July 22, 1924. 1,502,261

W. McARTHUR

METHOD OF AND APPARATUS FOR TREATING OIL SAND

Filed April 27, 1923 4 Sheets-Sheet 1

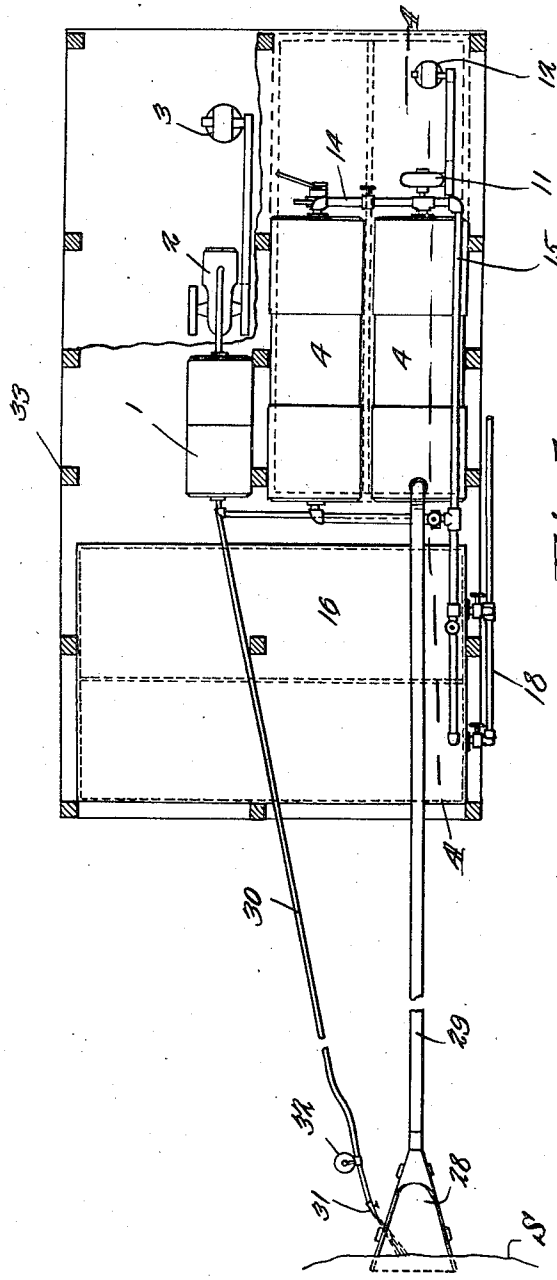


Fig. 1.

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Filed April 27, 1923 4 Sheets-Sheet 2

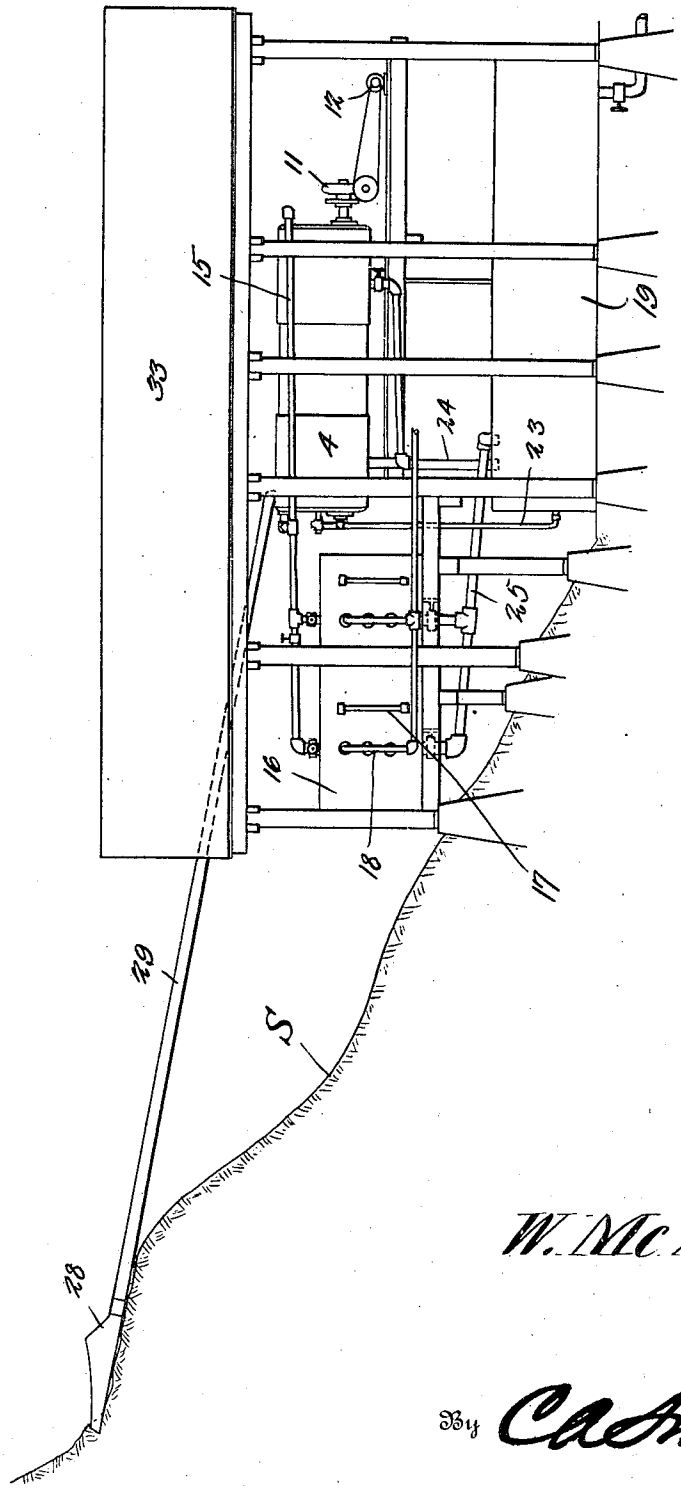


Fig. 2.

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METHOD OF AND APPARATUS FOR TREATING OIL SAND

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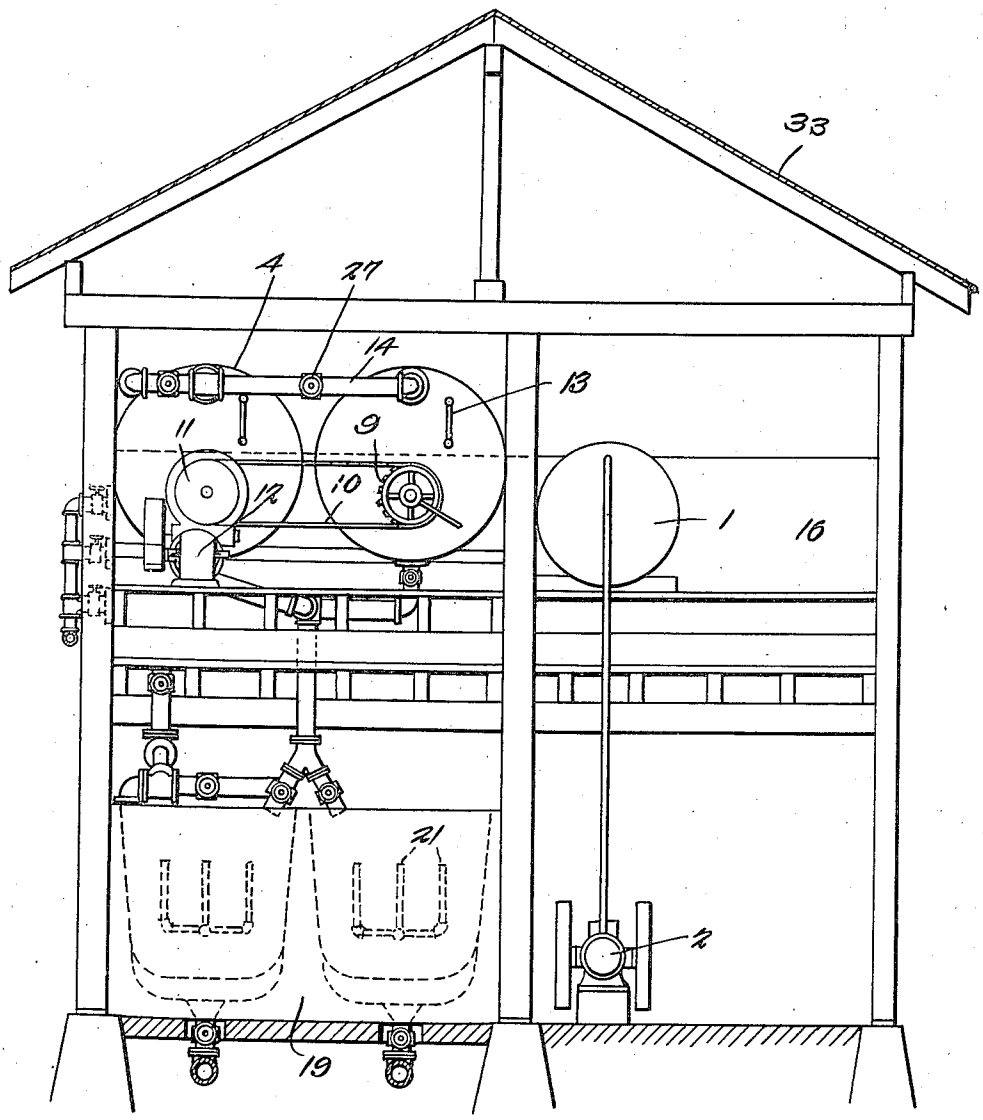


Fig. 3.

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METHOD OF AND APPARATUS FOR TREATING OIL SAND

Filed April 27, 1923 4 Sheets-Sheet 4

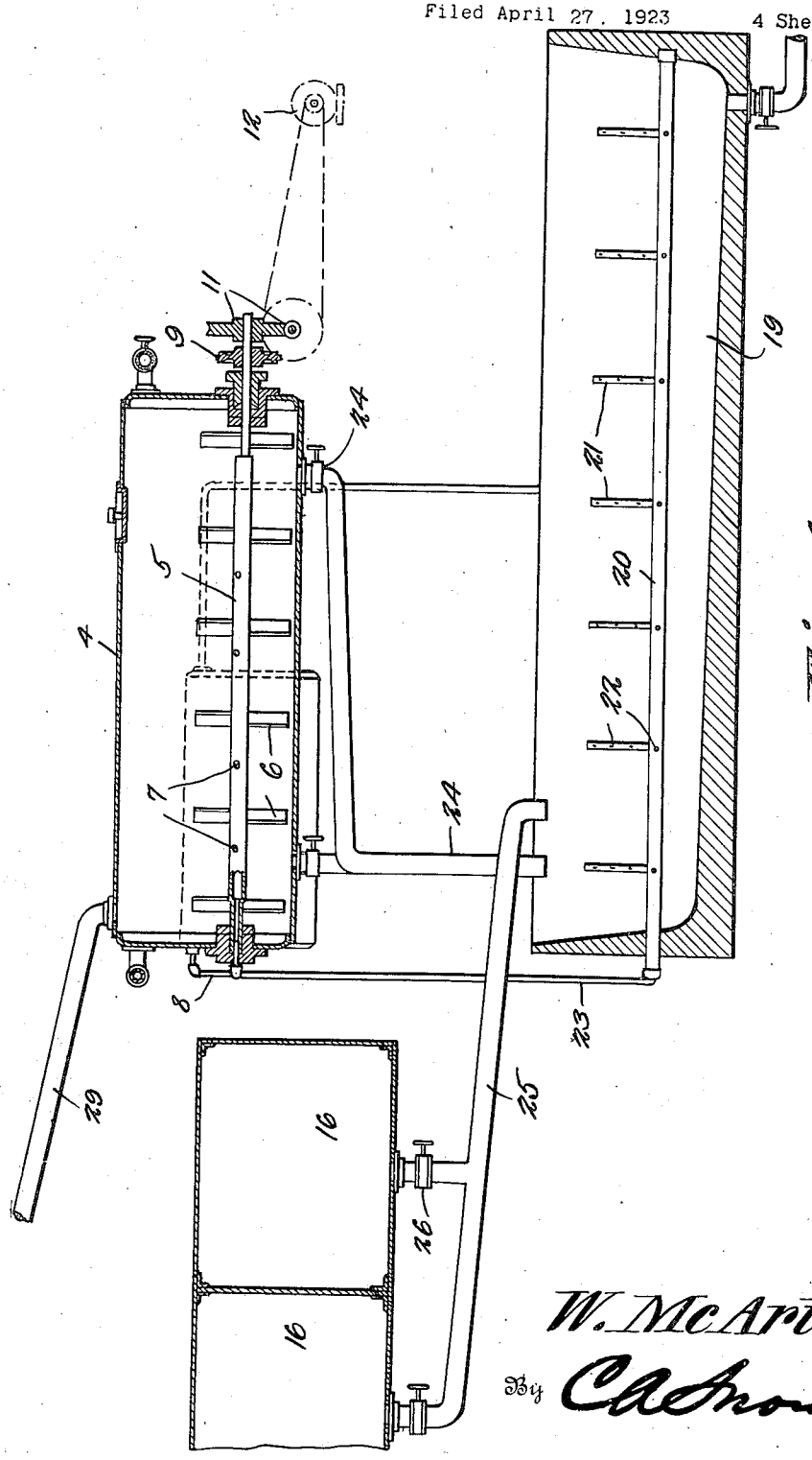


Fig. 4.

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Patented July 22, 1924. 1,502,261

UNITED STATES PATENT OFFICE.

WILLIAM McARTHUR, OF SEATTLE, WASHINGTON.

METHOD OF AND APPARATUS FOR TREATING OIL SAND.

Application filed April 27, 1923. Serial No. 635,066.

To all whom it may concern:

Be it known that I, WILLIAM McARTHUR, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented a new and useful Method of and Apparatus for Treating Oil Sand, of which the following is a specification.

This invention relates to a method of separating oil from oil sand and also to apparatus for use in carrying out the method.

In many localities there are found large deposits of black sticky sand known as "oil sand." Various attempts have been made to treat this sand so as to remove the oil from it and allow the sand to be used for commercial purposes. It has been found that the application of heat tends solely to bake the sand and produce a hard rock-like substance of no value. Superheated steam has also been employed in an effort to remove the oil but this has been without success.

One of the objects of the present invention is to treat the sand by a cold process wherein a solvent is used for dissolving the oil content mixed with the sand, this content being easily separated from the sand which can, thereafter, be used commercially.

Another object is to provide apparatus which can act directly on the oil sand deposit, breaking up the bank subjected to the action of the apparatus so that the necessary separation process can be followed rapidly and efficiently at the point of supply.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts and in certain novel steps of the method hereinafter more fully described and pointed out in the claims, it being understood that changes may be made within the scope of the claims without departing from the spirit of the invention.

In the accompanying drawings the preferred form of apparatus has been shown.

In said drawings:

Figure 1 is a plan view of the complete apparatus, portions of the housing being shown in section.

Figure 2 is an elevation of the apparatus.

Figure 3 is an enlarged end elevation.

Figure 4 is a vertical longitudinal section through a portion of the apparatus, said section being taken on the line 4—4 Figure 1.

Referring to the figures by characters of reference 1 designates a tank of any desired construction for holding air under compression, this tank being combined with a suitable compressor 2 adapted to be actuated by a motor 3.

Suitably mounted at any desired point are a desired number of agitating tanks 4 each of which may be provided with a longitudinal tubular shaft 5 from which radiate agitating arms 6. This shaft may be formed with vent openings 7 whereby jets of air under pressure can be delivered into the tank. The shafts in the respective tanks 4 are connected at one end to the tank 1 by an air conducting pipe 8. Mounted on each of the shafts 5 is a sprocket 9 and a chain 10 engages these sprockets so as to insure simultaneous rotation of the shafts. One of the shafts is driven by worm gearing shown generally at 11 and adapted to be actuated in any suitable manner by a motor 12.

Each tank 4 is preferably provided with a gauge glass 13 near the top thereof and the two tanks communicate at their ends through pipes 14. These pipes open into the upper portions of the tanks and are adapted to conduct overflow therefrom to an inclined pipe 15 extending to and opening downwardly into oil settling tanks 16. Each of these settling tanks is provided with a gauge glass 17 and opening into each tank at different levels are oil outlet pipes 18.

Located below the levels of the tanks 4 and 16 are sand cleansing tanks 19 preferably formed of concrete lined with glass or other acid proof material. In each of these tanks is located a pipe 20 having tubular nozzles 21. Openings 22 are formed in the pipe and nozzles so that jets of air will be delivered under pressure into the tank 19. Pipes 20 are connected by pipes 23 to the pipes 8 so that air under pressure is thus supplied from the tank 1.

The tanks 4 are provided with drain pipes 24 opening downwardly from the bottoms of said tanks into the tops of the tanks 19 and drain pipes 25 extend from the bottoms of the tanks 16 to the tops of the tanks 19. Valves 26 are suitably located in the drain pipes 24 and 25 for controlling the flow of material therethrough and additional valves 27 are also provided in the pipes 14 for controlling the flow of liquid.

A collecting pan 28 is used in connection with the apparatus and is adapted to be

forced into the bank of sand S to be treated. An outlet pipe 29 extends from this pan to the top of one of the tanks 4. An air conducting pipe 30 extends from tank 1 and is provided with a nozzle 31 for directing a jet of air into the pan 28 and toward the receiving end of the pan. A container 32 opens into this pipe 30 and is adapted to hold a suitable solvent such as naphtha, gasoline, etc.

It is to be understood that the apparatus herein described can be arranged within a suitable housing 33 for protecting it from the elements. The structure is designed to be erected at the side of the sand bank S so that when the pan 28 is forced into the sand the loosened sand will be free to gravitate through pipe 29 to tank 4. Air under pressure is delivered to nozzle 31 and will draw a constant supply of solvent from the container 32 and blow it into the sand extending across the open end of the pan. This mixture of air and solvent will tend to break up the mass of sand by softening the oil mixed therewith. The sand and solvent will flow through pipe 29 to tank 4 where it will be agitated thoroughly by the rotating blades or arms 6 and the jets of air escaping through the openings 7. The level of the fluid consisting of the solvent and the softened oil will rise to the pipes 14 through which the liquid will overflow and pass into the tanks 16. Here the sand is allowed to settle while the fluid will drain off at predetermined levels through the pipes 18. The proper levels at which to draw off the fluid can be determined by examining the glasses 17. Any sand that may settle in the tanks 4 and 16 can be drawn off through the pipes 24 and 25 respectively and delivered into the tanks 19. In these tanks 19 the sand is subjected to the action of a chemical cleansing agent, which can be in the form of a suitable acid, the thorough mixing of the sand and cleansing agent being effected by the action of the air jets issuing from pipes 20 and nozzles 21. The sand can be removed from these tanks 19 and used for various purposes, such as glass making. The liquid drawn off through the pipes 18 can be refined and again used as a solvent as hereinbefore pointed out. Obviously valves can be placed as shown or wherever else desired for controlling the flow of materials through the apparatus.

What is claimed is:

1. The herein described method of treating oil sand which consists in subjecting the same to the action of an oil solvent directed thereagainst under pressure, subsequently agitating the sand and solvent in a container, allowing the mixture to settle, draining the liquid from the mixture, and finally subjecting the sand to the action of a chemical cleansing agent.

2. The herein described method of treating oil sand which consists in subjecting the sand to the action of a mixture of air and an oil solvent, directing the mixture of sand and solvent into an agitator, conducting the mixture to a settling tank, withdrawing the liquid from the settling tank, and finally subjecting the sand to the action of an air agitated cleansing agent.

3. The herein described method of treating oil sand which consists in directing a jet of oil solvent and air against a sand bank to loosen the sand, then conducting the mixture of sand and solvent to a tank, subjecting the mixture in the tank to the agitating action of air jets and movable arms, conveying the mixture to a settling tank, withdrawing the liquid from the settling tank, and finally subjecting the sand to the action of an air agitated cleansing fluid.

4. In apparatus of the class described the combination with a sand collecting pan and means for directing a jet under pressure into the sand, of a tank, means for conducting sand from the pan to the tank, rotatable agitating means within the tank, a setting tank, means for conducting overflow from the agitating tank to the settling tank, an acid proof cleansing tank, means for conducting sand to the cleansing tank from the agitating and settling tanks, and means for discharging air jets under pressure within the cleansing tank.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILLIAM McARTHUR.

Witnesses:
KARL H. KOBER,
GERTRUDE SMITH.