

No. 655,430.

Patented Aug. 7, 1900.

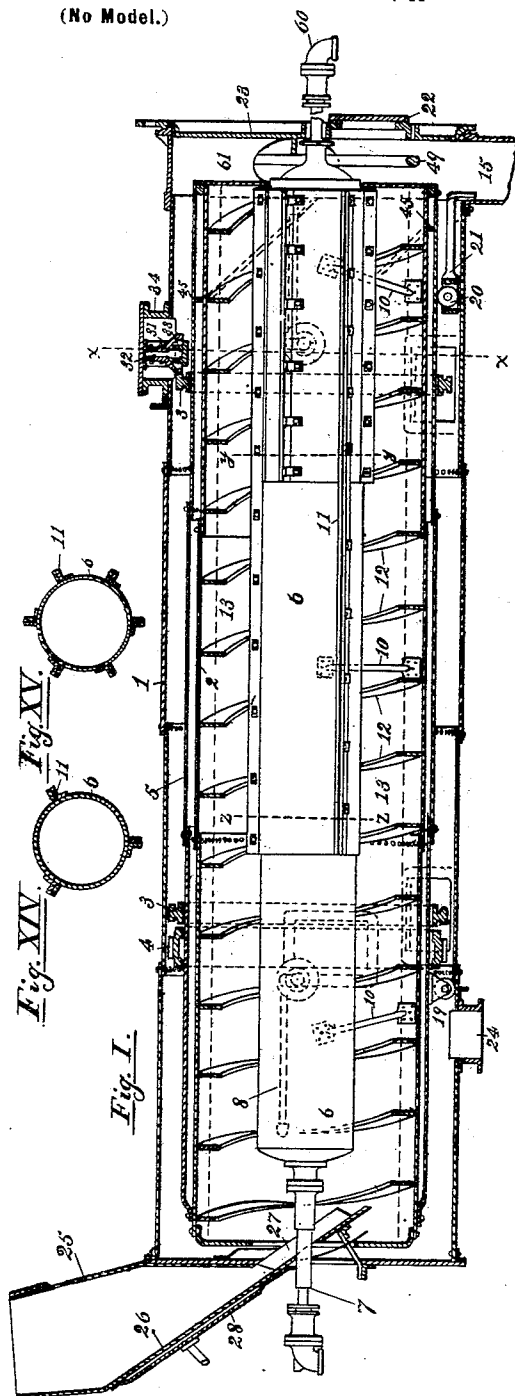
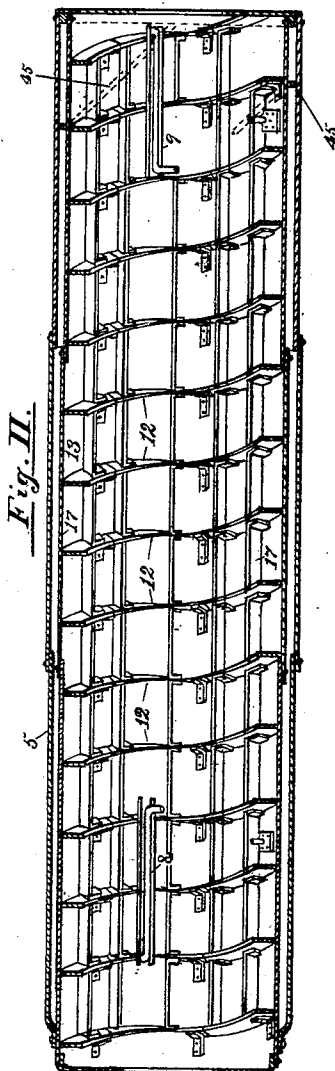
A. F. L. BELL.

APPARATUS FOR EXTRACTING AND REFINING ASPHALTIC MATERIAL.

(Application filed July 16, 1897.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses

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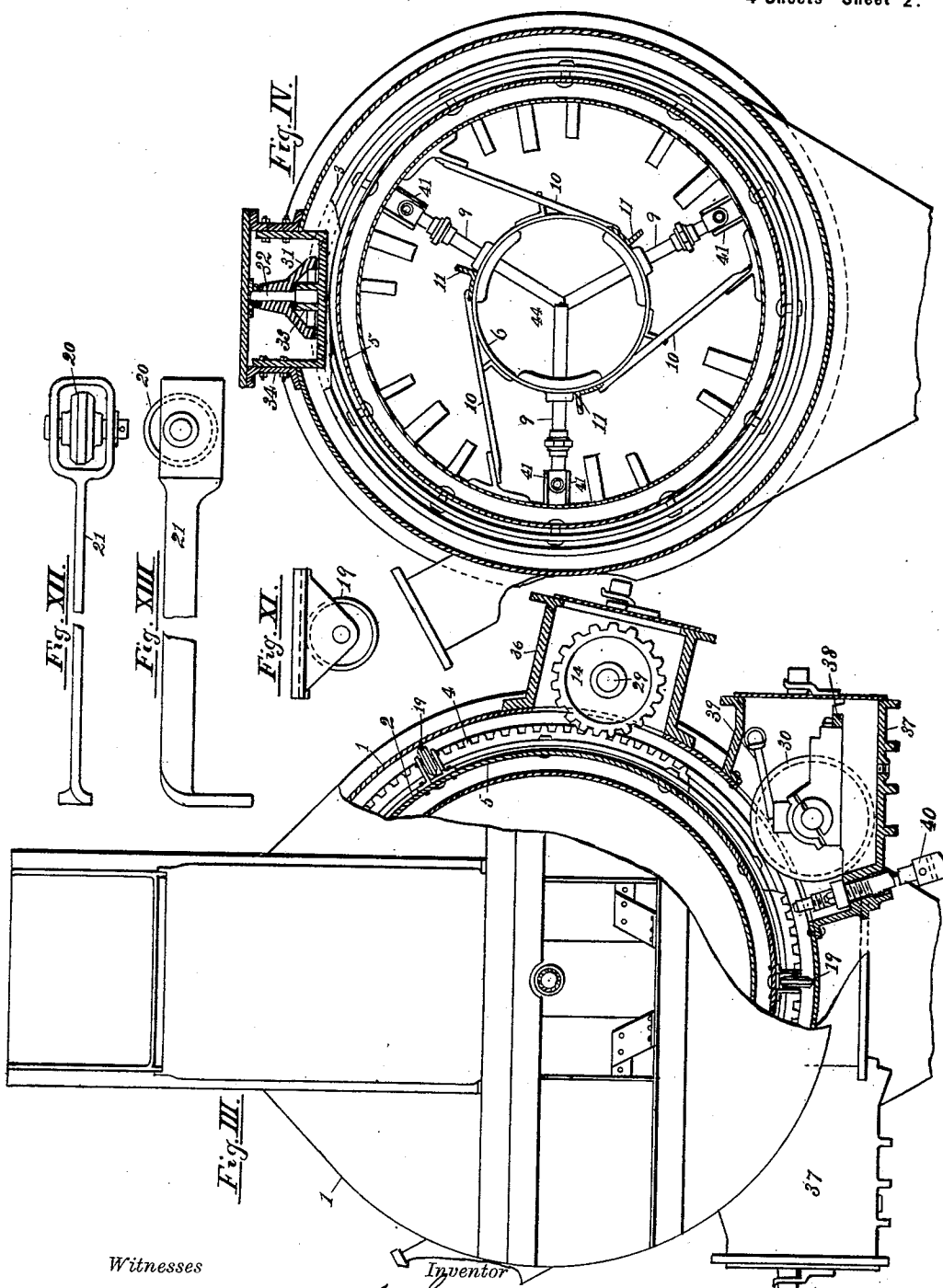
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4 Sheets--Sheet 2.



Witnesses

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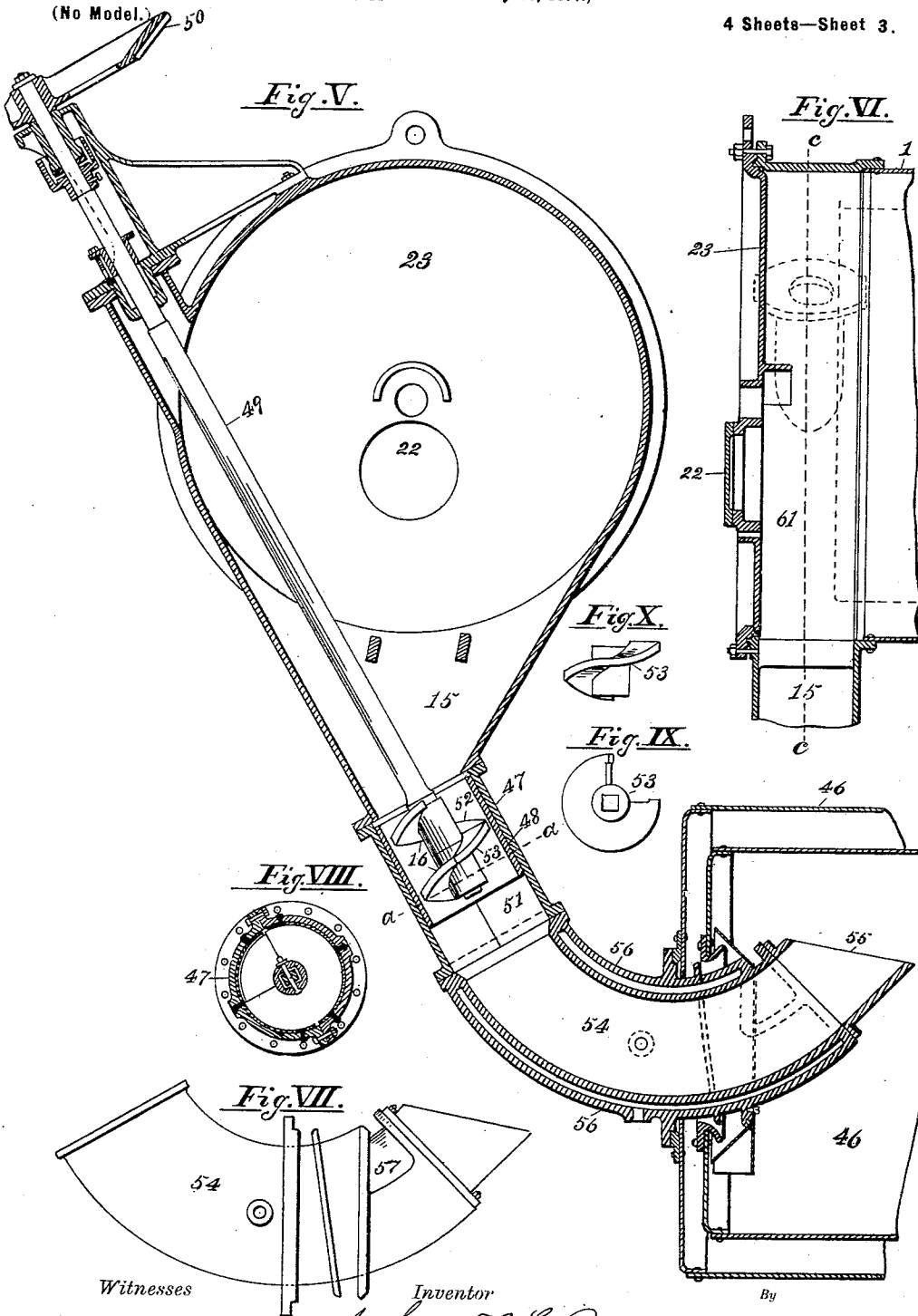
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4 Sheets—Sheet 3.

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4 Sheets—Sheet 4.

Fig. XVII.

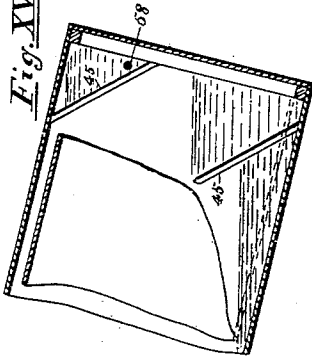


Fig. XVIII.

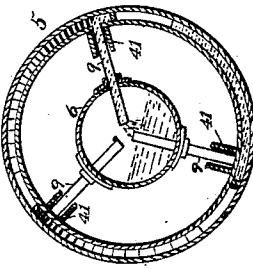


Fig. XVI.

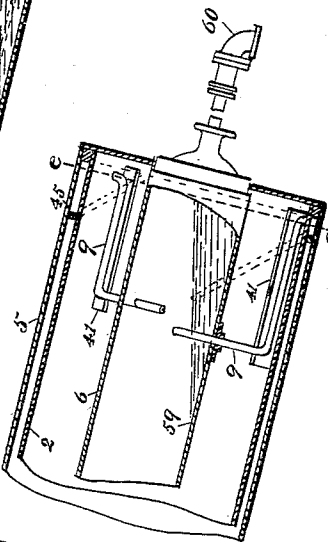


Fig. XX.

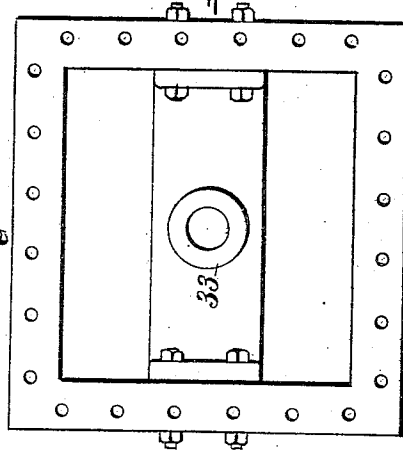
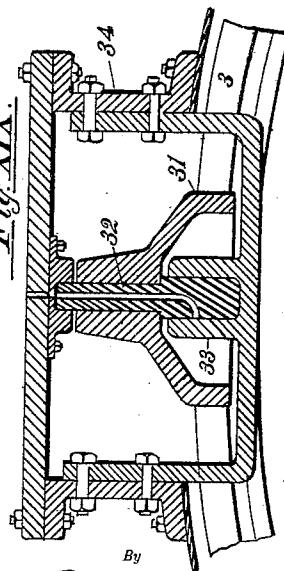


Fig. XIX.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR EXTRACTING AND REFINING ASPHALTIC MATERIAL.

SPECIFICATION forming part of Letters Patent No. 655,430, dated August 7, 1900.

Application filed July 16, 1897. Serial No. 644,804. (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, and State of California, have invented certain new and useful Improvements in Apparatus for Extracting and Refining Asphaltic Material Combined with Sand or other Earthy Matter, of which the following is a specification.

My invention relates to the extraction and refinement of asphaltic material from earthy matter or other impurities associated with the ore in its natural state and comprehends in part a method and apparatus for such extraction and refinement, operating in succession and in an organized form upon the material from its crude state as produced from the earth or mine to the finished product, such method and apparatus being directed to what is known as the "solvent" process of treatment, whereby the asphaltic material is by affinity, dilution, agitation, and heat incorporated with liquid solvents, such as distillates of petroleum, and reduced to a solution, from which solution the liquid solvent is evaporated and then condensed or liquefied and used over again, performing its office continuously by circulation.

That part of my invention included in my present application relates to what is called the "melting" section or elements in a plant or system for the extraction and refinement of asphaltum, of which the preceding section is the crushing and disintegrating apparatus and the following section is an apparatus for mixing the disintegrated and softened material with the liquid solvent above referred to.

My present improvements consist of a main revoluble cylinder externally heated by an enveloping steam-jacket and by a drum or cylinder forming a core for the main vessel, an external casing to prevent radiations of heat, means to introduce and expel the asphaltic material, to operate the main cylinder, devices to seal the melting cylinder or chamber against the entrance or escape of vapor, and in various accessories of a constructive and operative nature, that will be more fully described in connection with the drawings herewith and forming a part of this specification.

The object of my invention is to secure in an extensive and complete manner the application of heat to the asphaltic material and at the same time agitate and disintegrate the same by mechanical means.

Referring to the drawings, Figure I is a vertical longitudinal section through the axis of the melting-cylinder set in a horizontal position for convenience of illustration. Fig. II is a section through the main cylinder, with the core-cylinder and outer casing removed. Fig. III is an end view of the receiving end of the main melting-cylinder. Fig. IV is a transverse section through the same on the line *xx* in Fig. I. Fig. V is a section, in part on the line *cc* in Fig. VI looking from the interior and showing the manner of conveying the melted material to the mixing apparatus. Fig. VI is a vertical section through a portion of the melting-cylinder at the discharging end of the same, the view being reverse to Fig. I. Fig. VII is a side view of a steam-jacketed sealing siphon-pipe through which the melted material is discharged on its way to the mixing machinery, forming a sealed joint against the escape of the vaporized solvent. Fig. VIII is a section on the line *aa* in Fig. V, chamber of the discharge-way of the melting-cylinder. Fig. IX is a detail of Fig. V, showing a section of the screw to expel the melted material. Fig. X is an edge view of Fig. IX. Fig. XI is an enlarged side view of one of the bearing-rollers by means of which the main melting-cylinder is inserted or removed from the outer shell. Fig. XII is an edge view of a portable bearing-roller used in removing and replacing the main melting-cylinder. Fig. XIII is a side view of Fig. XII. Fig. XIV is a section on the line *zz* in Fig. I. Fig. XV is a section on the line *yy* across the central heating-drum in the melting-cylinder. Fig. XVI is a view in section of the melting-cylinder set in an inclined position, showing the method of draining water from the steam-jacket around the main cylinder and from the central heating-drum. Fig. XVII is a partial section longitudinally of the outer shell or steam-jacket of the main cylinder, showing the diagonal collecting-vanes to raise and discharge the water. Fig. XVIII is a section on

the line *ee* in Fig. XVI. Fig. XIX is a section through the thrust-roller for the main cylinder and connected parts, and Fig. XX is a plan view of the housing and bearing for the thrust-roller.

Similar numerals of reference apply to like parts in the several figures of the drawings.

The melting apparatus as a whole consists of an outer shell or casing 1, Fig. I, that forms a supporting member for the whole, prevents the radiation of heat, and may also collect and save any vapor that contains petroleum or asphaltic matter, here shown in a horizontal position, but capable of being set at any angle as the nature of the material operated upon may require. If the material is in any degree friable, the helical vanes will move the material forward without the main cylinder being inclined; but if the material is gummy and adhesive—that is, containing a large amount of asphaltum—then its forward movement has in part to be attained by gravity and an inclined position of the main cylinder.

Revolving within the casing 1 is a main cylinder 2, supported on bearing-rings 3 and driven by means of a circular rack 4. The cylinder or drum 2 is provided with a steam-jacket 5, that keeps it at a high temperature on the outside, and it is also heated from the interior by means of the central drum 6, which is filled with steam from the pipe 7, connecting to a steam-boiler. Steam passes from the central drum 6 to the jacket 5 through the pipes 8, Figs. I and II, and condensed water from the steam-jacket is returned to the central drum 6 by similar pipes 9, discharging at the center of the drum, so as not to allow the condensed water to flow back from the cylinder 6 to the outer jacket 5, as will be more fully explained in a future place. The central drum 6 is held concentric with the main one 2 by means of the struts 10, that are set tangential to the central drum 6 and the end ones oblique to its circumference, so as to form longitudinal braces.

Around the periphery of the central drum 6 can be placed ribs or vanes 11, as seen in Figs. XIV and XV, that tend to retain the material on the drum 6 as it falls from the interior of the main cylinder or from the annular chamber 13 between this drum and the main shell 2. These vanes 11 can be of any number and may be applied on the last section only, on the end and middle sections, or over the whole length, if required. This, as in the case of longitudinal movement of the material, depends upon its viscosity and the amount of asphaltum it contains, and I do not limit myself to a particular number or arrangement of these vanes 11.

Around the interior of the main drum 2 are spiral vanes 12, preferably continuous, as seen in Figs. I and II, so that the material when it enters the annular chamber 13 from the chutes 25 will be gradually moved forward to the lower or discharge end of the melter

and be thrust out at 15 by an expelling-screw 16. (Seen enlarged in Fig. V.) This sealed joint, it will be seen, is a result of the material being impervious when reduced to a semiliquid or plastic state, so as to be sent through a curved pipe or trap 54, thus forming a perfect and impervious seal against vapor, gas, or any volatile substance.

Besides the spiral vanes 12 on the interior of the cylinder or drum 2 there are parallel bars 17, Fig. II, set longitudinally between the convolutions of the vanes 12, acting as buckets to lift the material and cause it to fall on the central drum 6.

Around the periphery of the main drum 2 are bearing-rollers 19, preferably three in number, that, in conjunction with a portable roller 20, are used when the main drum 2 is to be removed or replaced in the outer casing 1. The roller 20, Figs. I, XII, and XIII, is mounted in a frame 21, that can be inserted through the manhole 22 in the rear head 23 of the casing 1, and a manhole 24 is provided at the bottom of the outer shell or casing 1, through which the rollers 19 can be inserted or removed or through which can be passed a portable roller 20, if that is preferable.

The operation is as follows: The material falls from the crushing and disintegrating apparatus through the chute 25 on the inclined face 25 and then passes down the chute 27 into an annular space 13. As, however, the material is of a viscous or gummy nature at this point and would lodge in the tapered portion of the chute 25, I provide a steam-heating jacket 28 at the lower side of the chute, so the material resting on the face 26 will be partially melted and slide off into the chute 27. The material after entering the annular chamber 13 is gradually moved forward toward the outer or discharge end by means of the helical vanes 12 and by the inclination of the structure, as seen in Fig. XVI, is raised continually from the bottom by the bars 17, Fig. II, and falls on the central drum 6, and from this back again to the outer face between the vanes 12, and is thereby heated and agitated until in a semiliquid or plastic state. The rate at which the material passes from the receiving to the discharging end of these melting cylinders or drums is determined by the pitch of the vanes 12, the speed of revolution, and also by the slope or inclination at which the apparatus is set. When the melting apparatus is set at an inclination, there is an end thrust of the rotary parts according to their gravity and the slope, and as the cylinders and their contents are heavy this thrust cannot safely be taken up by running-collars or sustained by the rollers 30, Fig. III. I therefore provide a thrust bearing or bearings consisting of a roller 31, mounted on a strong stud 32, that fits into the socket 33, supported in the frame or nipple 34. The bearing-ring 3 rests against the roller 31, as seen in the enlarged section, Fig. XIX, and also in Fig. XX, which

shows the housing and manner of supporting the socket 33. This roller 31, having a slow motion in the socket or bearing 33, is well protected from sand or grit and will withstand the longitudinal thrust of the main cylinder 2 and the central drum 6 and the material in the chamber 13 with other weights of the rotary parts.

Referring to Fig. III, the revolving parts are driven by a tooth-pinion 14 on a shaft 29, that extends through and is supported by a housing 36, attached to the outer shell 1, the pinion 14 meshing into the annular wheel or rack 4 on the steam-jacket shell of the main drum 2.

The rollers 30, on which rest the bearing-rings 3, are set in a housing 37, one at each side, and are made adjustable by means of packing 38 or in any other suitable manner to compensate for wear. A pipe 39 is provided for oiling the bearings of the rollers 30, and a lifting-screw 40 is provided in the housing 37 by means of which the main cylinder 2 can be raised clear of the bearing-rollers 30 for adjustment or insertion of the truck-rollers 19.

Referring again to the pipes 8 for conveying steam from the drum 6 to the steam-jacket 5 and to the pipes 9 for conducting the condensed water back from the steam-jacket 5 to the drum 6, the latter connect from the center of the drum 6, as seen at 44 in Fig. IV, and are protected in the chamber 13 by brackets 41, that prevent injury or displacement by falling of the material against the pipes 9.

To collect the water in the steam-space 5 and deliver it to the pipes 9, I provide diagonal diaphragms 45, as seen in Figs. XVII and XVIII, the pipes 9 communicating with the apex of the triangular pockets 58, formed by the diaphragms 45, which raise the water that collects in the bottom of the steam-jacket, so it will enter and flow through the pipes 9 into the center of the central drum 6 and be discharged above the water-level 59, maintained by the draining-pipe 60.

I will now proceed to describe the method of discharging the material after its treatment in the melting apparatus. This would be a simple matter to accomplish if the material could be discharged into the open air, but this is not the case. The subsequent processes of mixing, extracting, and so on are conducted in sealed vessels and under pressure, so the discharge-way from the melting apparatus has to be sealed and the material moved by mechanism, as shown in Figs. V to X of the drawings, the chamber 61 in Fig. VI corresponding to the chamber of like reference in Fig. I, but from the reverse side.

46 in Fig. VI represents a portion of a mixing apparatus, (not included in my present application), and corresponding to the details shown at C in the diagram Fig. I of the drawings in my application for Letters Patent on crushing and disintegrating apparatus "for

extracting and refining asphaltum," hereinbefore named.

At the end 23 of the melting apparatus, hereinbefore described, is a discharge-spout 15 from the chamber 61, leading to a cylinder 47, in which is placed a revolving screw 16, mounted on and driven by a shaft 49, that receives motion from a gear-wheel 50, or in any other suitable manner. The cylinder 47 has a renewable lining 48, provided because of the rapid abrasive wear at this point, and is separable into two parts, as seen in Fig. VIII, so that one side or both can be moved laterally to give access to the screw 16. This latter is also subject to rapid wear and to facilitate removal is made in two parts or sections, one of which is shown in Figs. IX and X. A space 51 is left at the bottom of the cylinder 47, so these sections 52 53 of the screw 16 can one at a time be placed on the shaft 49. From this cylinder 47 the melted material enters the curved pipe 54 and, being forced therethrough by the screw 16, is discharged at 55 into the cylinder 46.

The constructive details for connecting the pipe 54 to the vessel 46 and forming a sealed joint between that vessel and the melting apparatus are not described here, because these will form in part the subject-matter of a separate application for Letters Patent.

To keep the melted material in a soft or plastic state as it passes through the curved pipe 54, I provide a steam jacket or space 56, that embraces the pipe 54, except a small portion at 57, omitted to accommodate a fastening in the vessel 46, not included in this application.

Having thus described the nature and object of my invention and a suitable method of constructing and applying the same, what I claim as new, and desire to secure by Letters Patent, is—

1. In an asphaltum extracting and refining apparatus, a stationary casing, a revoluble main cylinder therein, with means for heating the exterior of said cylinder, a central concentric hollow core or drum fixed within said cylinder and revolving therewith, with means for heating said drum, and means for introducing and removing the material to be treated within the annular chamber included between said cylinder and drum, substantially as specified.

2. In an asphaltum extracting and refining apparatus, a stationary casing, a revoluble main cylinder within said casing, steam-jacketed as to its exterior, a central concentric hollow core or drum fixed within said cylinder and revolving therewith, means for introducing steam within said drum and said steam-jacket, helical vanes within the annular chamber between said main cylinder and said central drum, and means for introducing and removing the material to be treated within the said annular chamber, substantially as specified.

3. In an asphaltum extracting and refining apparatus, a stationary casing, a revoluble main cylinder therein, having a central hollow core, forming an annular chamber between the said inner core and the outer wall of the cylinder, means for heating said annular chamber through its inner and outer walls, helical vanes within said annular chamber, longitudinal lifting-plates between said helical vanes, and means for introducing and removing the material to be treated within said annular chamber, substantially as specified.

4. In an asphaltum extracting and refining apparatus, a stationary casing, a revoluble main cylinder therein, steam-jacketed as to its exterior, having a central hollow core, forming an annular chamber between said inner core and the outer wall of the cylinder, pipe connections for introducing steam into said inner core and outer jacket and for withdrawing water of condensation therefrom, helical vanes within said annular chamber, and means for introducing and removing the material to be treated within said annular chamber, substantially as specified.

5. In an asphaltum extracting and refining apparatus, a stationary casing, an annular melting-chamber therein, mounted revolvably upon an axis, means for heating said annular chamber through both its convex and its concave walls, helical vanes within said annular chamber, means for introducing the material to be treated, and a curved trap-outlet for discharging said material, with means for expelling the same through the trap, substantially as specified.

6. In asphaltum extracting and refining apparatus a revoluble main vessel or cylinder having a steam-jacket around its exterior, a longitudinal heating-drum set central therein and attached thereto, diaphragms forming pockets in the steam-jacket around the main cylinder by which water is raised from the bottom of the steam-jacket space and discharged through pipes leading from these pockets to the central heating-drum, all arranged substantially as described.

7. In an asphaltum extracting and refining apparatus, a steam-jacketed annular melting-chamber mounted revolvably upon an axis, a steam-heated hollow core therefor, a stationary outer casing, helical vanes within said annular chamber, means for introducing the material to be treated, a curved steam-jacketed-trap exit-pipe, and a rotative screw for impelling the softened material through the trap, substantially as specified.

8. In an asphaltum extracting and refining apparatus, a steam-jacketed annular melting-chamber mounted revolvably upon an axis, a steam-heated core therefor, helical vanes with-

in the annular chamber, means for introducing and withdrawing the material from the said chamber, rotary supports for said revoluble chamber, gearing for rotating the said chamber, and a stationary casing, surrounding and inclosing the revoluble chamber, its rotary supports, and its actuating-gears, substantially as specified.

9. In asphaltum extracting and refining apparatus, a cylindrical melting vessel provided with steam-heating devices, an outer inclosing shell or casing, communicating therewith, a discharge-way and a propeller-screw to force the plastic melted material there-through, the screw inclosed in a separable cylinder, made in sections and insertible without removing the shaft on which the screw is mounted, substantially as described.

10. In asphaltum extracting and refining apparatus, an inclined revoluble jacketed main vessel or cylinder having means to move the material longitudinally therethrough, a centrally-fixed heating-drum therein, steam connections between the central drum and steam-jacket of the main drum at one end, and water connections between the water-jacket and central drum at the other end, permitting steam circulation through the central drum and the steam-jacket, in the manner substantially as specified.

11. In asphaltum extracting and refining apparatus, a revoluble main cylinder having a steam-jacketed exterior and a central heating steam-drum revoluble therewith, pipes communicating from the central heating-drum to the steam-jacket, and pipes leading from the steam-jacket to the central steam-drum to return condensed water to the latter, said pipes discharging at or near the axis of the central steam-drum and above the water-level therein, substantially as described.

12. In asphaltum extracting and refining apparatus, the combination of a stationary casing or shell, and an interior revoluble main vessel or cylinder having a steam-jacket around its exterior, and a longitudinal heating-drum set central therein and attached thereto, means for admitting steam to the outer jacket and draining the water therefrom, means for supplying the material to the revoluble vessel, means for advancing the material through the revoluble vessel and means for discharging the material from the revoluble vessel, substantially as described.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

ARTHUR F. L. BELL.

Witnesses:

S. McADAMS,
VICTOR J. HALL.