

UNITED STATES PATENT OFFICE.

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TANK-HEATER.

931,980.

Specification of Letters Patent. Patented Aug. 24, 1909.

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To all whom it may concern:

Be it known that I, SAMUEL S. WOODBURY, citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Tank-Heaters, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in tank heaters and pertains more particularly for heating tanks of crude petroleum.

The object of my invention is to provide a device of this character in which tanks of crude petroleum can be economically and uniformly heated causing the least amount of evaporation and whereby the oil is thoroughly mixed, settled and heated preparatory to delivery to pipe lines.

Another object of my invention is to provide a more simple cheap and effective device to accomplish the results desired.

In the accompanying drawing Figure 1 is a side elevation of my improved device partly in section. Fig. 2 is an enlarged vertical sectional view partly broken away of the burner and heating drum. Fig. 3 is a perspective view of the mixing drum showing the lower end broken away.

Referring now to the drawings 1 represents a tank which as shown is made of wood or other material and provided with a closed upper end to prevent evaporation and keep out the dirt, etc. The upper end of the tank has a rod 2 extending downwardly therethrough and has its lower end screwed into the slip joint of the sleeve 3 and by means of which the circulation of the water or oil in the tank can be raised or lowered to extent of the flexibility of the pipe 8. The upper end of the rod 2 is screw-threaded at 5 and having a nut 6 screwed for adjusting the rod up or down and also for allowing of its ready removal. The lower end of the sleeve is provided with a T-pipe joint 7 through which the pipe 8 passes. The said pipe extends outwardly through the tank while the inner end passes inwardly through the side wall 9 of the mixing drum 10 and has its inner end turned upwardly at 11 the said drum being supported by the pipe as shown. The drum as shown is of an elongated form and having its side wall 9 above the pipe 8 pro-

vided with two or more clips 12 and 13 which pass around the pipe or sleeve 3 and steady and serve as additional supporting means for the drum.

The lower end of the drum 10 is provided with the horizontal outwardly extending flange 14 the purpose of which will be hereinafter more fully described. The drum as shown has its upper and lower ends open, while the upper end is provided with radially arranged inclined blades 15. The blades 15 are intended to check the rapid ascension of the hot oil from heater to surface of tank where rapid evaporation would take place, and mixing it thoroughly with the currents of cold liquid as it is drawn upwardly through the spreader, caused by the upward current of heated oil, and discharging it in a circular motion, giving the oil in tank a circular circulation and still further mixing it. This with the downward circulation to take the place of oil drawn to the surface through circulator from the bottom makes circulation quite complete.

Adjacent the tank I provide my improved heater which consists of a base 16 having a circular burner 17 mounted thereon. The said burner having a vertical outer wall 18 and an oblique inner wall 19 provided with perforations 20 which are arranged at an angle to the oblique wall 19 and thus gives a circular motion to the gas flame coming in contact with the heating cylinder at about the same angle as the spiral ribs of the heater. This with my central suction draft at bottom and top causes the flames to hug or follow closely to the heating cylinder from bottom to top making a very economical heater in the consumption of fuel. The burner has connected thereto the oil or gas supply pipe 21 which has the air inlets 22 which supply air to the burner and forms a Bunsen burner. The said burner 17 is provided with a series of upwardly extending members 23 which have at their upper ends the notches 24 in which rests the casing 26 of the heater. The heater is composed of an outer metal casing 26 and inner fireclay or brick lining 27 as shown. The lower end of the casing is flared outwardly as indicated at 28 to form an enlarged combustion space 29 just above the burner. The upper end of the casing extends considerably above the fire brick

and is provided at its upper end with a cap 30.

Extending upwardly through the center of the fire brick is a heating chamber 31 which is of a length equal to that of the fire brick and is preferably cast and having conical shaped upper and lower ends 32 and 33 which are screw threaded for coupling the pipes thereto, as will be hereinafter more fully described. The said tank has cast thereon spiral ribs 34 which are of a width to extend out to and snugly fit the inner face of the fire brick 27, and thus forming a spiral passage around the chamber.

Connected to the upper end 32 of the chamber is a pipe 35 which extends through casing 26 and is connected to the pipe 8 and all of which forms the return pipe to the tank 1. The said pipe intermediate the tank 1 and the tank 31 is provided with a cock 36 by means of which the flow of oil through the pipe may be regulated or cut off. The lower end 33 of the chamber 31 has a pipe 37 connected thereto and extends downwardly below the base 16 and is connected to the tank 1 a distance above the bottom thereof. The said pipe is also provided with a cock 38, by which the oil to the tank 31 may be regulated or cut off as desired.

In operation the burner is lighted in any desired manner and the inner face 19 being obliquely arranged the jets extend at an angle and engage the lower end of the tank 33. Previous to the lighting of the burner the cocks 36 and 38 are opened. The products of combustion, smoke and heat from the burner pass upwardly between the chamber and the fire brick and are caused to encircle the tank, thus forming a long spiral passage 34' for the heat and cause the oil within the chamber to become more thoroughly heated with the least possible amount of oil or gas for the burner. The fire brick also retains the heat and causes a more thorough heating of the chamber. The oil as it becomes heated within the chamber 31 will cause a circulation thereof through the pipes 35 and 37. The pipe 37 supplying the oil from the tank 1 to the lower end of the chamber 31 while pipe 35 conveys the heated oil back to the tank 1. The pipe 35 as shown is connected to the pipe 8 which discharges the oil into the drum 10 in an upward direction thus causing an upward movement of oil from the lower end of the drum therethrough as shown and causing a thorough mixing of the cool oil in the tank with the heated oil from the pipe 8. The oil as it is driven upwardly through the drum strikes the oblique blades 15 which spread the oil in an upward and outward direction and tend to thoroughly mix and cause a thorough circulation of the oil within the tank 1 and mix the cool and heated oil whereby the whole body of oil is maintained at the same tem-

perature. The drum 10 is a sufficient distance from the bottom of the tank 1 to allow of any sediment to settle to the bottom of the tank and supply pipe 37 being above the bottom will not draw off such sediment.

The flange 14 at the bottom of the cylinder is to make more certain of drawing the colder oil from the sides of the tank and not from along the sides of the cylinder where the oil to some extent is warmer.

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

1. The combination with a tank, a mixing drum supported therein above the bottom, and having open bottom and inclined radially arranged spreading blades at the upper end, a heater adjacent the tank, a pipe connected to the lower end of the tank and chamber, a pipe connected to the upper end of the chamber and extending through the tank, and into the mixing drum and having its end turned upward and discharging the liquid in an upward direction through the drum.

2. The combination with a tank, a mixing drum supported therein above the bottom and having an open bottom, and an outwardly extending flange surrounding the lower end, a heater chamber adjacent the tank, a pipe connected to the lower end of the tank and heater chamber, a pipe connected to the upper end of the heater chamber, and extending through the tank and into the mixing drum and having its end turned upwardly and discharging the liquid in an upward direction through the drum.

3. The combination with a tank, a heater adjacent thereto, and consisting of an annular burner upwardly extending projections carried by the outer periphery of the burner, a casing resting upon the upper end of the said projections a spaced distance above the burner said casing having a contracted upper cylindrical portion, a fire brick lining for said casing a hood carried by the upper end of said casing, a chamber vertically disposed within the fire brick above the burner, and having a spiral passage between the fire brick and the chamber, a pipe connecting the upper end of the chamber with the tank, and a second pipe connecting the lower end of the chamber with the tank, substantially as set forth.

4. The combination with a tank, of a mixing drum therein, a rod connected to said drum and extending upwardly through the tank, means for adjusting said rod for adjusting the mixing drum, a heater adjacent the tank, a pipe connected to the tank and the lower end of the heater, a second pipe connected to the upper end of the heater and extending into the tank and in communication with the mixing drum.

5. The combination with a tank, of a mixing drum consisting of a cylinder radially ar-

ranged, inclined blades carried by the upper
end of said drum, a rod attached to the side
of the drum and extending through the upper
end of the tank, means for adjusting said rod
5 up or down for adjusting the mixing drum,
a heater adjacent the tank, a pipe connected
to the tank and lower end of the heater, a
pipe in communication with the upper end of
the heater and extending into the tank and

through the side of the cylinder and having 10
its ends turned upwardly therein.

In testimony whereof I affix my signature
in presence of two witnesses.

SAMUEL S. WOODBURY.

Witnesses:

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