

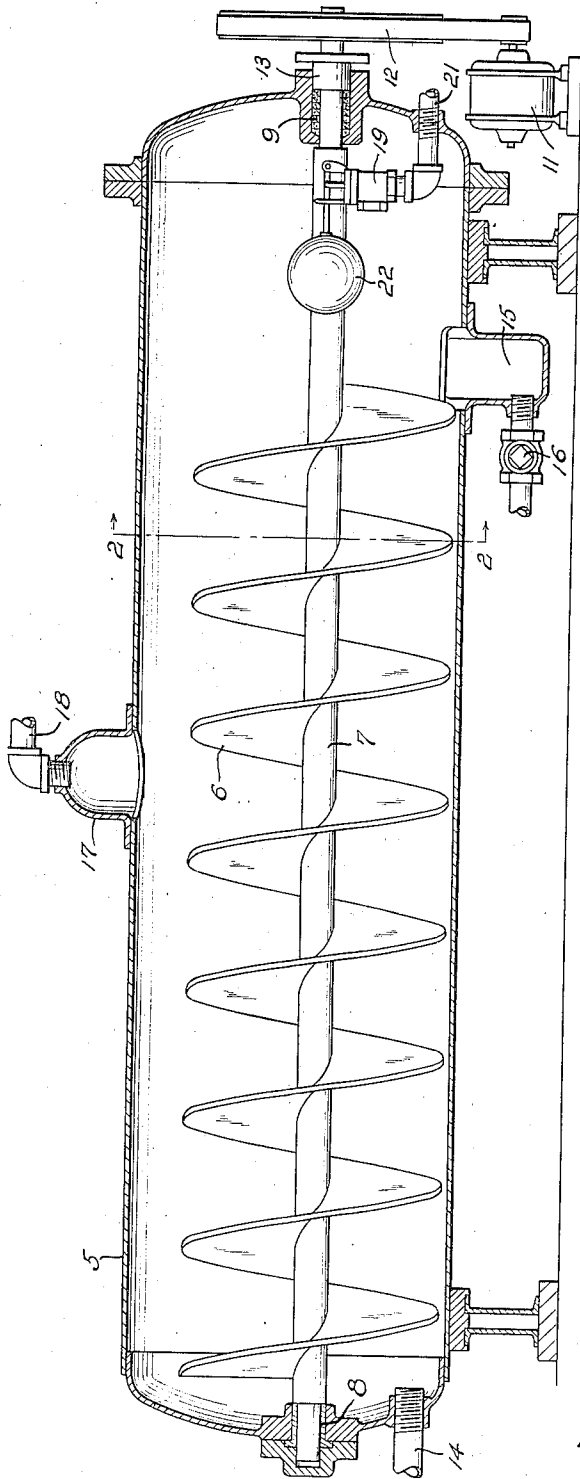
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W. I. BETTIS

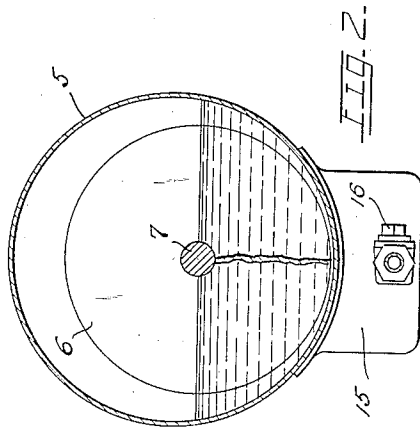
2,107,625

## GAS SEPARATOR

Filed Feb. 13, 1936



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FILED 2-

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## UNITED STATES PATENT OFFICE

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## GAS SEPARATOR

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## 1 Claim. (Cl. 183—2.7)

In this specification, and the accompanying drawing, I shall describe and show preferred embodiments of my invention, and specifically mention certain of the more important objects.

I do not limit myself to the exact forms disclosed however, since various changes and adaptations may be made therein without departing from the essence of the invention as hereinafter claimed.

My invention relates to mechanical means for separating gases, solids, and liquids of higher gravity, from liquid mixtures in which such substances are held in suspension or solution. It will be found to be especially useful in the oil industries. Among its principal objects are; first, to provide an improved continuous method for effectively eliminating impurities of the stated kinds from liquids, by mechanical means, either with or without the use of heat; second, to furnish facilities for separation of gases from liquids concurrently with separation of solids and liquid impurities; third, to supply apparatus for accomplishing the above purposes without waste of useful substances; and, fourth, to accomplish the aforesaid objects by means of simple, efficient and relatively inexpensive apparatus.

My objects are accomplished in the manner illustrated in the accompanying drawing, in which—

Figure 1 is an elevation of a preferred embodiment of my invention, in central longitudinal section, and

Figure 2 is a cross section of the above construction, taken on the line 2—2 of Fig. 1.

Similar reference numerals refer to similar parts throughout both views.

In the separation of gases from liquids, particularly when the liquids are viscous, certain physical phenomena control in marked degree. Heating the liquid may hasten the process, but it does not change the character of the factors involved. The speed of liberation of gas from a liquid in which it is contained, at any particular temperature, depends upon; the area of the liberating surface; the depth of fluid below said surface; and the viscosity of the liquid.

Obviously when gas is held in suspension or solution a considerable distance from the liberating surface, time will be required for the gas particles to move to that surface, depending upon the viscosity of the liquid. Moreover, after the gas particles have arrived at the liberating surface, the surface tension of the liquid will continue to hold them for a time. Eventually the surface tension will be overcome, and the gas will break through the surface and become free.

My invention is based upon, and fully utilizes, the principles just discussed. In the preferred form that has been selected for illustration, I employ a horizontal cylindrical shell 5, constructed to resist whatever pressure it may be called upon to withstand. Within the shell there is a screw-type conveyor, comprising a helical fin 6, that is wound with a substantial pitch upon a shaft 7. This shaft is below the center line of shell 5, and the outer diameter of the helical fin is made such that there is only a slight clearance between it and the bottom of the shell. Shaft 7, is supported by an internal bearing 8 at one end of the shell; and extends through a stuffing box 9, that also serves as a bearing, at the other end of the shell. The shaft is adapted for rotation at a low speed, by means of a motor 11 and reduction drive 12. The construction illustrated indicates means for inspecting or replacing bearing bushings, at each end of the device, in a manner that will be apparent to those familiar with such constructions, it being remembered that the bearing at the stuffing box end comprises the packing itself as well as the lining of gland 13.

In the illustrated construction, the screw conveyor is right-handed, and, intended to be operated in a clock-wise direction when viewed from the driven end. It thus tends to move the contents of the shell from left to right.

The incoming liquid to be treated, which in the case of some oil wells may be a mixture of oil, gas, water and sand, enters through the inlet pipe 14. The contained sand and water will settle, remain close to the bottom of the shell, and be gradually moved along toward the right by the conveyor, until they are finally dropped into sump 15 at the right-hand end of the shell. A blow-off cock 16 provides means for emptying the sump, from time to time.

A central upwardly extending dome 17 collects separated gas, and delivers the same to a gas outlet pipe 18.

At the right-hand end of the shell there is an internal float valve 19, communicating with discharge pipe 21, by which purified and de-gasified liquid is delivered from the device. The float valve maintains the level of the liquid within the shell at approximately the center line of shaft 7, as indicated in Fig. 2. When there is a tendency for the liquid level to rise above this point, the float 22 rises, and allows discharge through valve 19, to reduce the liquid level to normal.

As stated above, the screw conveyor operates at a low speed, so as not to agitate the liquid in

shell 5, and so as to provide time for liberating gases from the wetted surfaces exposed on the upper portions of helical fin 6. The gas liberating capacity comprises not only the normal surface of the liquid in the shell, but also the combined surfaces of both sides of the upper portions of helical fin 6. These upper portions constantly have a thin film of gas containing liquid adhering thereto, and this film is being constantly renewed as the helical fin revolves.

Obviously only a trifling amount of power will be required to rotate the screw conveyor; and the device will need practically no attention in operation, since all working parts are lubricated by the liquid in the shell.

I particularly desire to emphasize that, in my device; the normal area of gas-liberating surface is enormously increased by the use of the two side areas of the revolving fin for this purpose; the film of gas-containing liquid on the fin is very thin, and, consequently, gas liberation therefrom is proportionally rapid; and the time required for liberating the gas from the exposed wetted surface of the fin may be made equal to the time of exposure, by varying the speed of

revolution of the film according to the viscosity of the liquid that is being treated.

Having thus fully described my invention, I claim:

A gas separator comprising; a closed horizontal cylindrical container of which the upper portion affords a unitary gas chamber; a rotatable shaft extending into the container parallel to, and directly below, the axis thereof; a continuous helical fin affixed to the shaft, within the container and extending nearly to the bottom thereof; means for passing gas-containing liquid into the container; and means for maintaining the liquid within the container at about the shaft level; said container having, a sump and outlet for heavy impurities at the bottom near one end, an outlet for purified liquid at an intermediate level near said end, and an outlet for gas at the top; said fin being adapted by rotation to move settled impurities along the bottom of the container into said sump; and the rotatable parts within the container being adapted to pass through said liquid without substantial agitation thereof.

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