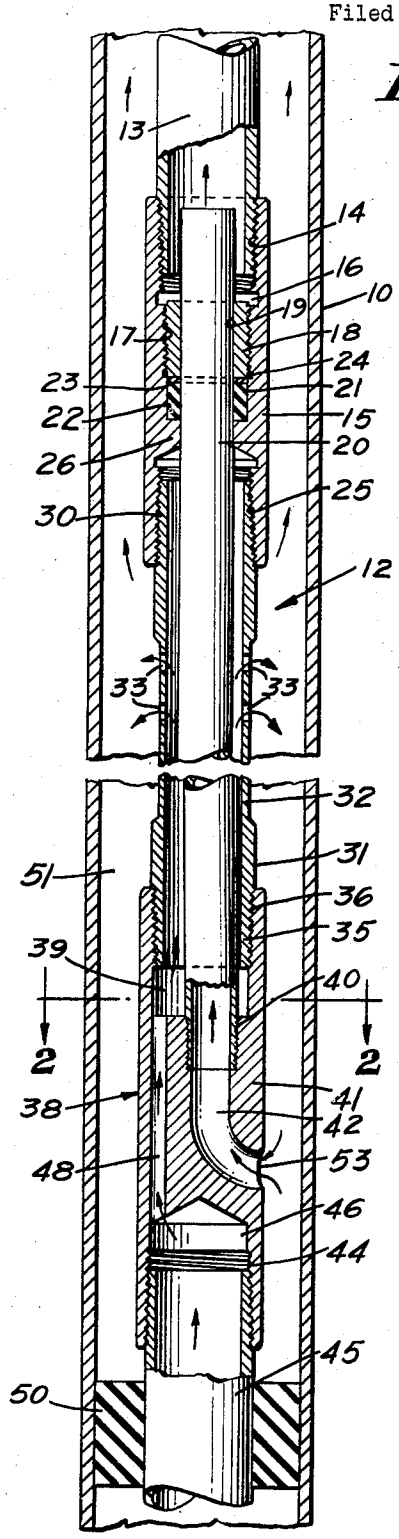
April 28, 1959 W. C. GIBSON 2,883,940

OIL AND GAS SEPARATOR

Filed April 22, 1957

Fig. 1.



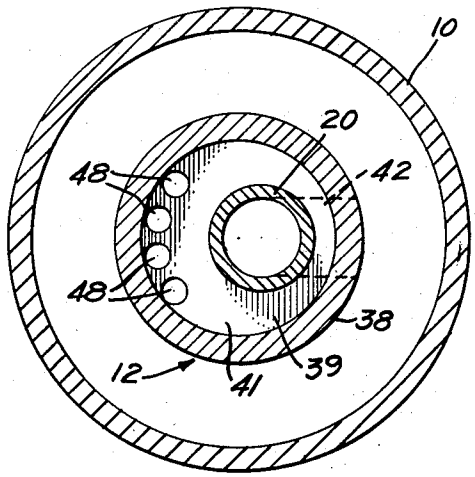


Fig. 2.

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OIL AND GAS SEPARATOR

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7 Claims. (Cl. 103—203)

This invention relates generally to oil well equipment and relates more particularly to separator means for separating the gas and oil in a well.

While the invention has particular utility in connection with the separating of gas and oil in an oil well, and is shown and described in such connection, it is to be understood that its utility is not confined thereto.

When both gas and oil must be handled by the pump of an oil well, the output is necessarily limited by the capacity of the pump. The valves of the pump constitute restrictions which limit the volume of fluid that may pass therethrough.

It is, therefore, an object of the present invention to provide a separator that is disposed within the well and below the pump which will separate the gas and oil so that the pump need only pump oil, the gas being forced out of the well by reason of the pressure of said gas within the well.

Another problem involved in gas and oil separators that may be located within the well is that heretofore separators of this character have had external pipes and projections which make it extremely difficult to remove the separator should certain parts of the well equipment become stuck for various well-known reasons and it is another object of the present invention to provide apparatus of the present character which may be readily removed under such conditions.

It is a further object of the invention to provide a separator of this character that has an entirely cylindrical exterior so that it may be removed with conventional removing tools.

A still further object of the invention is to provide apparatus of this character that is relatively simple in construction and effective in operation.

Another object of the invention is to provide apparatus of this character that is easy to install.

Still another object of the invention is to provide apparatus of this character that is relatively inexpensive to manufacture.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which show one arrangement. After considering this example, skilled persons will understand that variations may be made without departing from the principles disclosed, and any structures, arrangements or modes of operation that are properly within the scope of the appended claims are contemplated.

Referring to the drawings:

Fig. 1 is a longitudinal section through apparatus embodying the present invention; and

Fig. 2 is an enlarged sectional view taken on line 2—2 of Fig. 1.

Referring more particularly to the drawings, the oil casing is indicated at **10** and is of the usual well-known character. The oil and gas separating apparatus, indicated generally at **12**, is located within the casing **10**, said apparatus being supported within the casing by a pipe or

tubing **13**, the upper end of which is connected in the usual manner to the lower end of the pump.

The various parts of the apparatus **12** have a cylindrical exterior and all of said parts have an external diameter substantially smaller than the internal diameter of the casing **10**.

The lower end of the pipe **13** is externally threaded and is received in an internally threaded end portion **14** of a collar **15**. At the inner end of the portion **14**, there is an internal annular recess **16** from which there is an inwardly extending internally threaded portion **17** for reception of a packing gland **18** having a axial passage **19** therethrough in which is received the upper end portion of a pipe **20** having an external diameter smaller than the internal diameter of the pipe **13**. Inwardly of the threaded portion **17** of the collar, there is an annular recess **21** in which is disposed packing **22** of any suitable well-known character and between the packing **22** and the packing gland is a washer **23**. A seal **24** is disposed in an annular groove provided in the collar adjacent the inner end of the portion **17** to thereby provide a seal between said collar and the inner end of the packing gland.

The opposite or lower end of the collar **15** is provided with an internally threaded, inwardly extending axial recess **25**, the inner end of which is separated from the recess **21** by a partition **26** which has an axial opening therethrough for reception of the pipe **20**.

Recess **25** threadably receives the upper externally threaded end portion **30** of a connector tube **31** having an intermediate part **32** of reduced external diameter and having a plurality of perforations **33** therein, said perforations being spaced apart annularly and longitudinally.

The lower end of connector tube **31** has an externally threaded portion **35** threadably received in an internally threaded portion **36** of a recess which extends downwardly or inwardly from the upper end of a lower collar **38**. The inner end of the last mentioned recess is unthreaded and provides a chamber **39** in the bottom of which is a tapped recess **40** in which the lower threaded end portion of the pipe **20** is threadably received. The recess **40** is formed in a central portion **41** of the collar **38** and is offset to one side or eccentrically arranged with respect to the axis of the collar **38**. A passage **42** connects the inner or lower end of the recess **40** with the exterior of the collar **38** for a purpose to be hereinafter described. At the lower end of the lower collar **38** there is an upwardly or inwardly extending recess **44**, the outer end portion of which is internally threaded for reception of the upper externally threaded end portion of tubing **45** which depends from said lower collar **38**. At the upper end of recess **44** there is a chamber **46** which is connected with the chamber **39** by means of a plurality of annularly spaced longitudinally extending passages **48** in the central portion of the lower collar **38** and toward the side of said collar opposite the side toward which said recess **40** is offset.

Adjacent the lower end of the lower collar **38** there is a packer **50** of any suitable well-known character which is disposed about the pipe **45** and forms a seal between said pipe and the interior wall of the casing **10**. Packer **50** forms the bottom of an annular chamber **51** defined by the casing **10** and the collars **15** and **38** and connector tube **31**.

Gas and oil pass upwardly through the pipe **45** into the chamber **46** and thence to the chamber **39** by way of the passages **48** in the central portion of collar **38**. From the chamber **39** said gas and oil pass upwardly in the space between the exterior of the pipe **20** and the interior of the connector tube **31** and thence said oil and gas passes into the chamber **51** by way of the openings or perforations **33** in the connector tube. The gas, because of the pressure in the casing **10**, passes upwardly in the space

between said casing 10 and the pipe 13 and is taken from said casing 10 at the upper end thereof by well-known means. The oil which flows through the openings or perforations 33 flows downwardly in the chamber 51 to fill same above the outer end or opening 53 of the passage 42. This oil which has collected in the bottom of the chamber 51 is drawn upwardly through the passage 42 and pipe 20 and thence into the pipe 13 which is connected to the pump. Thus, when the pump is operating, the oil in said chamber 51 is pumped from the well and it will be apparent that with this arrangement, the pump has only oil to handle so that the effective capacity of the pump is greatly increased as the gas does not have to pass therethrough.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it is thought that it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing all of its material advantages, the embodiment herein before described being merely one arrangement.

I claim:

1. The combination in an oil well of a casing, a pump having an inlet and an outlet and a gas and oil separator disposed within the casing, said separator comprising a cylindrical upper collar connected with the inlet of said pump, said collar having a passage therethrough; a pipe removably disposed within said passage, said passage being enlarged at the outer ends; a packing disposed in one of the enlarged portions of said passage to form a seal between the collar and said pipe; a packing gland removably received in said enlarged portion of the passage in operable relationship with the packing for securing same; a connector tube about said pipe and having the upper end removably secured to the lower end of said collar, said connector tube having a larger inside diameter than the outside diameter of said pipe and having a plurality of perforations therein; a cylindrical lower collar having the upper end thereof removably secured to the lower end of the connector tube; means for removably securing the lower end of said pipe to said lower collar in offset relation to the axis of said collar, there being a passageway connecting the interior of said pipe with the exterior of said lower collar; tubing removably secured to the lower end of said lower collar and depending in said casing, said lower collar having a chamber adjacent the upper end thereof communicating with the space between said pipe and connector tube and there being a plurality of passages providing fluid communication between said tubing and said chamber, said passages being disposed at the side of said collar opposite the side toward which the lower end of said pipe is offset; and packer means between said tubing and casing, said packer means being located adjacent the lower end of said lower collar and forming a bottom wall for an annular chamber between the interior wall of the casing and the exterior of the upper and lower collars and the connector tube.

2. The combination in an oil well of a casing, a pump having an inlet and an outlet, and a gas and oil separator disposed within the casing, said separator comprising a cylindrical upper collar connected with the inlet of said pump, said collar having a passage therethrough; a pipe disposed within said passage, said passage being enlarged at the outer ends; a packing disposed in one of the enlarged portions of said passage to form a seal between the collar and said pipe; a packing gland in said one enlarged portion of the passage in operable relationship with the packing; a connector tube about said pipe and having the upper end secured to the lower end of said collar, said connector tube having a larger inside diameter than the outside diameter of said pipe and having a plurality of perforations therein; a cylindrical lower collar having the upper end thereof secured to the lower end of the connector tube; means for securing the lower end of said pipe to said lower collar, there being a passageway connecting the interior of said pipe with the exterior of said lower collar; tubing secured to the lower end of said lower collar and depending in said casing, said lower collar having a chamber adjacent the upper end thereof communicating with the space between said pipe and connector tube and there being a plurality of passages providing fluid communication between said tubing and said chamber; and packer means between said tubing and casing, said packer means being located adjacent the lower end of said lower collar and forming a bottom wall for an annular chamber extending upwardly within said casing.

3. Liquid and gas separating apparatus for installation in the casing of an oil well or the like having a pump with an inlet and an outlet, comprising: a cylindrical upper collar having a connection with the inlet of said pump; a pipe extending into said collar and having a discharge end adapted to deliver fluid to said connection with said pump; packing means sealing said pipe in said collar; a connector tube on said pipe, said tube having the upper end secured to said collar, said connector tube having a larger inside diameter than the outside diameter of said pipe and having a plurality of liquid and gas discharge openings therein; a cylindrical lower collar secured to the lower end of the connector tube; the lower end of said pipe being secured to said lower collar, there being a passageway in said lower collar connecting the interior of said pipe with the exterior of said lower collar; tubing of smaller outside diameter than the inside diameter of said casing, said tubing being secured to said lower collar and depending therefrom in said casing, said lower collar having a chamber communicating with the space between said pipe and connector tube and there being a plurality of passages in said lower collar providing fluid communication between said tubing and said chamber; and packer means defining a bottom wall for an upwardly extending chamber within the casing.

4. Oil and gas separating apparatus, comprising: a first cylindrical collar having internally threaded recesses in the end portions thereof separated by a wall having an opening therethrough, there being a packing recess in said collar and an internally threaded portion adjacent said recess for reception of a packing gland; packing in said packing recess; a packing gland threadably disposed in the packing gland recess; a connector tube having one end externally threaded and threaded into one of said end recesses of said collar, said connecting tube having a plurality of liquid and gas discharge openings therein; a second cylindrical collar having internally threaded recesses in end portions thereof, the opposite externally threaded end portion of said connector tube being threadably disposed in one of said recesses of the second collar, said second collar having a smaller, internally threaded recess offset toward one side thereof and opening toward the first collar; a pipe having one end externally threaded and received in the last mentioned recess, said pipe being of smaller outside diameter than the inside diameter of the connector tube and extending through said tube, through said opening in the first collar, through said packing and packing gland and having the adjacent end open beyond the packing gland, said second collar having a fluid connection between the exterior thereof and the inner end of said smaller recess in which the lower end of the pipe is threadably received, and also having a plurality of passages extending between the outer threaded recess of said second collar and the recess at the opposite end of said second collar; and means for defining a partitioned wall between the separator apparatus and well casing.

5. In liquid and gas separating apparatus, comprising: a first cylindrical collar having internally threaded recesses in the end portions thereof separated by a wall having an opening therethrough, there being a packing recess in said collar and an internally threaded portion adjacent said recess for reception of a packing gland;

packing in said packing recess; a packing gland threadably disposed in the packing gland recess; a connector tube having one end externally threaded and threaded into one of said end recesses of said collar, said connecting tube having a plurality of liquid and gas discharge openings therein; a second cylindrical collar having internally threaded recesses in end portions thereof, the opposite externally threaded end portion of said connector tube being threadably disposed in one of said recesses of the second collar said second collar having a smaller, internally threaded recess and opening toward the first collar; and a pipe having one end externally threaded and received in the last mentioned recess, said pipe being of smaller outside diameter than the inside diameter of the connector tube and extending through said tube, the opening in the first mentioned collar, said packing and packing gland, and open at the adjacent end, said second collar having a fluid connection between the exterior thereof and the inner end of said smaller recess, and also having a plurality of passages extending between the outer threaded recess of said second collar and the recess at the opposite end of said second collar.

6. In liquid and gas separating apparatus: a first collar having internally threaded recesses in the end portions thereof separated by a wall having an opening therethrough; a connector tube having one end threaded into one of the end recesses of said collar, said connecting tube having a plurality of discharge openings therein; a second collar having internally threaded recesses in end portions thereof, the opposite externally threaded end portion of said connector tube being threadably disposed in one of said recesses of the second collar, said second collar having a smaller, internally threaded recess opening toward the first collar; a pipe having one end externally threaded and received in the last mentioned recess, said pipe being of smaller outside diameter than the inside diameter of the connector tube and extending through said tube and first collar; and sealing means for sealing said pipe in said first collar, said second collar having a fluid connection between the exterior thereof

and the inner end of said smaller recess and also having passage means extending between the outer threaded recess of said second collar and the recess at the opposite end of said second collar.

7. In liquid and gas separating apparatus: a first tubular member having internal recesses in the end portions thereof separated by a wall having an opening therethrough; a connector tube having one end secured in one of the end recesses of said tubular member, said connecting tube having a plurality of discharge openings therein; a second tubular member having internal recesses in end portions thereof, the opposite end portion of said connector tube being disposed in one of said recesses of said second tubular member, said second tubular member having a smaller internal recess opening toward the first tubular member; a pipe having one end received in the last mentioned recess and secured therein, said pipe being of smaller outside diameter than the inside diameter of the connector tube and extending through said tube and first tubular member; and sealing means for sealing said pipe in said first tubular member, said second tubular member having a fluid connection between the exterior thereof and the inner end of the smaller recess, and also having passage means extending between the outer recess of the second tubular member and the recess at the opposite end of said second tubular member.

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