Aug. 30, 1955 A. G. JONES, JR 2,716,455

TRAP FOR FLUID IN A PIPE SECTION

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Fig. 2

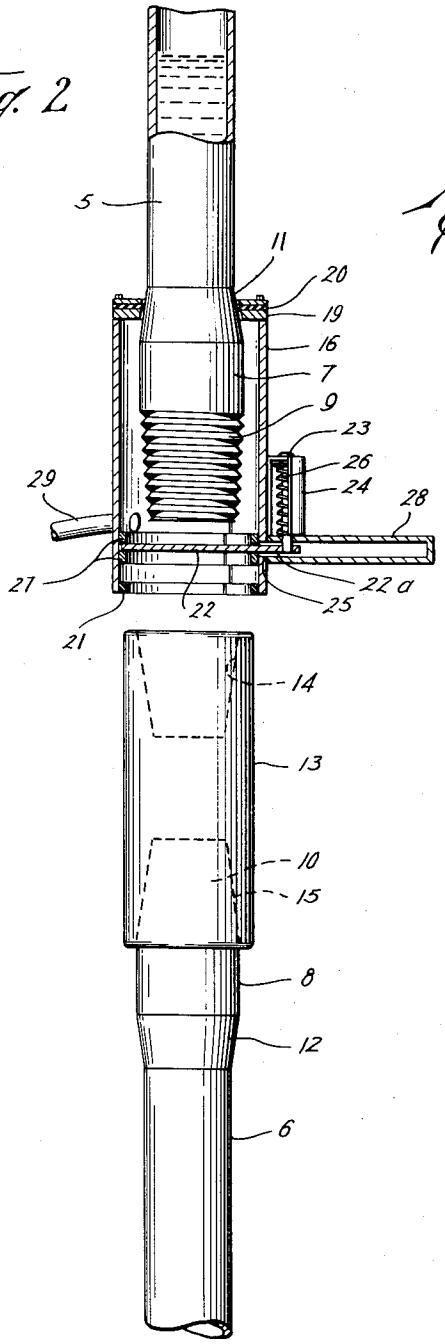
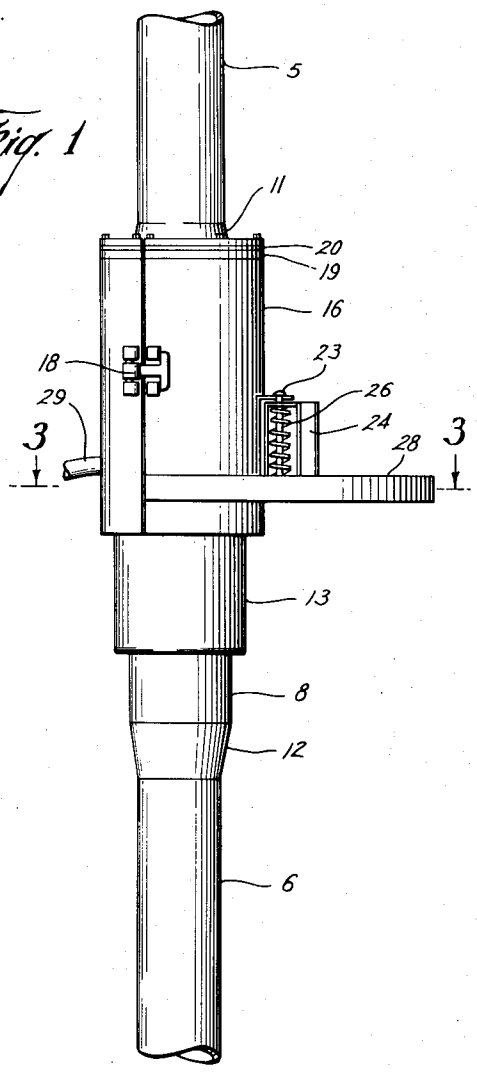


Fig. 1



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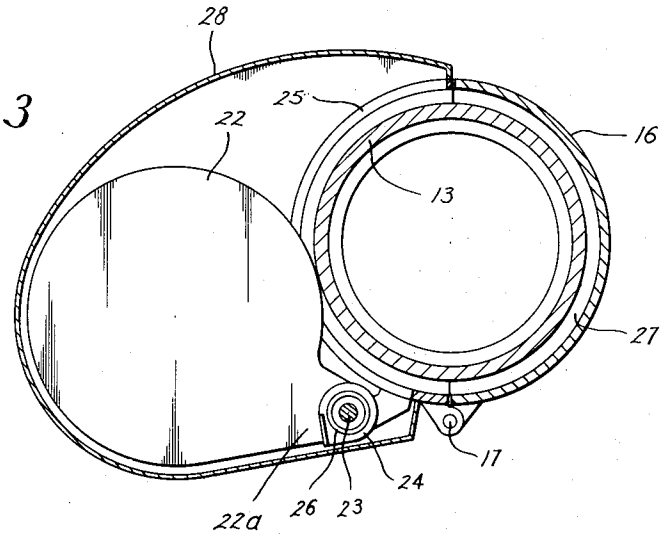
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Fig. 3



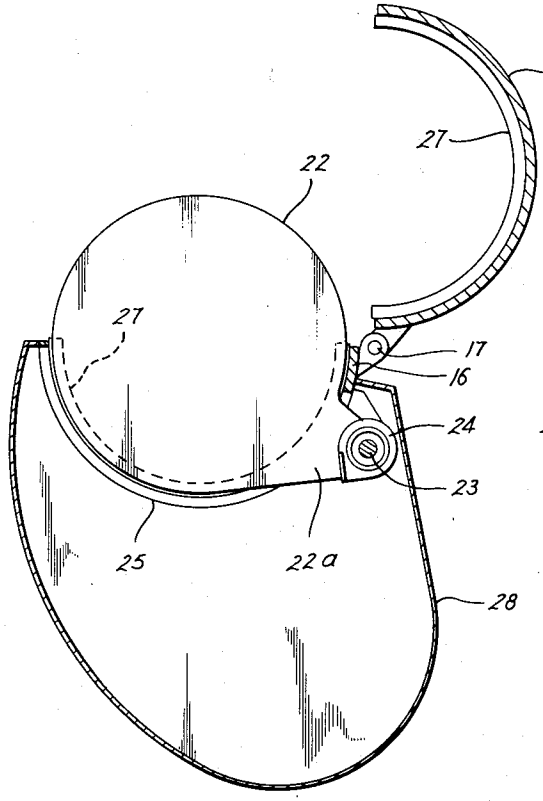


Fig. 4

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TRAP FOR FLUID IN A PIPE SECTION

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8 Claims. (Cl. 166—81)

This invention relates to a trap or retainer device which is employed to trap or retain oil and other fluid draining from the sections of a pipe string as the sections are unscrewed or otherwise removed from the pipe string during its withdrawal from a well.

In the drilling, formation testing and operation of wells such as oil wells, the pipe strings, such as the drilling string or testing string and the like must be withdrawn at varying intervals to perform various operations, such as changing the bit, installing formation testing tools, recovering fluid enclosed in the string, and for other purposes. Such strings will ordinarily be filled with fluid, which may be oil, water, drilling mud, etc. In order to withdraw such a string from the well, the sections of pipe forming the string must be successively unscrewed as the pipe is drawn upwardly from the well. Any fluid in the sections will drain out of the sections as they are broken out of the string and will spill out over the derrick floor and on the men engaged in removing the pipe. The spillage of such fluids is both hazardous to the operators and is wasteful, particularly if the pipe is filled with oil or special drilling muds. Also, it is often desirable to measure the amount of fluid inside the pipe string, particularly during formation testing, as this may be a measure of the production possibilities of the well.

Briefly stated, a primary object of the present invention is to provide a generally tubular trap or retainer device which is adapted to seal about the pipe string above and below the joint between adjacent sections of the pipe string and which includes a valve or gate which is adapted to close the lower end of the upper pipe section more or less automatically as that section is released from the next lower section to thereby prevent the uncontrolled loss of fluid from the removed section.

Another object is to provide a tubular body, split longitudinally and hinged at one side so that it may be closed about the pipe string and provided with sealing means at its opposite ends to seal about the pipe above and below a connection between pipe sections, the body being supported on the upper pipe section to be moved upwardly therewith as the upper section is withdrawn from its connection with the next lower pipe section, the body being provided with a shutter or gate which will automatically close the bore of the body below the lower end of the upper pipe as it is separated from said next lower section.

A further object is to provide a sealing sleeve adapted to longitudinally span the joint between a pair of pipe sections and provided with an automatic shutter to close between the ends of sections as they are separated.

Other and more specific objects and advantages will become apparent from the following detailed description when read in conjunction with the accompanying drawing which illustrates a useful embodiment in accordance with this invention.

In the drawing:

Fig. 1 is an elevational view of the trap device in accordance with this invention shown in position about the joint between connected sections of a generally conventional pipe string;

Fig. 2 is a view generally similar to Fig. 1, showing the pipe sections after being disconnected and showing the trap shutter in closed position;

Fig. 3 is a cross sectional view taken generally along line 3—3 of Fig. 1; and

Fig. 4 is a cross-sectional view generally similar to Fig. 3 but showing the parts of the trap body in the open position preparatory to being closed about the pipe string.

In the drawing there is shown upper and lower pipe sections **5** and **6**, respectively, forming adjoining sections of a conventional string of drill pipe or tubing. The pipe sections, as illustrated, may be formed of conventional external upset pipe having external upset portions **7** and **8**, respectively, at their ends terminating in externally threaded pins **9** and **10**, respectively, and forming external shoulders **11** and **12**, respectively, at the junctures of the upset portions with the pipe. The pipe sections are connected together by means of a conventional screw collar **13**, having internally threaded boxes **14** and **15**, respectively, at its upper and lower ends to receive the respective pins **9** and **10**.

The trap in accordance with the present invention comprises a generally tubular sleeve-like body **16** composed of two complementary semi-cylindrical portions hinged together at one side by means of hinges **17** (Figs. 3 and 4) so that the parts of the body may be swung apart to open it and to be then closed about the pipe string. A latch **18**, of any suitable and generally conventional form is mounted on the side of the body opposite the hinges to lock the parts of the body in closed position about the pipe string.

The upper end of body **16** is provided with an inwardly extending annular flange or shoulder **19**, the bore of which is preferably made somewhat smaller in diameter than that of upset portion **7**, so that it will engage shoulder **11** and prevent pipe section **5** from being withdrawn upwardly through the upper end of body **16**, although pipe section **5** is free to rotate relative to body **16**. An annular sealing ring **20**, constructed of any suitable resilient material such as rubber or rubber-fabric composition is suitably secured to flange or shoulder **19** and is arranged to project annularly therefrom so as to compressively engage the outer surface of pipe section **5**, preferably about shoulder **11**, as shown, when the body is closed, to thereby form a fluid-tight seal between the pipe section and the upper end of body **16**.

The length of body **16** is made such that it will longitudinally span the joint between the pipe sections when the latter are screwed together in the usual made-up condition, and will extend downwardly about the exterior of collar **13** some distance below the upper end thereof, as best seen in Fig. 1. At its lower end, body **16** is provided with an inwardly projecting annular sealing ring **21** which is constructed of resilient material and is adapted to form a fluid-tight slidable seal between the lower end of body **16** and the exterior of collar **13**, when the trap is closed about the body.

A shutter **22** of generally circular shape is connected at one side by means of a crank arm **22***a* to a longitudinally extending pivot pin **23** rotatably journaled in a bracket **24** mounted on the exterior of one portion of body **16**. This portion of the body is provided with a horizontal slot **25** through which shutter **22** may enter the interior of body **18** from the exterior thereof. A coil spring **26** is mounted about pin **23** between the bracket and the shutter to urge the shutter to its inward or closed position. A pair of longitudinally spaced guide rings or

shoulders 27—27 are mounted on the interior of body 16 to guide shutter 22 in its movement into the interior of body 16 and to hold it firmly in place when in the closed position. It will be understood that the spacing between guide rings will be made such that shutter 22 will fit snugly between them so that there will be minimum seepage of fluid past the shuttter from the interior of the body above the shutter. A horizontally disposed generally flat housing 28 is mounted on the exterior of body 16 and is shaped to enclose shutter 22 when the latter is in its open position and to permit horizontal swinging movement of the shutter between its open and closed position. Housing 28 is closed throughout its periphery and its inner end is secured to the exterior of body 16 surrounding slot 25 by any suitable fluid-tight connection. This housing serves to prevent loss of fluid from body 16 through shuttter slot 25, since it encloses the slot, the shutter and the path of movement of the shutter to and from its bore-closing position.

A drain pipe 29 communicates with the interior of body 16 at a point just above shutter 22.

The above-described device is employed in the following manner:

The trap will initially be in the open position shown particularly in Fig. 4 and will be mounted on the pipe string by closing the parts of the body about collar 13 and the adjacent portion of pipe section 5 as shown in Fig. 1. When thus closed about the pipe string, shutter 22 will occupy the position shown in greater detail in Fig. 3 in which the shutter will be held in the open position against the urging of spring 26 by its engagement with the exterior of collar 13. The upper end of the body will be sealed with the exterior of pipe section 5 through ring 20. The lower end of the body will be sealed about collar 13 by means of sealing ring 21.

As upper pipe section 5 is unscrewed from collar 13 it will move upwardly. Its upward movement will engage flange or shoulder 19 drawing body 16 upwardly with it over the surface of collar 13. At the instant pin 9 becomes completely unscrewed from the collar and moves above the upper end of the collar, the spring pressure on shutter 22 will swing the latter to the closed position, shown particularly in Fig. 2, trapping liquid in pipe section 5 in body 16. This liquid may then be drained off through drain pipe 29 to any place of disposal desired. The lower end of body 16 will still be engaged about the upper end of collar 13 at the moment the shutter closes so that very little fluid can escape at any stage of the separation of the pipe sections.

After the fluid has been drained off through drain pipe 29, the trap may be opened and removed from the end of section 5 in readiness for attachment about the next joint as it is withdrawn from the well.

It will be understood that numerous alterations and changes may be made in the details of the illustrative embodiment within the scope of the appended claims but without departing from the spirit of this invention.

What I claim and desire to secure by Letters Patent is:

1. A device for trapping fluid in a pipe section being removed from a pipe string, comprising, in combination with a vertically disposed pipe string composed of pipe sections connected end-to-end by means of threaded joints, a generally tubular body removably mountable on said string surrounding a joint between upper and lower adjacent pipe sections, means for supporting said body on said upper section for movement upwardly therewith as it is unscrewed from the lower pipe section, and a horizontally disposed shuttter member movably mounted on said body to close the bore thereof below said upper section as the latter is withdrawn from said lower section.

2. In a device as defined in claim 1, resilient means urging said shutter member to the bore-closing position.

3. In a device as defined in claim 1, annular seals between said body and said pipe string above and below said joint.

4. A device as defined in claim 1 wherein said body is composed of a pair of complementary semi-cylindrical segments hingedly connected at one side, and releasable latch means connecting said segments at the opposite sides.

5. In a device as defined in claim 1, a horizontally disposed housing mounted on the exterior of said body and enclosing said shutter member and its path of movement to and from its closed position.

6. In a device as defined in claim 1, a drain pipe through the wall of said body communicating with the interior thereof above said shutter member.

7. A trap for fluid in a pipe section, comprising, a generally tubular body removably mountable about the exterior of a pipe section to extend below the lower end thereof, sealing means mounted on the body to form a seal about the exterior of the pipe section above the lower end thereof, means for supporting the body on the pipe section above said lower end, a horizontal slot through the wall of said body adjacent the lower end thereof, a shutter member pivotally connected to the exterior of said body positioned to swing through said slot to close the bore of said body, resilient means urging said shutter member toward the bore-closing position, and a horizontally disposed housing mounted on the exterior of said housing enclosing said shutter member and its path of movement to and from its bore-closing position, the inner end of said housing being sealed about said slot.

8. A trap for fluid contained in an upper pipe section being unscrewed from its joint with a sub-adjacent pipe section, comprising, a sleeve member surrounding the joint and extending above and below the joint, sealing means mounted on the sleeve member to form fluid-tight seals with the exterior of the pipe sections above and below the joint, means for supporting said body on the upper pipe section for movement upwardly therewith, and movable shutter means mounted on the exterior of said sleeve member and automatically movable across the bore of the sleeve between the ends of the pipe sections as they are separated.

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