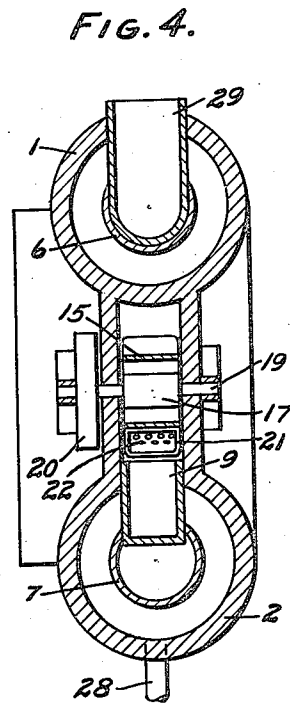
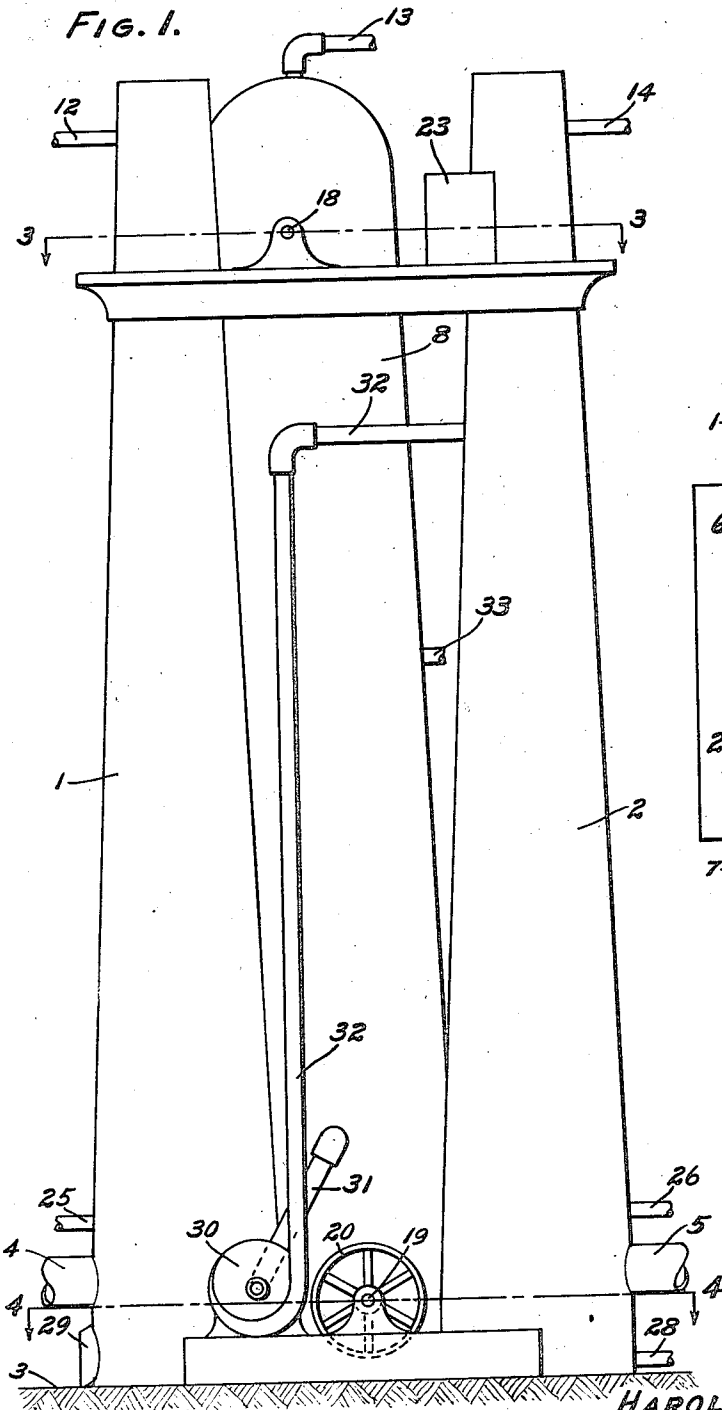


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 APPARATUS FOR DISTILLING SHALE AND THE LIKE.
 APPLICATION FILED MAY 5, 1919.

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 2 SHEETS—SHEET 1.



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FIG. 2.

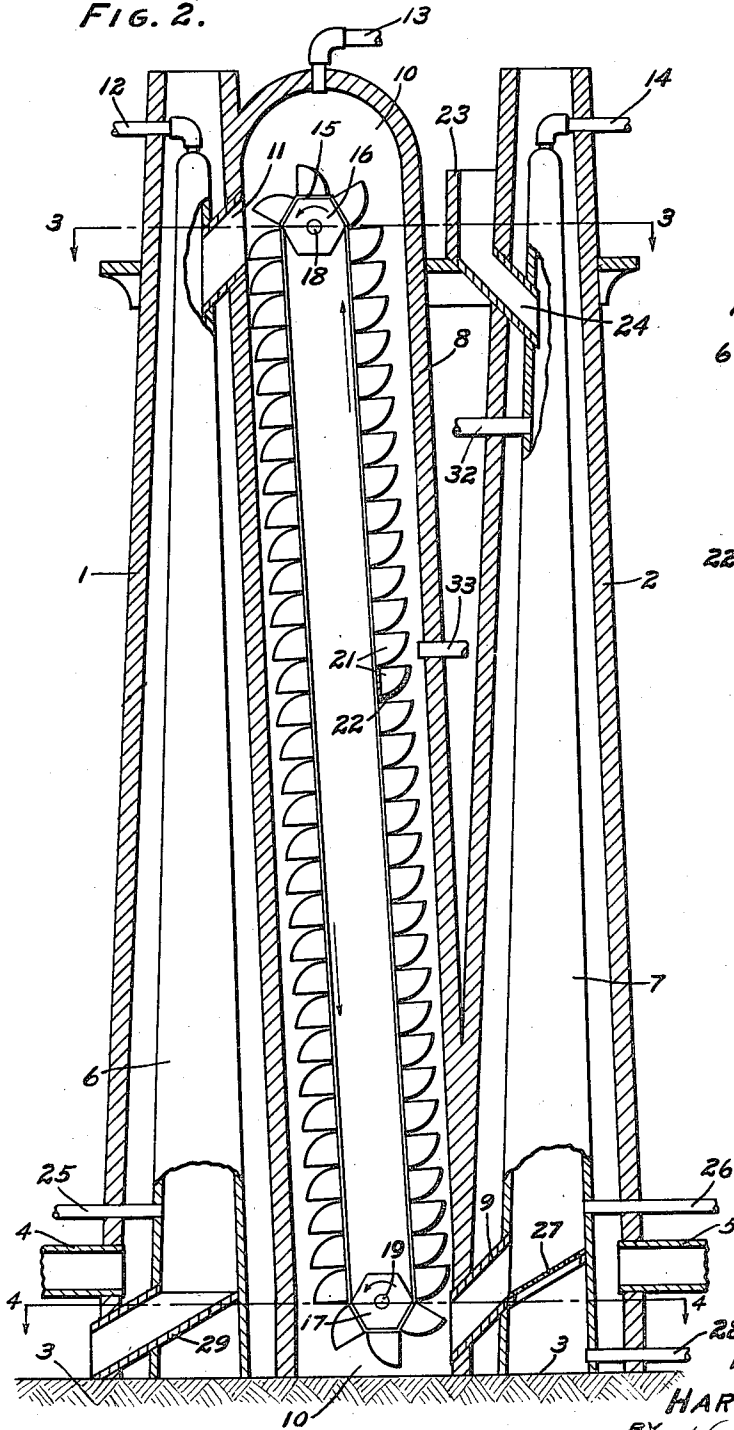
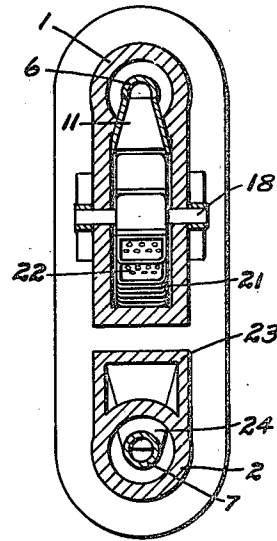


FIG. 3.



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UNITED STATES PATENT OFFICE.

HAROLD H. GODFREY, OF LOS ANGELES, CALIFORNIA.

APPARATUS FOR DISTILLING SHALE AND THE LIKE.

1,309,890.

Specification of Letters Patent.

Patented July 15, 1919.

Application filed May 5, 1919. Serial No. 294,875.

To all whom it may concern:

Be it known that I, HAROLD H. GODFREY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Apparatus for Distilling Shale and the like, of which the following is a specification.

My object is to make an apparatus for distilling shale and the like and my invention consists of the novel features herein shown, described and claimed.

Figure 1 is a side elevation of a shale still embodying the principles of my invention.

Fig. 2 is a sectional elevation on a plane parallel with Fig. 1.

Fig. 3 is a horizontal sectional detail on the lines 3—3 of Figs. 1 and 2.

Fig. 4 is a horizontal sectional detail on the lines 4—4 of Figs. 1 and 2.

The heaters 1 and 2 are vertical flues tapering from the foundation 3 upwardly. The pipes 4 and 5 discharge heat from a furnace into the bottoms of the heaters 1 and 2 and the heaters are open at the top.

Retorts 6 and 7 are mounted in the heaters 1 and 2, said retorts resting upon the bottom 3 and said retorts are centrally located in the heaters and are tapered from the bottom upwardly.

An elevator shaft 8 connects the bottom of the heater 2 to the top of the heater 1, there being a spout 9 leading from near the bottom of the retort 7 into the bottom of the chamber 10 of the elevator shaft and a spout 11 leading from the top of the chamber 10 into the top of the retort 6.

Pipes 12, 13, and 14 lead to a condenser, the pipes 12 and 14 being tapped into the top of the retorts 6 and 7 and the pipe 13 being tapped into the top of the elevator shaft 8.

A belt 15 is mounted upon heads 16 and 17 fixed upon shafts 18 and 19 extending horizontally through the elevator shaft 8 and a driving pulley 20 is fixed upon one of the outer ends of the shaft 19 for operating the elevator.

The elevator buckets 21 have perforations 22 for draining the liquid out of the buckets. A hopper 23 is mounted at the upper end of the heater 2 and has a spout 24 extending through the wall of the heater 2 into the upper end of the retort 7. Steam is discharged

into the bottoms of the retorts 6 and 7 through pipes 25 and 26.

A strainer 27 is mounted above the bottom of the retort 7 to discharge the solid matter into the spout 9 and allow the liquid to pass through the strainer to the bottom of the retort 7 and the liquid is drawn from the bottom of the retort 7 through the pipe 28.

A spout 29 leads from near the bottom of the retort 6 through the wall of the heater 1. A centrifugal pump 30 is connected to the lower part of the elevator chamber 10 by a pipe 31 and the pump discharges through the pipe 32 to the upper part of the retort 7 at a point below the spout 24.

Solvents such as still tops are discharged into the central portion of the chamber 10 through a pipe 33.

In the practical operation of distilling shale in my apparatus the shale is dumped into the hopper 23 and discharged into the retort 7. Heat is supplied through the pipe 5 to the heater 2 to heat the retort 7 to about 500° or 600° Fahr. This will handle shale containing bitumen soluble in light hydrocarbons such as still tops. The solvents are introduced into the elevator shaft 8 through the pipe 33 until the solvent fills the chamber 10 to the level of the pipe 33 and fills the retort 7 to the same level. The shale will pass downwardly through the retort 7 to the strainer 27 and the solid matter will pass through the spout 9 to the bottom of the chamber 10.

The solvent partly saturated with bitumen is pumped from the bottom of the chamber 10 through the pipe 32 to the top of the retort 7 and passes downwardly through the retort and the liquid matter passes through the strainer 27 and is drawn off through the pipe 28. The liquid should not be drawn away through the pipe 28 until it is thoroughly saturated with bitumen.

Steam is introduced into the bottom of the retort 7 through the pipe 26 at a temperature of about 500° Fahr. and all volatile matter including the steam and light hydrocarbons will pass upwardly in the retort 7 and outwardly through the pipe 14 to a condenser and the products such as ammonia, water and hydrocarbons, will be condensed and subsequently separated.

From the bottom of the chamber 10 the solid matter is carried upwardly by the buckets 21 and the liquid matter will drain

through the perforations 22 and the solid matter will be discharged through the spout 11 into the top of the retort 6. The volatile matter will pass from the chamber 10 through the pipe 13 to the condenser.

Steam is injected into the bottom of the retort 6 through the pipe 25 at a temperature of about 600° or 700° Fahr. The furnace heat is introduced into the heater 1 through the pipe 4 to a temperature of about 600° or 700° Fahr. The shale will be separated from all the remaining portions of volatile matter in the retort 6 and the distilled shale will pass outwardly through the spout 29. In the case of shale containing bitumen not readily soluble in still tops or the like the shale may be destructively distilled by maintaining a temperature of 1000° Fahr. and omitting the solvents.

In case instructive distillation is resorted to it is advisable to introduce a solvent such as tops through pipe 33 in order to wash off the bituminous matter that may still adhere to the shale. The solvent will be either distilled and collected in the condenser or will be drawn off to pipe 28 in the usual manner.

Various changes may be made without departing from the spirit of my invention as claimed.

I claim:

1. An apparatus for distilling shale and the like comprising two heaters in the form of vertical flues mounted upon a foundation, an elevator shaft connecting the bottom of one heater to the top of the other heater, an elevator in the elevator shaft, a retort mounted in each of the heaters, a funnel at the top of one heater and having a spout

discharging into one retort, a spout leading from the bottom of the retort to the bottom of the elevator shaft, a spout leading from the top of the elevator shaft to the top of the other retort, a spout leading outwardly from the bottom of the second retort, and a pump connecting the bottom of the elevator shaft to the upper part of the first retort.

2. An apparatus for distilling shale and the like comprising two heaters in the form of vertical flues mounted upon a foundation, an elevator shaft connecting the bottom of one heater to the top of the other heater, an elevator in the elevator shaft, a retort mounted in the first heater, a retort mounted in the second heater, a funnel at the top of the first heater and having a spout discharging into the first retort, a spout leading from the bottom of the first retort to the bottom of the elevator shaft, a spout leading from the top of the elevator shaft to the top of the second retort, a spout leading outwardly from the second retort, a pump connecting the bottom of the elevator shaft to the upper part of the first retort, a heat pipe discharging into the bottom of the first heater, a second heat pipe discharging into the bottom of the second heater, a solvent pipe discharging into the first retort, a drain pipe leading from the bottom of the first retort, steam pipes connected to the bottom of the two retorts and vapor pipes leading from the tops of the two retorts and from the top of the elevator shaft.

In testimony whereof I have signed my name to this specification.

HAROLD H. GODFREY.