

March 19, 1940.

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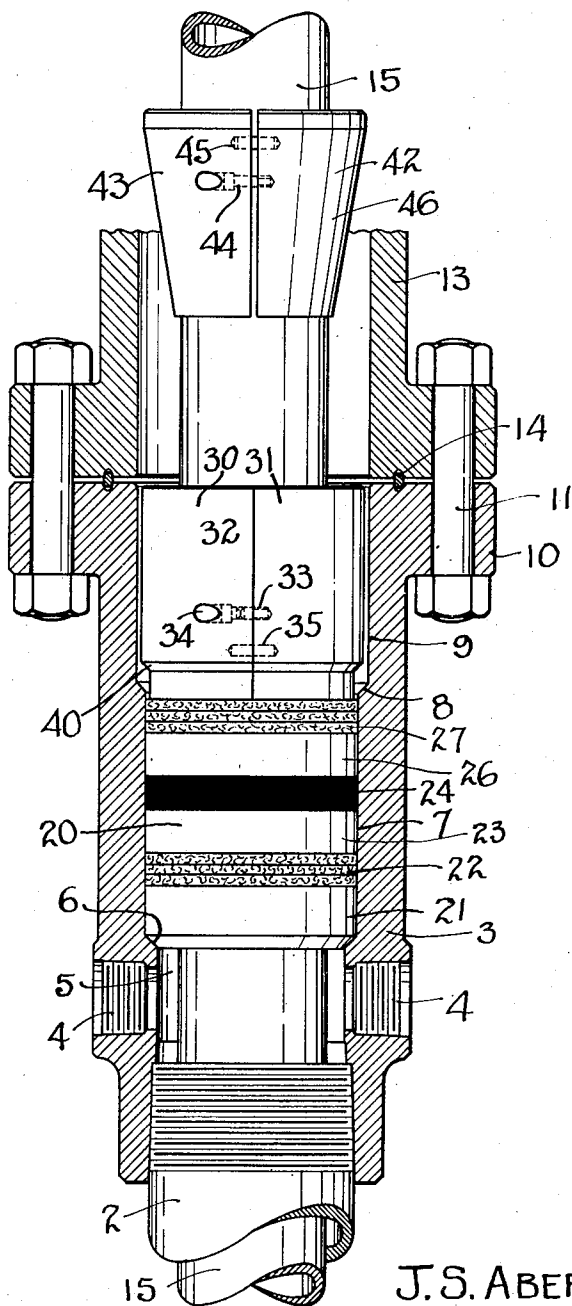
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BRADEN HEAD AND PIPE HANGER

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FIG. 1



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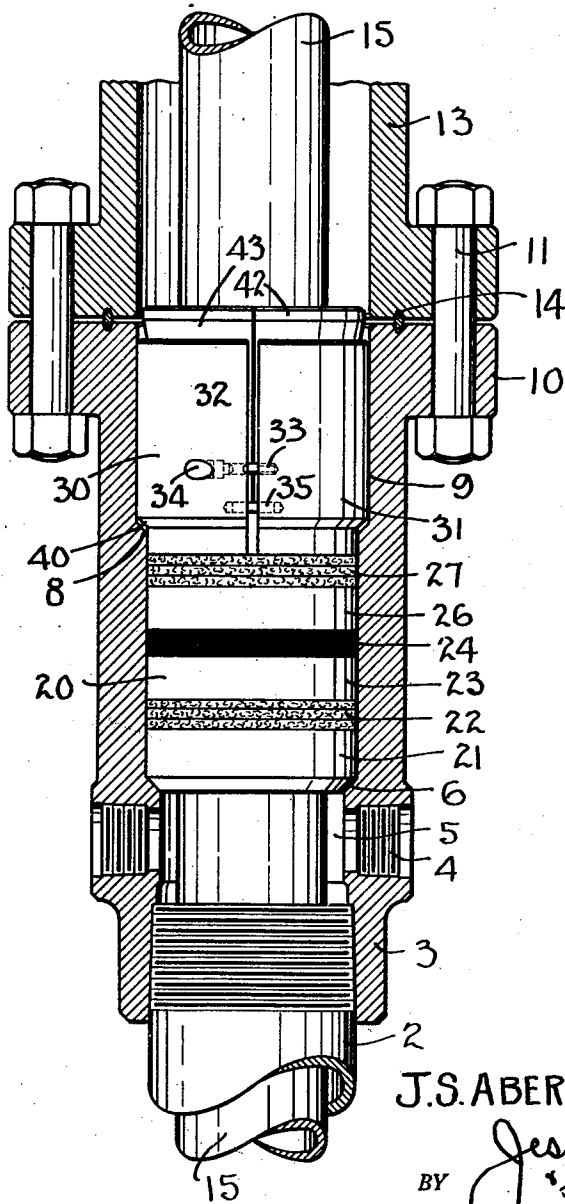
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Fig. 2.



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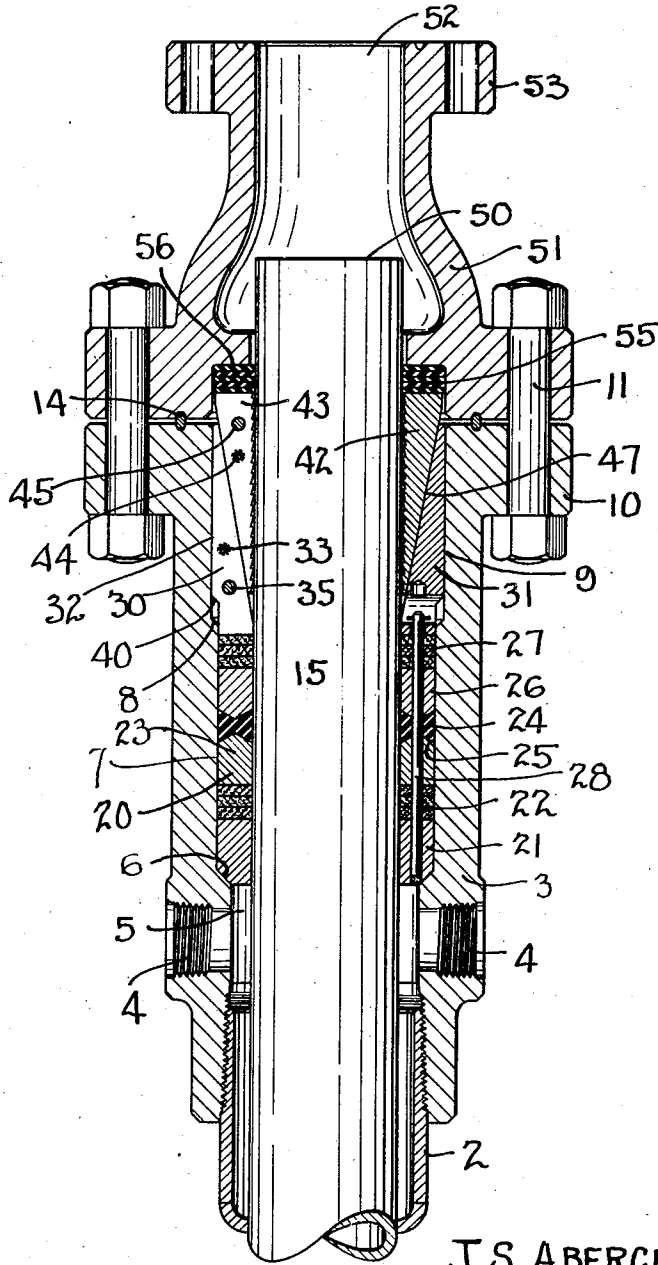
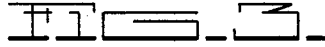
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UNITED STATES PATENT OFFICE

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BRADEN HEAD AND PIPE HANGER

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9 Claims. (Cl. 166—14)

The invention relates to an improvement in combination Braden head and pipe hanger device for well heads wherein a string of pipe is to be suspended in the well bore in the Braden head after the Braden head has been positioned on the well.

It is one of the objects of the invention to provide a casing or Braden head in combination with a pipe hanger wherein the pipe may be arranged to be suspended at a desired elevation and sealed in position in the casing head without having to cut and thread the string of pipe in order to support it by a tubing hanger.

Another object of the invention is to provide a tubing hanger for well heads which may be expanded and moved into sealing position upon application of the weight of the string of tubing.

Another object of the invention is to provide a tubing hanger wherein the tubing is hung by clamping a set of slips about the tubing, which slips will be received in a tubing hanger to expand and hold the hanger in sealing position.

Another object of the invention is to provide a pipe hanger which may be dropped through the well head fitting on to its seat and thereafter expanded by the weight of the string of tubing supported thereon to form a seal with the casing head.

Another object of the invention is to provide a tubing hanger which will expand to provide a seal when a predetermined load is placed thereon.

Still another object of the invention is to provide a tubing hanger which may be connected to the pipe to hang it at any desired elevation and which may be thereafter clamped in position.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a vertical sectional view with the packing assembly and tubing hanger in position in the casing head and with the tubing and slips about to be lowered into position to set the hanger.

Fig. 2 is a vertical sectional view similar to Fig. 1 but with the pipe and slips supported in the tubing hanger which has been set in sealing position.

Fig. 3 is a vertical sectional view with a bonnet clamping the several parts in secured position to support and lock the tubing in place.

In Fig. 1 the well casing is indicated generally at 2 and this casing is surmounted by the casing or Braden head 3 which may have the flow

openings 4 therein if desired. This head 3 has a passage 5 therethrough and it is through this passage that the drilling and other operations have been performed. This internal passage is provided with a shoulder 6 and a cylindrical area 7 above which merges with a second shoulder and seat 8, which in turn extends upwardly to provide a second cylindrical area or seat 9. A flange 10 carries the bolts 11 by which the blow-out preventer or other well head fitting 13 is connected to the casing head. A seal ring 14 may fit into cooperating grooves in the casing head and fitting 13. The parts just described are those on a well during the drilling operations.

When the drilling operation is completed or the well is to be produced a string of pipe or tubing 15 is lowered into the well bore. The well bottom assembly is usually carried by this string of tubing and after the well has been washed and is ready to produce, this string of tubing 15 must be set at the desired elevation. It is often impossible to determine the exact elevation at which this tubing is to be suspended in the well bore and it is only after the well is ready to produce that the exact elevation is known. Often during the washing operation this string of tubing is raised and lowered and when the packer on the well bottom assembly is set it is not unusual to use this string of tubing 15 as the setting string. This is generally known in the fields as a tubing setting of the well. When the elevation has been determined, it is then necessary to so arrange the packing head 3 at this elevation.

The practices now prevalent in the field are to raise the tubing 15 after the desired elevation has been determined and cut off the pipe at that elevation, thread the end thereof and then thread a suitable tubing hanger on to this upper end so that the hanger may be suspended in the casing head 3. Such operations as cutting and threading the piece of pipe are objectionable, first because after the well has been washed and the packer on the well bottom set the static head of the column of liquid in the well may not create a sufficient back pressure on the formation to prevent a blowout because the heavy drilling mud has been replaced by water. The period when the tubing is being set or hung is therefore the most dangerous period in completing a well. The saving of a few minutes time at this period is very essential so with this in mind the assembly shown in the draw-

ings has been devised and includes a sealing unit 20 which is shown in section in Fig. 3 as being made up of a bottom ring 21, a set of packing rings 22 thereon, and expander ring 23 mounted on the packing 22.

A seal ring of resilient material mounted on the expander ring 23 and shaped with a cooperating face to cooperate with the apex 25 on the expander ring. A hold-down ring 26 surmounts the seal ring 24 and a second set of packer rings 27 are in turn mounted upon the hold-down ring 26. If desired through rods 28 may hold these parts in assembled position. All of the rings 21, 22, 23, 24, 26 and 27 are split so that they may be passed around the pipe 15 and assembled as shown. The split portions of each ring will be staggered with respect to the next adjacent ring so that a seal will be provided with the cylindrical surface 7 of the casing head 3.

When this packing unit has been assembled about the pipe 15 it can be slipped downwardly along the pipe through the well head fitting 13 and into the cylindrical area 7 of the casing head. A clamping unit will next be assembled about the pipe 15 and dropped into position in the casing head. This unit is shown in elevation in Figs. 1 and 2 and is made up of the two half sections 30 and 31. These sections have cylindrical outer surfaces 32 which are arranged to fit the cylindrical bore 9 of the casing head 3. When they are assembled about the pipe 15, however, they will be drawn together by a pull-up screw or bolt 33, one of which is provided on each side between the two halves 30 and 31. These bolts are inserted through the lateral holes 34 and the parts will be guided in their movement by the dowel pins 35 which interfit in suitable openings in each of the halves. When the pull-up screw 33 is fixed in place this clamping unit will be of less diameter than the bore 9 so that it may be dropped through the well head fitting 13 into the casing head 3 and will lean upon the top packing ring 27. The packing unit 20 will normally be of such proportion that the shoulder 40 on the clamping unit will be spaced above the shoulder 8 in the casing head. The parts will then be in the position shown in Fig. 1.

The pipe 15 is now raised and a set of slips 42 comprising two or more individual jaws 43 will be clamped about the pipe by means of through bolts or screws 44 which are similar to the screws 33. Dowel pins 45 will guide the movement of the parts. These slips will be clamped about the pipe in this manner. The pipe may now be lowered through the fitting 13 so that the tapered periphery 46 of the slips will fit into the tapered bowl 47 in the inside of the clamping unit. When the weight of the tubing is transmitted through the slips to this bowl 47, there will be a lateral thrust which is only resisted by the bolts or screws 33 because, as noted in Fig. 1, this clamping unit does not fit snugly within the cylindrical area 9. It is intended that the weight of the tubing will shear the screws or bolts 33 so that the halves 30 and 31 may move laterally to engage the bore 9. The weight of the tubing will also cause a downward movement of the clamping unit to compress the packing unit 20 so that the seal ring 24 thereof will be expanded to form a seal with the bore 7. In this manner the pipe 15 will be supported at the desired elevation. The packing unit will be compressed to form a seal and the clamping unit will securely hold this seal in position, due to the weight of the string of tubing and also due to the frictional contact of the sur-

face 32 with the bore 9. The well head fitting 13 and other devices above the casing head 3 may now be removed. The pipe is securely anchored and if the upper end thereof is not at the desired elevation, the pipe may be readily cut off so that the upper end 50 will extend slightly above the casing head 3. A bonnet or other fitting 51 may now be attached to the flange 10 by the bolts 11 and it is usual to have this bonnet 51 in the form of a swagged nipple which reduces the size of the well bore to a smaller passage 52 and consequently a smaller flange 53 on the upper end of the nipple so that the permanent valves and Christmas tree fittings may be of a smaller size and less expensive than the larger drilling fitting such as 13 which had previously been upon the well head.

The lower face of the bonnet 51 is recessed at 55 to receive a set of packing or sealing rings 56 which may be deposited on the upper surface of the slip jaws 42 and 43. When the bonnet 51 is clamped in position by the bolts 11, this pressure will force the tubing downwardly a slight amount to further expand the clamping unit and compress the packing unit. The shoulder 4 abutting against the shoulder 8, however, limits the downward movement of the pipe and the clamping unit so that an excessive pressure may not be applied to the packing unit. The shoulders 8 and 40 may come into engagement where there is a long heavy string of tubing, such as 15, supported upon the construction.

Broadly the invention contemplates a casing head and tubing hanger assembly which can be readily applied to the tubing to suspend it at the desired elevation and to seal and clamp it in position.

What is claimed is:

1. A combination casing and tubing head including a body, spaced shoulders in said body, a packing unit disposed on the lower shoulder, a clamping unit disposed on said first unit and above the upper of said shoulders, a bowl in said clamping unit, frangible members holding said clamping unit together, a tubing extending through said head, and means to be affixed to said tubing and to be lowered thereby into said bowl, and additional means to force said first means into said bowl to compress said clamping unit against said packing unit and to break said members and effect expansion of said clamping unit against said head.

2. A well head including a body, a packing unit supported therein, a tubing extending through said head, a clamping unit assembled about said tubing and movable into said head to seat on said packing unit, and means affixed to said tubing to move against said clamping unit to utilize the weight of the tubing to compress said packing unit and to then expand said clamping unit into frictional engagement with said head.

3. A well head including a body, a packing unit supported therein, a tubing extending through said head, a clamping unit assembled about said tubing and movable into said head to seat on said packing unit, and means affixed to said tubing to move against said clamping unit to utilize the weight of the tubing to compress said packing unit, and means on said unit to release under such pressure to expand said clamping unit into frictional engagement with said head whereby the fittings above said head may be removed.

4. A well head including a body, a packing unit supported therein, a tubing extending through said head, a clamping unit assembled about said tubing and movable into said head to seat on

said packing unit, and means affixed to said tubing to move against said clamping unit to utilize the weight of the tubing to compress said packing unit and to expand said clamping unit into frictional engagement with said head, and additional means to be affixed on said head to anchor said first means and tubing in position.

5 A well tubing, a set of slips affixed thereon, a sectional unit to receive said slips, a well head to receive said unit, and fragile means holding the sections of said unit together but adapted to be sheared by the weight of the tubing applied by said slips so that said unit will expand radially in said well head.

10 6. A well tubing, a set of slips affixed thereon, a sectional unit to receive said slips, a well head to receive said unit, frangible means holding the sections of said unit together but adapted to be sheared by the weight of the tubing applied by said slips so that said unit will expand radially in said well head, and a packing unit to be compressed by the weight of said tubing and held compressed by said sectional unit.

7. In combination with a well head and tubing hanger, a hanger unit, said unit including a plurality of sections to make up a circumferential hanger, and shear means connecting said sections together so that said unit may be positioned in said head but adapted to be sheared to allow radial movement of said sections.

8. A tubing hanger and clamping unit including a plurality of sections, pull up screws to connect said sections together to provide a circular hanger, said screws being frangible to release said sections when the weight of the tubing is hung thereon so that said sections may move radially outward in a support.

15 9. A hanger for well heads including a pair of substantially semi-circular members, means to hold said members together forming a circle so as to be inserted into the well head, said holding means being frangible when the load is applied to the hanger so that said members may separate and move radially outward to engage the well head.

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