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MEANS FOR SEPARATING GAS AND OIL IN WELLS

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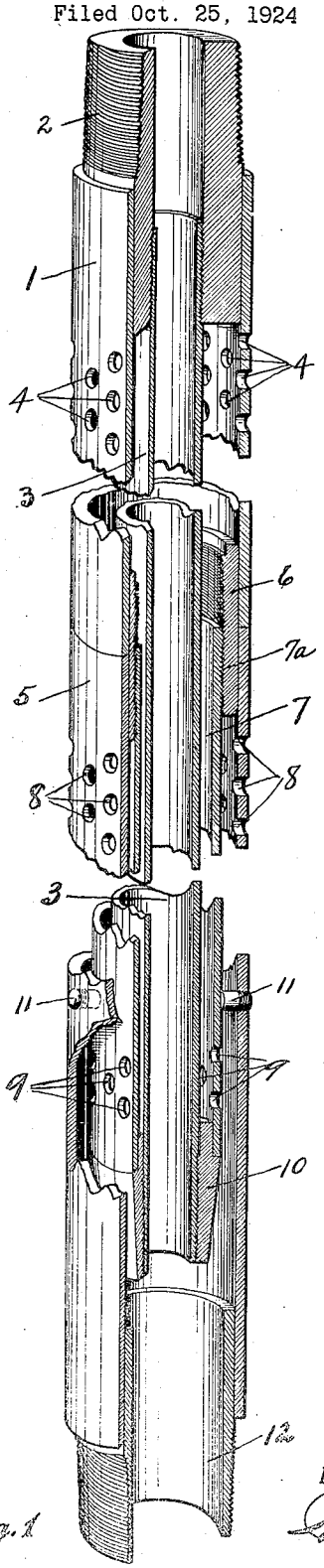


Fig. 1

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UNITED STATES PATENT OFFICE.

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MEANS FOR SEPARATING GAS AND OIL IN WELLS.

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Our invention refers more particularly to a new process for separating oil and gas under pressure in a well and to one which may be developed with two or more stages, each stage being of sufficient length to allow the oil to flow freely into the outer shell, and then dropping a distance, which is determined in each case by the specific gravity of the oil, the amount of gas and the oil flow, the oil dropping in the annular space between an outer pipe or casing and an inner pipe or casing, the inner pipe or casing being the suction pipe of the pump and the distance the oil drops before reaching the entrance or end of the inner pipe being sufficient to permit the gas to pass upwardly and the annular space between the outer and the inner pipes being less in area than the combined area of the openings through the outer pipe, near its upper end, and through which the oil and gas enter the outer pipe. The annular space between said outer and inner pipes is greater than the area of the suction pipe of the pump to which the device is to be attached. This permits the gas to pass upwardly and out of the device due to its lighter specific gravity, and at the same time allows the oil to pass downwardly into the device and to the end or entrance of the suction pipe. In other words, our process contemplates the inflow of the oil and gas mixture through an opening or openings in the upper end of an outer pipe or casing, which opening or openings have a greater combined area than the annular space between said outer pipe and an inner pipe, thus permitting room for the gas to rise and escape through said opening or openings while the mixture flows into said outer pipe and drops down to the lower end of or entrance into the inner pipe, which is the suction pipe of the pump. One stage, as that term is used, contemplates an outer pipe and an inner pipe, with the holes in the outer pipe near its upper end and the inlet at the lower end of the inner pipe. Two stages would include a second section of outer pipe, also having openings therein near its upper end, with an intermediate pipe, and the inner, or suction pipe. The inner or secondary shells or casings of the various stages of the device are connected together a short distance above the lower end of the inner or suction member, with an opening or openings therethrough greater in combined area than the area of the suction member. The action caused by the mixing of the oil at this point is a breaking up or separation of the oil and any gas that has been carried with the oil to this point, thus freeing the gas and allowing it to pass upwardly and out through the openings in the outer casing.

In order to fully explain our invention, we have illustrated the same on the accompanying single sheet of drawings, on which a two stage embodiment of our invention is shown.

The figure is a side elevation of a device embodying our invention, the parts being assembled and shown in longitudinal section.

Referring more in detail to the drawing, 1, designates the outer shell or casing, provided at its upper end with a steel bushing, 2, threaded to receive a coupling for connecting said outer shell or casing 1, to the pump line. Said bushing 2 is also threaded interiorly to receive the upper end of an inner pipe or casing, 3, referred to as the suction pipe. Said outer casing is provided near its upper end with a series of holes or openings, 4, the combined area of said openings, 4, being greater than the area of the annular space between the outer casing 1, and the inner casing 3.

For a second stage, a second section of outer casing, as 5, is connected to the lower end of the first section, 1, by means of an inner coupling 6, threaded internally and having the upper end of an intermediate pipe or casing 7, screwed thereinto, as at 7^a. Said second section of outer casing, 5, is also provided near its upper end, below said coupling 6, with a series of openings, 8, said openings being of a combined area greater than the annular space between the said outer casing and the inner casing 3, which is extended down through said second section of outer casing 5, and into said intermediate casing 7, substantially as shown. Said intermediate casing 7, is provided near its lower end with a series of openings, 9, and said intermediate pipe or casing, 7, and said inner, or suction casing 3, are connected with a steel cone, 10, threaded onto the end of the inner or suction pipe, 3, and fitting into the end of said intermediate pipe, substantially as shown. It will be understood that a section of each stage is broken out to reduce the size of the figure. The length of these sections are dependent upon several things, namely, the specific gravity of the oil, the amount of gas, and the oil flow, and

must be calculated in each case to give the desired results. As an example only, it may be stated that the upper section of outer casing is approximately eight feet in length, the openings, 4, therein, being in the upper twelve inches thereof, and the lower section of outer casing being sixteen feet, six inches.

The invention will be more clearly understood by a description of the operation thereof. The oil and gas mixture flows into the openings 4, the capacity of which is greater than the capacity of the annular space between the casings 1 and 3, thus permitting the mixture to drop and at the same time permitting the gas therein to escape and rise and pass out through said openings 4, inasmuch as they are not all required to supply full capacity to the annular space. The oil falls down into the intermediate pipe or casing 7, until it reaches the openings 9, in said intermediate pipe. Oil and gas mixture is also flowing into the second stage, or outer casing 5, through the openings 8, and falling down in said outer casing 5, the gas escaping and passing upwardly and out of said surplus openings, or surplus area, as before described. The oil in the intermediate pipe 3, and the oil in the outer casing or pipe 5, meets at the holes, 9, in said intermediate pipe, and this causes a breaking up or separating of any gas that has been carried down to this point with the oil, and this gas escapes and passes upwardly, as before described, because of its lighter specific gravity and can escape through the openings 8. As the oil reaches the end of the steel cone, 10, the suction from the pump through the inner, or suction pipe, 3, carries the oil out.

Centering studs or screws, as 11, are shown for centering and holding the intermediate pipe or casing 7. The outer pipe or casing 5, is also provided at its lower end with a nipple, 12, for such use as may be desired, or it can be omitted.

The heart of this invention it will be understood is the provision of means whereby the gas and oil mixture is admitted through an inlet in an upper level into a chamber in which it can drop or fall a distance to permit the gas to escape upwardly because of its lighter specific gravity and to escape through the same inlet because of its excess capacity compared with the space in which the oil falls, with means for applying suction at a lower level for carrying off the oil, and in calculating the distance the mixture is to fall and the relative sizes of the openings and suction areas, based on certain controlling things, such as the specific gravity of the oil in the well, the amount of gas, and the oil flow in the well.

We do not limit our invention to the details of construction and arrangement shown for the purpose of illustrating one embodiment of our invention, except as we may be limited by the hereto appended claims.

We claim:

1. Means for separating oil and gas in a well under pressure, said means including in combination, an outer casing, an inner suction pipe, an intermediate casing between said outer casing and said inner suction pipe, means closing the annular space between said outer casing and said inner suction pipe at the upper end thereof, said outer casing having inlet openings through its side near its upper end, said openings having an inlet area greater than the area of the annular space between said outer casing and said inner suction pipe, said intermediate casing being interposed between said outer casing and said suction pipe at a distance below their upper ends and being provided with means closing the annular space around its upper end and the outer casing, and said outer casing having inlet openings through its sides below said means and said intermediate casing being provided with inlet openings through its side near its lower end and a distance below the openings in said outer casing, said intermediate casing and said inner suction pipe being connected with means closing the annular space therebetween, said inner suction pipe being open at its lower end and below the openings in the intermediate casing, substantially as and for the purpose described.

2. Means for separating oil and gas under pressure in a well including a plurality of pipes or casings one within the other with annular spaces therebetween, means closing the annular spaces betwen the outer casing and the inner pipe at one level, means closing the annular space between the outer casing and an intermediate casing, said outer casing having inlet openings through its side immediately below said closing means, whereby oil entering said openings drops a distance within said outer casing, the openings through said outer casing being of greater combined area than the annular space within said outer casing, whereby to permit gas to rise from the falling oil and to escape through said openings, the oil falling into the intermediate casing passing out through the openings in the lower end thereof and mixing with the oil falling in the outer casing from the lower inlet openings therein, and means for applying suction to the inner suction pipe, substantially as and for the purpose described.

Signed at Los Angeles, Los Angeles County, California, this 18th day of Oct. 1924.

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