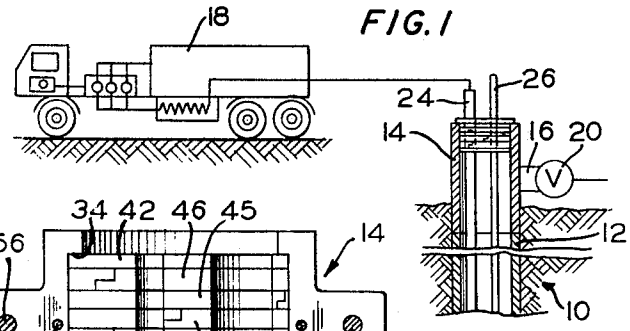
July 23, 1968 R. B. SEESE ET AL 3,393,740

WELL-PACKING HEAD

Filed Feb. 17, 1966

FIG. 1



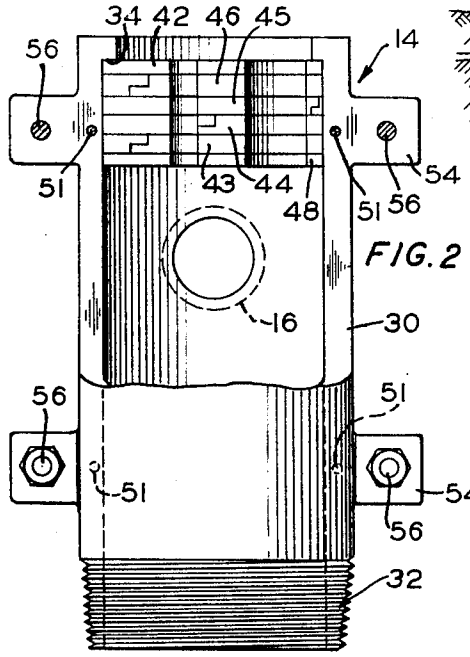


FIG. 2

FIG. 3

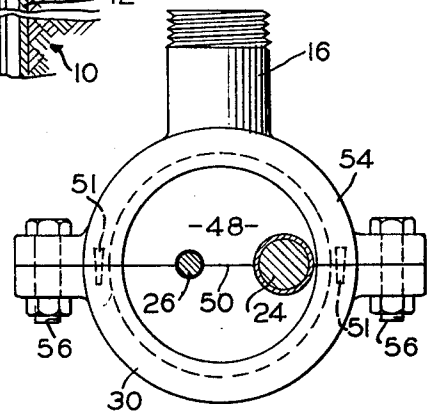
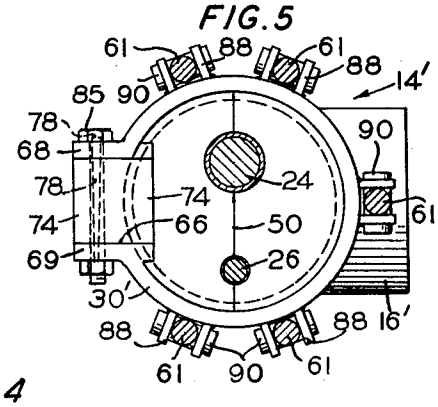


FIG. 5



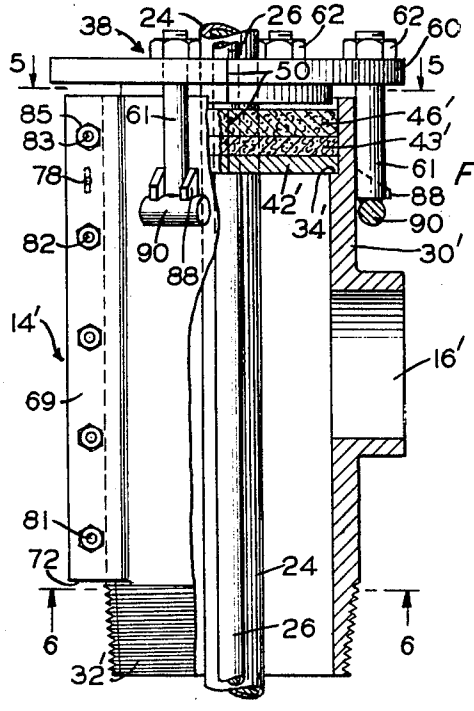
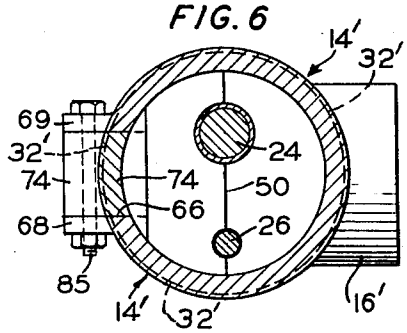


FIG. 4

FIG. 6



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3,393,740

WELL-PACKING HEAD

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17 Claims. (Cl. 166—84)

ABSTRACT OF THE DISCLOSURE

This invention relates to an improved casing head for a well. The improved casing head includes a cylindrical threaded portion for connecting it to the upper end of the well, a cover having an opening for a tubing string and a cable line, the cover being split to facilitate assembly and the cover also including packing means to prevent uncontrolled exhaust of gases from the well.

This invention relates to apparatus for removing solid material from an oil, gas or water well. This invention takes the form of an improved casing head which can be easily mounted on the upper end of a well. The head may be split so that it can be assembled around a tubing string and associated cable. The casing head has a cover which includes packing which is radially expandable to effect a gas tight seal with the head and the tubing string and cable.

It is an object of the invention to provide improved apparatus for controlling the release of gas pressure from a well where gas is supplied to the well under high pressure to enter into the interstices of sand or other matter that is causing a drilling or swabbing tool to stick in the well casing. When the gas pressure is suddenly released, this loosens the sand or other material by expansion of the gas and thus releases the tool or swab, as described in the Bryant patent application Ser. No. 449,219 filed Apr. 19, 1965.

With a well casing left open ended when the pressure is suddenly released, oil is sometimes sprayed over the surrounding area. Aside from the annoyance of this experience, it presents a fire hazard, and it has resulted in damage to the pumping and well equipment apparatus by fire.

Another object is to keep the top of the well casing closed during the release of gas pressure and to provide a controlled escape for the gas through a side outlet.

Still another object is to provide a packing head of the character indicated with provision for attaching it to the upper end of a standard well casing and with provisions for placing the head over existing cable and/or tubing strings that extend down into the casing.

Other objects, features and advantages will appear or be pointed out as the description proceeds.

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views;

FIGURE 1 is a diagrammatic view showing a well and casing with a well-packing head, made in accordance with this invention, connected to the top of the casing;

FIGURE 2 is a greatly enlarged side elevation, partly broken away and in section, showing the packing head of FIGURE 1 without the tubing string and the drilling or swabbing line;

FIGURE 3 is a top plan view of the apparatus shown in FIGURE 2 but with the packing head placed around the tubing string and the drilling or swabbing line as in FIGURE 1;

FIGURE 4 is a view similar to FIGURE 2 but showing a modified form of the invention and showing the tubing string and the drilling or swabbing line;

FIGURE 5 is a top plan view of the apparatus shown in FIGURE 4, but with the top plate removed; and

FIGURE 6 is a sectional view taken on the line 6—6 of FIGURE 4.

FIGURE 1 shows a well **10** having a casing **12** with a head **14** closing the top of the casing. The head **14** has a side outlet **16** through which gas is exhausted from the inside of the casing. Gas under high pressure is supplied to the well **10** from a gas supply unit **18** through tubing string **24**.

The escape of gas is prevented by a control valve **20**. The cross section of the side outlet **16** and the control valve **20** are sufficient so that when the control valve **20** is opened, the escape of gas from the well is very rapid and the expansion of gas which has entered the interstices of the sand or other solid material in the well expands to loosen any such material which has packed at locations to prevent free movement of a drilling or swabbing tool within the casing.

FIGURE 1 also shows diagrammatically a tubing string **24** and a drilling or swabbing line **26** which extend downward into the casing **12**. The head **14** is of such construction that it can be placed around the drilling or swabbing line **26**, and the construction for obtaining this result will be explained in connection with the larger scale views.

FIGURE 2 shows the head **14** which includes a generally cylindrical portion **30** with threads **32** on the outside of its lower end for threading into the top section of the well casing. The side outlet **16** is preferably located about midway between the upper and lower ends of the cylindrical portion **30**.

At the upper end of the cylindrical portion **30** there is a rim providing a shoulder **34** inside the head **14** and this shoulder provides an abutment surface for holding a top plate **42** in the head. Under this top plate **42** there are a plurality of packing seals **43**, **44**, **45** and **46** in the head. Below the packing seals there is a bottom plate **48** which fits into the cylindrical portion **30** and the seals **43–46** between the plates **42** and **48** to serve as a stuffing box around the tubing string **24** and the drilling or swabbing line **26** to prevent escape of gas through the upper end of the head **14**.

In order to construct the head **14** so that it can be placed in the top of the well casing and around the drilling or swabbing line without disturbing them, the head **14** is made in two parts which divide along a plane **50** (FIGURE 3) which coincides with the diameters of the tubing string **24** and the drilling or swabbing line **26**. In order to obtain proper alignment of the two sections of the head **14**, there are tapered pins **51** projecting from one section and which fit into complementary openings in the other section.

Not only the cylindrical portion **30** is so divided but also the top plate **42** and the lower plate **48**. The packing seals **42–46** are constructed so that they can be placed around the tubing and drilling or swabbing lines and in contact with the inside surface of the cylindrical portion **30** of the head and this can be done in various ways depending upon the type of packing seals that are used. In FIGURE 2 the packing seals **43–46** are made with split portions at different locations and by having a plurality of packing seals at different locations lengthwise of the head **14**, the splits or discontinuities in the packing seals come at different places so that there is no location where there is not a solid section of packing at one place or another along the assembly packing seals **43–46**.

After assembly of the various parts of the head **14** around the tubing and cable strings, the assembled parts are held together by clamps **54** which fit tightly around

the upper and lower parts of the head **14**. The clamps **54** are shown provided with a fastening in the form of clamping bolts **56**.

FIGURE 4 shows a modified construction for the head. In this modified construction a head **14'** is provided with an outlet **16'** and has threads **32'** at its lower end. The head has a cylindrical portion **30'** with a shoulder **34'**.

A cover generally shown at **38** includes a lower plate **42'** that rests on the shoulder **34'**, and an upper plate **60** which serves as a stuffing box gland. Packing seals, for example, **43'** and **46'**, are clamped between the lower plate **42'** and the upper plate **60** and this upper plate **60** is attached to the head **14'** by bolts **61** which extend through openings in the top plate **60**. There are nuts **62** threaded on the upper ends of the bolts **61** for clamping the top plate **60** tightly against the packing seals **43'** and **46'** to control the pressure of the packing seals against the inside of the cylindrical portion **30'** and against the tubing string **24** and the drilling or swabbing line **26**.

The lower plate **42'** and the top plate **60** are made in two parts with a split along a plane **50** in order to fit around the tubing string and the drilling or swabbing line as in the case of the construction described in FIGURE 2; but the cylindrical portion **30'** is of different construction and has a longitudinal slot **66** (see FIGURE 5) extending for the full height of the cylindrical portion **30'**. This slot **66** is wide enough to pass the drilling or swabbing line **26**, and will now be described in more detail.

The side wall of the cylindrical portion **30'**, on both sides of the slot **66**, is constructed with a radially extending flange. The flange on the lefthand side of the slot **66** is indicated by the reference character **68** and the flange on the righthand side of the slot **66** is indicated by the reference character **69**. These flanges extend from the top of the cylindrical portion **30'** to a location **72** which is somewhat above the threads **32'**. Below the location **72** the cylindrical portion **30'** does not have flanges on opposite sides of the slot **66** since these would interfere with the continuity of the threads **32'**.

A filler **74** fits into the slot **66** throughout the entire length of the slot and closes the slot after the head **14'** has been placed around the drilling and swabbing line **26** and around the tubing string if the latter is also an obstruction. This filler **74** extends out for the full radial extent of the flanges **68** and **69** along the part of the head where there are flanges **68** and **69**, but not below the location **72**. The filler **75** below the location **72** is flush with the circumference of the cylindrical portion **30'** and is threaded in the same way as the rest of the cylindrical portion for screwing it to the upper end of a well casing.

In order to insure alignment of the threads **32'** on the filler **66** and on the other portions of the head **14'** at opposite sides of the slot **66**, there is a tapered pin **78** which fits into complementary openings through the flange **68**, filler **74** and flange **69** so as to always bring these parts into the same longitudinal alignment with one another.

This also aligns openings **81**, **82**, and **83** which extend through the flanges **68** and **69** and through the filler **74** for receiving bolts **85** which clamp the flanges **68** and **69** against the opposite sides of the filler **74** after the parts have been brought into alignment by the pin **78**.

The connection of the bolts **61** to the outside of the cylindrical portion **30'** is by means of lugs **88** welded to the sides of the head **14'** and by cross pieces **90** welded to the bolts **61** below the lugs **88**. This provides a secure connection between the bolts **61** and the outside of the head **14'** and eliminates possibility of the bolts becoming lost since they are permanently attached to the head; but other expedients can be used for holding the bolts **61** such as a conventional flange around the outside of the head, but with the same slot **66** as in the cylindrical portion **30**.

The preferred embodiments of the invention have been illustrated and described, but changes and modifications can be made and some features can be used in different combinations without departing from the invention as defined in the claims.

We claim:

1. A casing packing head including, a cylindrical threaded portion for connection to the upper end of a casing of a well, a cover having an opening for a tubing string that extends down into the casing from above the head, the cover being formed in two parts and having its line of division across said opening whereby the cover can be assembled over the tubing string, means for holding the parts of the cover tightly together, and the cover also including packing means, said packing means comprising a plurality of split packing seals arranged substantially coaxially in said head and effecting a gas tight seal with the side walls of said head to prevent the escape of gas from said well.

2. The casing packing head described in claim **1**, said cover having a second opening on the line of division for a cable line.

3. The casing packing head described in claim **2**, the cylindrical portion of the head extending to the top of the head and the cover extending into the upper end of the cylindrical portion of the head, and a branch outlet in one side of the head above the casing coupling and below the cover for the release of gas from the annular space within the well.

4. The casing packing head described in claim **3**, the packing means being between the part of the cover that extends into the upper end of the head and a confronting area of the inside surface of the cylindrical portion of the head.

5. A casing packing head including a cylindrical threaded portion for connection to the upper end of a casing of a well, a cover having an opening for a tubing string that extends down into the casing from above head, the cover being formed in two parts and having its line of division across said opening whereby the cover can be assembed over the tubing string, means for holding the parts of the cover tightly together, and the cover also including packing means in position to prevent gas under pressure in the well from escaping between the cylindrical portion of the head and the cover, said cover having a second opening on the line of division for a cable, the cylindrical portion of the head extending to the top of the head and the cover extending into the upper end of the cylindrical portion of the head, and a branch outlet in one side of the head for the release of gas from the annular space within the well, the packing means being between the part of the cover that extends into the upper end of the head and a confronting area of the inside surface of the cylindrical portion of the head, said packing means including a plurality of split seal means, the seal means immediately adjacent said cover having solid portions extending across the line of division of the cover.

6. The casing packing head described in claim **5**, said packing seal means also sealing between the cover and the tubing string and cable.

7. A casing packing head including a cylindrical threaded portion for connection to the upper end of a casing of a well, a cover having an opening for a tubing string that extends down into the casing from above the head, the cover being formed in two parts and having its line of division across said opening whereby the cover can be assembled over the tubing string, means for holding the parts of the cover tightly together, and the cover also including packing means in position to prevent gas under pressure in the well from escaping between the cylindrical portion of the head and the cover, said cover having a second opening on the line of division for a cable, said cover including a stuffing box gland plate, and a lower

plate which seats on an abutment surface within the cylindrical portion of the head, the gland plate clamping the packing means against the lower plate.

8. The casing packing head described in claim 7, said planed plate having a portion that extends across the top of the head radially beyond a portion of the head located below the plate, and fastening means around said portion of the head located below the plate and at angularly spaced locations around the head for holding the plate on the head, said fastening means being adjustable to change the pressure on the packing means.

9. The casing packing head described in claim 8, said fastening means being a circle of bolts with the bolts connected to the outside of the head by welding and with threaded upper ends of the bolts extending above the top of the head and through and beyond openings through the plate.

10. A casing packing head including a cylindrical threaded portion for connection to the upper end of a casing of a well, a cover having an opening for a tubing string that extends down into the casing from above the head, the cover being formed in two parts and having its line of division across said opening whereby the cover can be assembled over the tubing string, means for holding the parts of the cover tightly together, and the cover also including packing means in position to prevent gas under pressure in the well from escaping between the cylindrical portion of the head and the cover, said cover having a second opening on the line of division for a cable, said head having a longitudinal slot extending for the full length thereof and wide enough to pass over a tubing string and a cable with which the head is intended to be used, and means for closing the slot after the head and cover are placed around the tubing string and cable.

11. The casing packing head described in claim 10, further including means for aligning the opposite sides of the slot to close the slot with the opposite sides in a predetermined relation to one another.

12. The casing packing head described in claim 11, the lower end of the head being threaded for screwing into a well casing, and the aligning means being in position to align threads on opposite sides of the slot.

13. The casing packing head described in claim 10, further including a filler piece that fills the slot, radially extending flanges along opposite longitudinal edges of the slot, and fastenings that extend through the flanges and filler to hold the filler in the slot.

14. The casing packing head described in claim 13, further including a tapered pin that extends through openings in the flanges and filler to align the fastening openings.

15. The casing packing head described in claim 14, further including threads on the lower portion of the head for connecting the head with a well casing, the threads extending across the filler, and said filler, at the threaded portion of the head, having its outside surface flush with the adjacent outside surface of the head on both sides of the slot.

16. The casing packing head described in claim 2, the cable line being for swabbing.

17. The casing packing head described in claim 2, the cable line being for drilling.

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