Nov. 4, 1924. 1,514,162

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APPARATUS FOR RECOVERING BITUMEN AND CRUDE OIL FROM TAR SAND, OIL SAND, BITUMINOUS SANDSTONE, SHALES, AND THE LIKE

Filed July 18, 1921

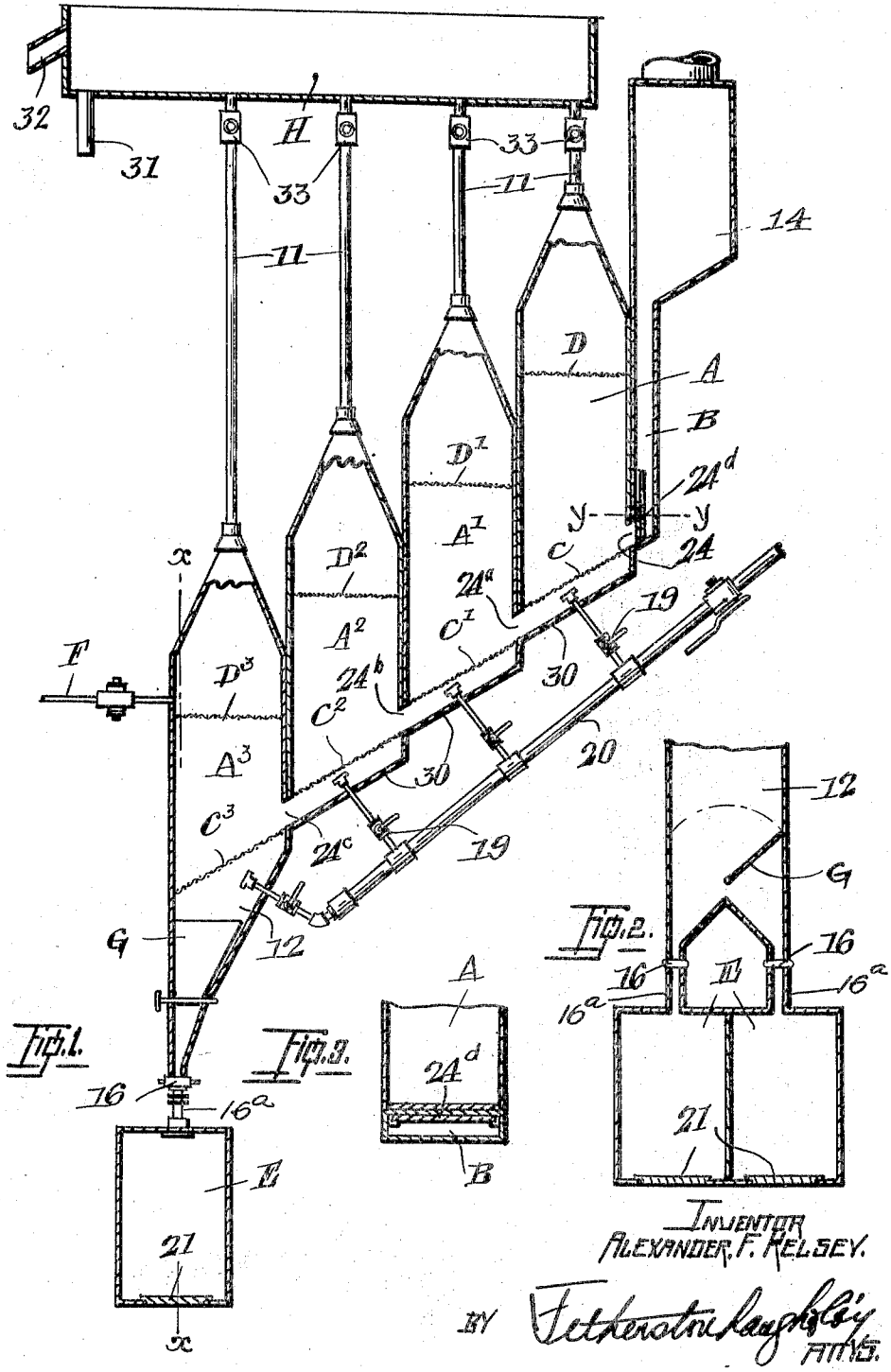


Fig. 1.

Fig. 3.

Fig. 2.

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Patented Nov. 4, 1924. 1,514,162

UNITED STATES PATENT OFFICE.

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APPARATUS FOR RECOVERING BITUMEN AND CRUDE OIL FROM TAR SAND, OIL SAND, BITUMINOUS SANDSTONE, SHALES, AND THE LIKE.

Application filed July 18, 1921. Serial No. 485,484.

To all whom it may concern:

Be it known that I, ALEXANDER FRANCIS KELSEY, a subject of the King of Great Britain, and resident of the city of Edmonton, in the Province of Alberta and Dominion of Canada, steam engineer, have invented certain new and useful Improvements in Apparatus for Recovering Bitumen and Crude Oil from Tar Sand, Oil Sand, Bituminous Sandstone, Shales, and the like, of which the following is a specification.

This invention relates to method and apparatus for recovering bitumen and crude oil from tar sand, oil sand, bituminous sandstone shale, and the like, and the objects of the invention are to provide a simple and effective method and apparatus by which the valuable bitumen and crude oil may be recovered from tar sand, oil sand, bituminous sandstone, shales and the like, in the most efficient way possible and with apparatus of an extremely simple character.

More particular objects of the invention are to avoid the use of any solvent, which is dangerous in use on account of its inflammable or explosive nature, to avoid as far as possible the use of moving parts in the apparatus whereby the expenditure of power may be reduced or limited, to avoid the use of any heat treatment which will deteriorate the quality of the bitumen and to enable the process to be carried on with low pressure steam.

More particular objects of the invention are to generally simplify and modify the process to enable the various steps to be economically carried out in such a manner as to produce the highest yield possible of the valuable constituents in the material treated.

It consists essentially of the improved method and apparatus hereinafter described in detail in the accompanying specification and drawings.

In the drawings:

Figure 1 is a sectional elevation of an apparatus which may be used to carry out the method.

Figure 2 is a transverse section on the line *x—x*, Figure 1.

Figure 3 is a sectional detail on the line *y—y*, Figure 1.

In the drawings, like characters of reference indicate corresponding parts in all the figures.

The various parts of the apparatus may be constructed of any suitable or convenient material, such as galvanized iron, suitably reinforced and covered with lumber.

Referring to the drawings:

B is a chute or hopper from and through which the tar sand is fed by gravity into suitable separating compartments, A, A^1, A^2, and A^3, which are open at the bottom and have conduits 11 leading from the top to an overflow tank H.

C, C^1, C^2 and C^3 indicate screens below the separating compartment, and through which the sand is designed to pass, these screens being located above steps 30 in a waste conduit 12 formed with two branches discharging into containers E, of which two are provided and in which the separated sand falls after the bitumen is collected, each of these containers being formed with a door 21 at the bottom through which the sand can be dropped out to waste. The screens C, C^1, C^2, C^3 are graded in size from one inch to one-eighth of an inch.

D, D^1, D^2, D^3 indicate screens located in the containers, A, A^1, A^2, A^3 a distance above the bottom thereof and being of substantially one-half of an inch in mesh.

F is a water supply pipe through which water or brine is supplied under pressure, entering the compartment A and supplied in sufficient quantity to maintain a proper level, as hereinafter described. The object of using brine in place of water is to increase the specific gravity by increasing the difference between the gravity of the fluid and the oil or bitumen, and thus causes the latter to rise more rapidly and positively to the surface.

G indicates a shutter mounted in the conduit 12 and adapted to deflect the material passing therethrough into either one of the containers E, valves 16 being provided in the branches 16^a which lead to the containers whereby the brine may be shut off and retained when the door 21 is open.

An opening 24 is provided through which the tar sand may pass from the chute B to the container A, and corresponding open-

ings 24^a, 24^b, 24^c, are provided between the containers, A^1, A^2 and A^3.

The opening 24 having first been closed by a sliding door 24^d, steam or hot compressed air is then supplied through the conduit 20 into valves 19 opened so as to allow an equal quantity of steam to pass through each valve.

The brine is maintained to a determined lever in the overflow tank H, the brine passing out of the tank through a suitable overflow conduit 31, the bitumen being design to pass out of an overflow conduit or chute 32 at the top thereof.

As soon as the brine in the container is brought to a predetermined point, the sliding door 24^d is raised a short distance, say, one inch, so as to allow the tar sand to enter the separator A on the screen C. As the tar sand disintegrates in this container, the bitumen released will rise through the brine into the conduit 11 and so overflow into the overflow tank H.

As soon as the lumps of tar sand are sufficiently reduced, they will fall through the screen C and pass on down into the separating compartment A^1, when the process is again repeated, as is also the case in the separators A^2 and A^3, the separated sand finally passing through the conduit 12 in one or other of the containers E.

As soon as one container E is full, the shutter G is turned over and the valve 16 closed so as to prevent escape of the liquid, and the sand is then removed from the container E.

The tar sand may be fed continuously into the upper part 14 of the chute B. The water level is maintained sufficiently high to enable the bitumen to overflow through the conduit 32 without any undue quantity of water passing over with it. In some cases it will be necessary to use a solvent, such as kerosene, in the overflow tank H, and, to enable this to be done, check-valves 33 are provided at the top of the conduits 11 of a character to prevent return flow of the liquid.

It is also possible to use heated compressed air instead of steam for heating the liquid.

The number of separating compartments used will depend on the degree to which it is necessary to carry on the separation, and will be dependent upon the character of the sand being treated. In some instances, the treatment may be effected with only one separating compartment.

As many changes could be made in the above construction and many widely different embodiments of my invention within the scope of the claims, constructed without departing from the spirit or scope thereof, it is intended that all matter contained in the accompanying specification and drawings shall be interpreted as illustrative and not in a limiting sense.

What I claim as my invention is:

1. An apparatus for the purpose specified comprising a separating container having an overflow conduit, a waste conduit connected to the bottom of the said container, means for feeding material into the side of the container, a screen in the lower part of the container, means for heating the material in the container, means for maintaining a flow of water through the container, and means for feeding material from the waste conduit, the said means comprising a pivoted shutter, a compartment and valved conduits leading from the shutter to the said compartment.

2. An apparatus for the purpose specified comprising a separating container having an overflow conduit and a waste conduit, the latter being connected to the bottom of the container, means for feeding material into the side of the container, a screen in the lower part of the said container, means for heating material in the container, means for maintaining a flow of water through the container, a plurality of branches connected to the waste conduit, and means for directing the material from the waste conduit to either of the said branches.

3. An apparatus for the purpose specified comprising a separating container having an overflow conduit and a waste conduit, the latter being connected to the bottom of the container, means for feeding material into the side of the container, a screen in the lower part of the container, means for heating material in the container, means for maintaining a flow of water through the container, a plurality of branches connected to the waste conduit, and means for directing the material from the waste conduit to either of the said branches, the said means comprising a pivoted shutter, and valves in each of said branches.

4. An apparatus for the purpose specified comprising an overflow tank, a separating container below the overflow tank, a valve conduit connecting the container with the overflow tank, the said container being formed at the bottom with openings on opposite sides, one opening being below the other, an inclined screen extending from the upper side of one opening to the lower side of the lower opening, an inclined bottom below the screen, means for feeding material into the upper opening, and a screen in the upper part of the container adapted to screen the material passing from the container into the overflow tank.

5. An apparatus of the character described, comprising an overflow tank, a plurality of stepped laterally adjacent containers, each located a short distance above the

other, conduits connecting each of the containers with the botom of the overflow tank, screens in each container, separately controlled heating means for each container, means for feeding material into the side of the uppermost container, and from the side of each container to the one laterally adjacent and below the same, and means for circulating a fluid through all the containers.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ALEXANDER FRANCIS KELSEY.

Witnesses:

G. G. CUFF,

R. H. MUNN.