April 4, 1939. C. H. BILLS 2,152,863

SAND, WATER, AND OIL SEGREGATOR

Filed Dec. 7, 1937

Fig. 1.

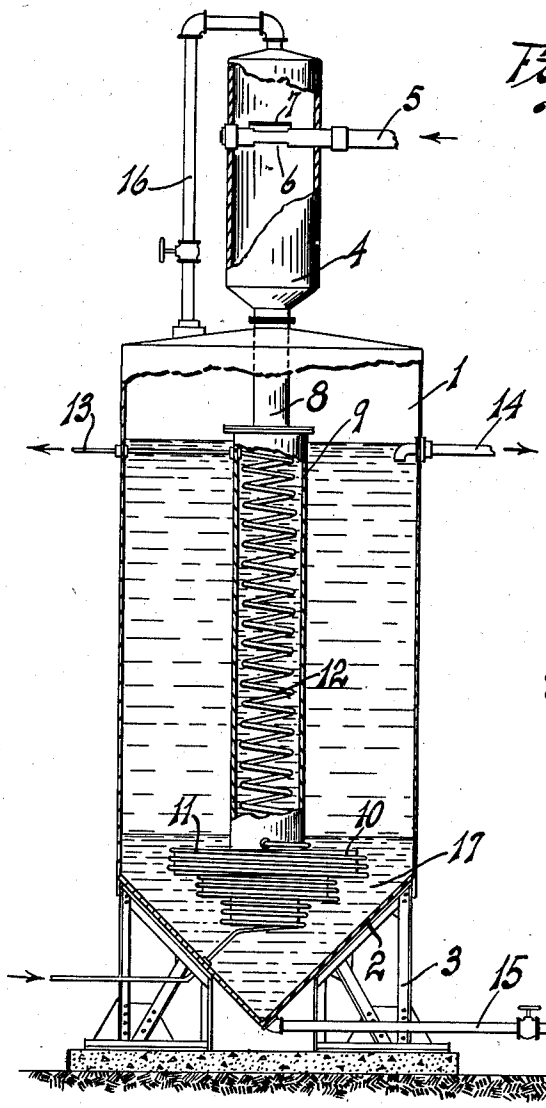


Fig. 2.

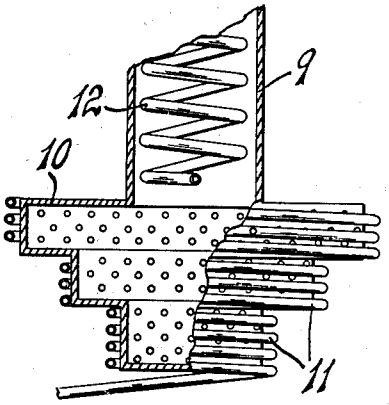
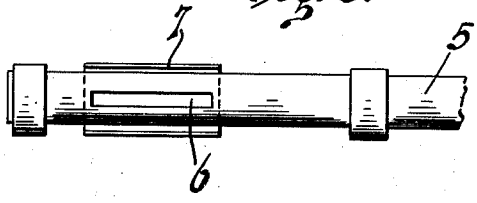


Fig. 3.



INVENTOR.
CLAUD H. BILLS.
BY
H. A. Duckman
ATTORNEY.

Patented Apr. 4, 1939 2,152,863

UNITED STATES PATENT OFFICE

2,152,863

SAND, WATER, AND OIL SEGREGATOR

Claud H. Bills, Maywood, Calif.

Application December 7, 1937, Serial No. 178,549

2 Claims. (Cl. 196—5)

This invention relates to a water, sand and oil segregator, which is located adjacent to producing wells, and ahead of the production and shipping tanks.

The purpose of this invention is to separate entrained sand or entrained water from the fluid produced from the well, and to provide a novel means for the withdrawal of the sand or water which is separated.

An object of my invention is to provide a novel heater for the purpose of separating entrained sand or water from the oil, and the heated oil in the cleaning process is delivered hot to the shipping tanks, and retains sufficient heat to facilitate pumping and shipping operations.

Still another object is to provide a novel device of the character stated, which will effectively remove entrained sand or water from the oil produced from the well, and further, to continuously remove the sand or water while the well is producing.

Still another object is to provide a novel segregator of the character stated, in which the fluid produced from the well is divided into small globules, whereby the sand and water is effectively removed from the oil.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing—

Figure 1 is a longitudinal sectional view of the segregator.

Figure 2 is a fragmentary longitudinal sectional view of the perforated hood and balancing column.

Figure 3 is a fragmentary bottom plan view of the intake pipe.

Referring more particularly to the drawing, the numeral 1 indicates an outer tank. The tank is provided with a cone bottom 2, which is preferably integrally formed with the tank. The tank is supported on a base 3, substantially as shown. An intake head 4 is mounted above the tank 1, and the intake pipe 5 from the well extends into the head 4. The pipe 5 is substantially horizontal, and is provided with oppositely arranged outlet slots 6.

A baffle plate 7 extends over the upper slot so that the oil is deflected downwardly, and is prevented from cutting the upper portion of the head 4. A conduit 8 extends from the bottom of the head 4, through the top of the tank 1, and into the upper end of the balancing column 9. The balancing column 9 is arranged centrally in the tank 1, and extends substantially the length of the tank.

A plurality of spreader rings 10 are arranged at the lower end of the balancing column 9, and these rings are perforated substantially as shown in Figure 2, for the purpose of allowing the oil and entrained sand or water to pass outwardly into the tank. The rings 10 are successively smaller in diameter, the purpose being to reduce the velocity of the fluid as will be further described.

Heating coils 11 surround the rings 10 on the outside thereof, and the uppermost coils vent inwardly as attached to the lower end of the coil 12, within the balancing column 9. Steam or water is pumped into the lowermost coil 11 passes upwardly through the successive coils, thence into the coil 12, and is exhausted through the upper pipe 13. Thus the coils 11 and 12 are connected in series, and a temperature is maintained in these coils to suit the characteristics of the oil which is being treated.

A skimming outlet pipe 14 extends from the pipe 1, adjacent the upper end thereof, and this pipe extends to the stock tanks. The water, sand, and the like, is withdrawn from the bottom of the cone 2, through the pipe 15. The clean oil outlet 14 is arranged in the tank 1, below any foam which may accumulate on the oil surface.

A gas transfer pipe 16 extends from the top of the head 4 and into the top of the tank 1, so that the separated gas will be returned to the oil and will mingle with the outgoing clean oil, for the purpose of maintaining the original gravity of the oil.

In operation, the cone bottom 2 is filled with water, preferably as produced by the well, and this water covers the perforated spreader rings 10. This water is maintained at a temperature to suit the characteristics of the oil which is being treated. The oil from the well which enters through the pipe 5 is expanded and separated from the entrained gas within the head 4, and at approximately the flow line temperature. This feature is noteworthy, since the application of heat to the oil before the separation of the gas would increase the amount of wet gas given off, and thus tend to impoverish the oil and reduce its gravity.

The gas rises in the head 4 and passes through the pipe 16 into the top of the tank 1. The oil flows downwardly through the pipe 8, and into the balancing column 12. This oil is gradually heated by the coil 12, and also the velocity of the downwardly flowing oil is reduced because of the

baffle action of the coil 12. Upon reaching the perforated rings 10, the oil comes into contact with the heated wash water 17 in the cone 2. The temperature of the oil is increased causing rapid expansion, and the flow is divided into fine streams or globules, as it passes through the perforations in said rings.

In passing outwardly, the oil also contacts the heated coils 11. In dividing the oil into fine streams or globules, a larger surface of the oil is exposed to the scrubbing action of the perforations and the hot wash water. Quick expansion breaks the encasing film around the entrained sand particles and globules or water and releases them.

The flow dividing process and quick expansion are repeated in each of the rings 10, and the temperature continues to increase, since each succeeding superimposed ring is larger in diameter than the one below. The speed of flow of the oil is gradually reduced to assist the settling of sand and water. The oil passes upwardly in the tank 1, and finally passes out through the pipe 14, to the stock tanks.

The gradual increase of the heat, together with the reduction of the velocity of the fluid during its passage through the balancing column, and through the perforated spreader rings are of importance in the elimination of the sand and water.

The sand which has been separated from the oil, settles to the bottom of the cone 2, and the water separated from the oil, becomes part of the wash water. The accumulated water and sand is drawn off as required, through the pipe 15.

In actual operation, on one well, the original fluid from the well contained 4% of mud and sand and water passing through the segregator. This was reduced to 0.4%.

Having described my invention, I claim:

1. A sand, water and oil segregator comprising a tank, a balancing column within the tank extending longitudinally thereof and substantially central within the tank, said balancing column terminating above the bottom of the tank, oil intake means at the upper end of the balancing column, a plurality of superimposed perforated rings fixedly attached to the lower end of the column, said rings being of different diameters and the uppermost ring opening into the bottom of the balancing column, a heating coil surrounding each of the rings, a heating coil within the balancing column, said last named heating coil being connected to the first named coils, a drain at the lower end of the tank, and a clean oil outlet adjacent the upper end of the tank.

2. A sand, water and oil segregator comprising a tank, a balancing column within the tank and extending longitudinally thereof, intake means at the upper end of the balancing column, a plurality of superimposed perforated rings fixedly attached to the lower end of the balancing column, said perforated rings being positioned above the bottom of the tank, the perforations in said rings being arranged on the periphery of each of the rings, all of said rings being inter-connected, a heating coil surrounding each of the rings and arranged around the periphery of each of the rings, a heating coil within the balancing column, a drain at the lower end of the tank and a clean oil outlet adjacent the upper end of the tank.

CLAUD H. BILLS.