purity throughout.

K are tracks upon which run trolleys M, from the frame-bars of which are suspended by roller-hangers *m* the ladles N, which are adapted to run under the discharges *j* from the cooling-tank and to carry the material delivered to them to any of the series of barrels O and to discharge the material gradually and successively into said barrels by means of a discharge-cock *n*.

This completes the general apparatus, and the operation thereof need not be further indicated, as it has been sufficiently described.

From this operation it will be seen the heat is distributed and at the same time a new surface of the drum is presented to the heat throughout the whole process of reducing and mixing, which obviates entirely the necessity of having to chip out any coating of coke on the side of the kettle and at the same time prevents all danger of getting any one part of the charge of asphalt too hot.

Experience has shown that a refining drum or kettle such as I have shown will run with-

out ever having to be chipped out and that the inside surface will always be perfectly smooth and only coated with a layer of asphalt, resembling a coating of varnish. Another effect of the use of a drum such as I have shown is the violent agitation of the material, for by the rotation of the drum a different particle of asphalt is presented to the surface all the time, so that the material will give off the water and objectionable volatile oils more readily. This rotation of the drum also keeps the sand and silt in the asphalt in a constant state of agitation, so that it does not stick to the side of the drum. On account of the periphery of the drum exposed to the fire never stopping for an instant in one place the fire never has time to overheat any one part of the plate, no matter how hot a fire is under the kettle.

As before stated, another important feature of the operation is that the moment the material in the rotating drum becomes heated enough to drive off the water and objectionable volatile oils it is discharged from the drum into the next vessel—to wit, the settling-tank—where it remains under only the necessary moderate heat to permit a further step of the operation—namely, the settling of the sand, silt, and other foreign matter to the bottom. From this vessel the material is drawn off into the third vessel or cooling-tank, the object of which is to insure the furnishing of a refined asphalt of equal pureness, which object is attained by the agitation of the charge therein upon distribution, so that the small percentage of settlings which are still present will be stirred up and no one portion of the batch drawn off will be purer than another.

The novel details of construction relating to the reducing or mixing drum will be seen by reference to Figs. 2 to 6, inclusive. The drum itself, as before stated, is a tight or closed one, the walls and periphery being made of suitable material properly braced and strengthened. The shaft *b*, on which it is mounted and with which, as an axis, it turns, is a hollow one, in order to provide for the arrangement of the devices for admitting air or steam and for the escape of the moisture-laden air and the deleterious vapors and oils from the otherwise closed drum. The object of admitting air (or at that period of the operation when the material has been raised above the boiling-point of water the admission of steam, which will not then condense) is to absorb and carry off the water contained in the material and also to carry off the objectionable gases and volatile oils. As shown in Fig. 4, there is across the end of the hollow axis or shaft a valve-seat *b'*, having a number of ports *b²* in it, with which said ports the several air-pipes *b³* communicate, said air-pipes extending along in the hollow shaft and passing out therefrom through suitable connections *b⁴* into the drum, whence they continue, as is shown in Fig. 2,

as pipes *b⁵* to the periphery of the drum, and thence extend across the periphery as perforated pipes *b⁶*. There are as many of these pipes as may be necessary, in practice about eight, and in order to provide for the entrance of air or steam through them always into the bottom of the drum, so that it will issue into the mass of material, it is necessary that only those ports *b²* which communicate with the then lower pipes shall be open, while the remaining ports—namely, those which communicate with the then upper pipes—shall be closed. To provide for this, there is a valve *b⁷*, which is shown in Fig. 5 in elevation, said valve having a port or ports *b⁸*, which, as the valve-seat *b* rotates with the axle, are adapted to be alined by the ports of said valve-seat. The valve *b⁷* is so located that its ports *b⁸* are at the lowest portion, and therefore the alinement of the valve-ports *b⁸* and the valve-seat ports *b²* takes place only at the lowest portion, and therefore the communication with the lowermost pipes only is opened, the other communications being closed. A spring *b⁹* holds the valve firmly to its seat, and the air or steam passes in through the hollow end of the axle or the gudgeon thereof and through openings *b¹⁰* in a sleeve therein and finds a passage through the valve-ports and valve-seat ports into the then lowermost air-pipes.

In order to provide for the discharge of the vapors from the drum without tendency to clog up the discharge-openings and without permitting any of the material to pass out with said vapors, there are made in the opposite end of the hollow axle and within the drum exit-openings *b¹¹*. Secured to the axle and completely guarding these openings is a shield *b¹²*, preferably in the form of a cone. Around the shaft is a flange *b¹³*, the diameter of which is sufficiently smaller than the diameter of the cone at that place to leave an opening or openings *b¹⁴*. The gases and vapors in making their exit pass from the drum around into the enlarged base of the shield *b¹²*, and thence through the openings *b¹⁴* into the body of the shield, and thence through the holes *b¹¹* into the hollow shaft or axle, and thence outwardly through the end thereof.

The shield *b¹²* protects the discharge-openings *b¹¹* from any drops of the material falling upon them and clogging them, and the collar or flange *b¹³* presents a sufficient barrier to prevent any of the material working in through the base of the shield and reaching the holes *b¹¹*, and if any of the material should happen to get inside of the conical shield its tendency would be to run to the bottom, and, due to the conical shape, would be finally delivered to the lowest point of the shield, where it would run off onto the mass of material in the bottom of the drum.

Within the drum and extending alternately from opposite sides thereof and at an angle are plates or flanges *b¹⁵*, which serve as stirrers or agitators, by means of which the ma-

terial is successively picked up and dropped from one to another and from side to side, thus providing for the proper mixing.

The charge of material is supplied to the drum through a door P, which is shown particularly in Fig. 3, and more in detail in Fig. 6. As the drum is very hot it is necessary to provide a means for opening and closing the door which can be operated rapidly and without unnecessary exposure to the heat. For this purpose I have secured to the periphery of the drum a flange *p*, against which, through the intervention of a packing-ring *p'*, the door closes. To both sides and the top of this flange are pivoted eyebolts *p²*, which operate in open-ended slots *p³* in the door and receive nuts *p⁴* on their outer ends. To the lower portion of the flange are pivoted similar bolts *p⁵*, which pass through complete sockets *p⁶* in the base of the door and receive nuts *p⁷* on their outer ends. These last-named bolts *p⁵* serve as hinges, about which, as shown in Fig. 6, when the eyebolts *p²* are relieved and thrown out of their slots, the door may swing to an open position. The packing-ring *p'* provides for a tight fit and the door may be opened and closed with facility.

The charge of liquid asphaltum which is added to the charge of the crude asphaltum passes into the drum through the controlling-gate *d*, (shown in Fig. 2,) and as this gate is on the drum and must revolve, and as its communication with the measuring-tank E of Fig. 1 must be a fixed one, I provide for this by making the pipe D (shown in Fig. 1) readily removable from its connections, so that when the drum comes to a state of rest it is easily inserted between the fixed connection from the measuring-tank E and the controlling gate or cock *d*, and then the liquid asphaltum is allowed to pass through into the drum. This gate *d* is not an absolute necessity but a great convenience, for if conditions demanded it the liquid could be run in through the main charging-door P. When the drum is about to be started again, the pipe D is removed and therefore presents no obstruction.

The charge of reduced and mixed material is drawn off from the drum through the controllable outlet Q, Fig. 2. It is obvious that this outlet, being upon the drum, must be free also of its connections. In order to permit the drum to operate and to make a suitable and accurate connection with this outlet, within the small limits of position at which the drum comes to a state of rest, I have the construction shown in Fig. 2.

The outer end of the outlet Q is in the form of a convex segment of a circle (shown at *q*) and forms the male coupling. *q'* is the connecting-pipe, having upon its end the concave or female portion of the coupling *q²*, which is larger in diameter than the portion *q* and is adapted, when the connecting-pipe *q'* is moved along lineally upon its supports or bearings *q³*, to engage with the portion *q* at any position in which said portion may lie

and to form a connection therewith, rising and otherwise moving to its seat, as the parts of a ball-and-socket joint. This lineal movement of the connection *q'* is effected by means of the screw *q⁴*, which moves the connection *q'* up to its place or withdraws it again.

The drum is mounted upon suitable anti-friction-bearings, here shown in the form of rollers *b¹⁶*, Fig. 2.

The settling-tanks G are shown in detail in Figs. 8 and 9 and need no further description than that given generally above.

The trough I, which leads from the settling-tank to the cooling-tank, is shown in detail in Fig. 10.

The form of conduit here shown I have devised for the purpose of overcoming the difficulty experienced in the use of pipes in filling up with the material and requiring to be constantly cleaned out at a loss of time and at a considerable expense. I have therefore provided for an open-topped trough the walls of which are made double to provide a steam-jacket *i*, and by reason of having the open top the trough may be readily scraped out. The communication of the trough with the settling-tank G is controlled by means of a gate R within the tank, as shown in Fig. 8.

In Fig. 1, S represents screen-baskets, here shown as suspended from the ends of the troughs I and adapted to screen the material as it falls into the cooling-tank. These screens may be placed at any portion of the course of the material and are to be used simply for the purpose of withdrawing such foreign matter as may find its way into the asphaltum and which would float instead of settling to the bottom of the settling-tanks.

The air-pipe L in the bottom of the cooling-tank is for the purpose of stirring up and agitating the material therein as a charge is being drawn off into the ladles, thereby making the output of equal purity throughout.

The ladles N, being mounted as described, are adapted to work longitudinally on the tracks K and laterally upon their suspending-trolleys M, besides swiveling on their hanging device, so that they can be brought to position for any of the series of barrels, and in practice in order to not fill any barrel with too much of the material, which even then must be quite hot and would have a tendency in large quantities to shrink the staves of the barrel and cause it to leak, it is customary to only fill a small portion into each barrel at a time, and for this purpose the ladles are moved quickly along from one barrel to another, putting only the required quantity in each.

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

1. In an apparatus for refining asphaltum, a rotatable closed drum for receiving the charge of material, means for admitting air or steam to the interior of the drum, and means for permitting the escape of the gases

therefrom, consisting of the hollow axle of said drum having openings to permit the escape of gases from the drum and a shield fixed to and circumscribing the axle, and protecting the openings thereof.

2. In an apparatus for refining asphaltum, a rotatable closed drum for receiving the charge of material, means for admitting air or steam to the interior of the drum, and means for permitting the escape of the gases therefrom, consisting of the hollow axle of the drum provided with openings into the drum and a conical shield surrounding the axle and protecting said openings.

3. In an apparatus for refining asphaltum, a rotatable closed drum, having means for receiving the charge of material and having hollow gudgeons at its ends, a hollow axle passing through the drum, means whereby air or steam is admitted through one of the hollow gudgeons into the interior of the drum, said axle being formed with openings near the opposite side of the drum, through which the gases escape from the drum, and a conical shield secured to the axle and surrounding said openings, said shield having its enlarged base presented toward the discharge end of the drum, whereby the openings in the axle are protected and any material reaching the interior of the shield will be returned to the drum.

4. In an apparatus for refining asphaltum, a rotating closed drum having a means for receiving the charge of material, said drum having a hollow gudgeon communicating with its interior, a connection with said gudgeon for supplying air or steam to the interior of the drum, pipes in communication with said connection and leading through the hollow gudgeon into and along the periphery of the drum and perforated to permit the escape of the air or steam, and a means, controlled by the rotation of the drum, for permitting said air or steam to pass only into those pipes which are lowermost, whereby they discharge into the mass of material.

5. In an apparatus for refining asphaltum, a rotating closed drum having a means for receiving the charge of material, said drum having a hollow gudgeon communicating with its interior, a connection with said gudgeon for supplying air or steam to the interior of the drum, pipes in communication with said connection and leading through the hollow gudgeon into and along the periphery of the drum and perforated to permit the escape of the air or steam, and a means, controlled by the rotation of the drum, for permitting said air or steam to pass only into those pipes which are

lowermost whereby they discharge into the mass of material, consisting of a valve-seat on the gudgeon provided with ports communicating with the air-pipes and a stationary valve against said seat, provided with a port adapted to aline with the ports of the valve-seat, only when the latter come around to their lowest position.

6. In an apparatus for refining asphaltum, a closed rotating drum which receives the charge of asphaltum and reduces it, said drum having a hollow axle provided with openings into the drum to permit the escape of the gases, and a conical shield protecting said openings.

7. In an apparatus for refining asphaltum, a closed rotating drum which receives the charge of asphaltum and reduces it, said drum having a hollow axle provided with openings into the drum, to permit the escape of the gases, a shield protecting said openings, and a flange or collar around the axle leaving openings around its periphery between itself and the shield, and acting as a barrier to the escape of the material.

8. In an apparatus for refining asphaltum, a rotating drum adapted to receive and mix the charge of material, said drum having a hollow axle provided at one end with air-pipes leading into and adapted to discharge air around the inside of the periphery of the drum, and a valve mechanism at said end adapted to control the entrance of the air to the pipes so that only those which are lowermost shall receive the air and discharge it into the material, and provided at the other end with openings, a shield-plate guarding said openings, and a flange on the axle in the base of the shield-plate and separated therefrom, to permit the escape through the hollow axle of the vapors from the interior of the drum, and to serve as a barrier to the escape of the material.

9. In an apparatus for refining asphaltum, the combination of a rotating drum for reducing and mixing the charge, with the means for withdrawing the charge, consisting of the convex coupling portion on the drum, the lineally-movable pipe having a concave portion adapted to form a connection with the convex portion, and the screw for adjusting said pipe and its concave portion.

In witness whereof I have hereunto set my hand.

ARTHUR F. L. BELL.

Witnesses:

WM. F. BOOTH,
S. H. NOURSE.