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BLOWOUT CLOSURE DEVICE PRESSURE HEAD

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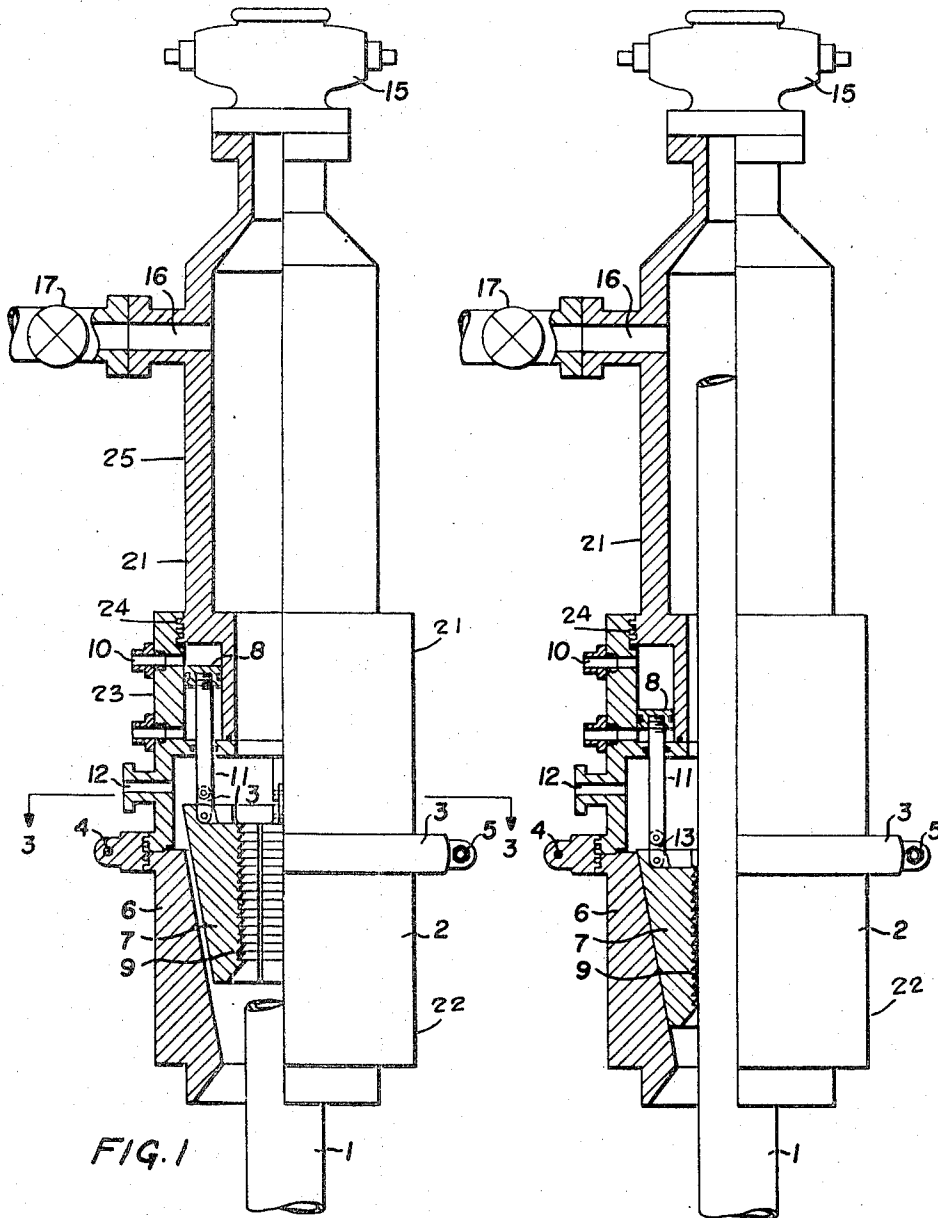


FIG. 1

FIG. 2

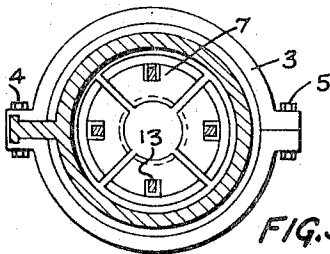


FIG. 3

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BLOWOUT CLOSURE DEVICE PRESSURE HEAD

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6 Claims. (Cl. 166—95)

The present invention is concerned with an improved process and apparatus for bringing into control a wild petroleum well from which fluids are escaping under pressure. The invention is particularly concerned with an improved apparatus wherein leakage around the string is prevented by the use of a setting seal fluid.

With any high pressure producing oil well there exists always the danger that the well will get out of control and that the well cannot be closed off or brought under control with existing equipment. For example, when a well is being drilled or repaired the pressure control equipment may become damaged or broken off. Thus, the pressure of the well can no longer be confined which results in a wild well from which gas and oil will rapidly escape over the landscape. This produces a fire hazard and endangers surrounding property and human life. It also causes enormous waste of valuable natural resources. Wells that have blown out as a result of casing failure caused, for example, by excessive corrosion present a serious problem since in such cases there will usually be nothing left but the bare casing and no structure such as flanges will be available to use as an anchoring means in attempting to cap the well. Wild wells of this nature present a particularly serious problem in marine installations since corrosion being particularly bad at the water line causes casing failure at this point.

The apparatus of the present invention utilizes hydraulically, or otherwise remotely actuated slips for gripping the pipe or casing. In addition a quick setting plastic, tar or other sealant is employed for securing a tight seal against the pipe as well as between the slips and around the slips. Final closure of the well is effected by closing a conventional blind ram preventer mounted at the top of the assembly.

The method and apparatus of the present invention may be fully understood by reference to the drawings illustrating embodiments of the same. Figure 1 illustrates the blowout closure device in an open position as it is being positioned over the pipe string. Figure 2 illustrates the identical closure device affixed to the pipe string and the well under control. Figure 3 is a view taken at III—III and illustrates the arrangement of the slips.

Referring specifically to Figure 1, the device is being placed over a blowing well 1 wherein fluids are flowing under high pressure from the upper end of the pipe string. The device comprises a housing shell having two sections which are held together with a split clamp ring 3 and suitable bolting or equivalent means 4 and 5. Housing 2 has an upper section 21 and a lower section 22. For convenience of construction upper section 21 may have an annular member 23 connected to the main portion 25 of the upper section 21 as at threaded joint 24. Housing 2 then is considered to have an upper section 21, including annular member 23 and main portion 21, and a lower section 22. Split clamp ring 3 is equipped with internal, female, circular grooves which register with corresponding male circular splines. The lower section 21 of housing 2 is characterized by having a lower sloping surface or

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shoulder member 6 along which a clamping means 7 moves upwardly and downwardly as actuated by means of a piston rod and head assembly 8.

The clamping means 7 is characterized by having a plurality of serrated teeth elements 9 on its inner surface. Thus, as the pressure on the closure device tends to blow off the device, these teeth elements bite more deeply into the metal of the pipe string. While it is not essential, it is preferred that the inner contour of element 7 be circular in order to meet the contour of the pipe string.

In operation, the housing 2 is slipped over the pipe string 1 as shown in Figure 1. The fluid will then blow through the unit emerging from the top of the housing. When the housing is placed in the proper position over the pipe as illustrated in Figure 2, hydraulic or pneumatic pressure is applied through port 10, thereby exerting a downward thrust on the piston head element 8. Sufficient downward thrust for initial setting can also be secured by sudden release of the weight of the slips permitting free fall such as when pins are removed, or electrical solenoids are de-energized. This thrust transmitted by piston rod 11 moves the clamping element 7 downwardly along shoulder 6 until the teeth impinge into the pipe string. At this point a sealing fluid, or a plugging agent, or a conventional lost circulation fluid such as cotton seed hulls and drilling mud or wood pulp and drilling mud or peanut hulls and drilling mud, or Portland cement, or quick setting plastic such as vinylidene chloride resin, or low melting alloy such as babbitt is injected through port 12. This fluid will seal over the orifices or openings between the teeth of clamping means 7 and around and between the slips comprising clamping means 7 and thus seal the assembly against leakage.

A conventional blind ram blowout preventer 15 is then actuated to stem and close off the flowing fluid from the pipe string. A suitable blind ram blowout preventer is commercially available from Cameron Iron Works, Inc., P.O. Box 1212, Houston, Texas. A blowout preventer is illustrated in the composite catalog published by Gulf Publishing Co., P.O. Box 2608, Houston, Texas, 1957, 22nd Edition, Volume 1, pages 1142-B and 1143. As pointed out heretofore, the control device for the present invention will tend to be blown from the string by this upward thrust which will force the teeth of clamp 7 into the metal of the pipe.

Clamping means 7 may be circular and continuous about the entire circumference of the pipe provided vertical slots are cut at special intervals essentially through the entire length to permit reduction in diameter at tooth surface when clamping means 7 moves downwardly with relation to sliding surface 6, or it may comprise two elements 180° apart. A particularly desirable construction is to have four clamping means 7 spaced 90° apart.

Under certain circumstances, it may be desirable to introduce a well killing fluid into the string. This fluid may be introduced through the conduit 16 controlled by valve 17.

In essence, the invention comprises the use of a blowout device which is characterized by a two stage seating of the clamp and the use of a sealing fluid to prevent leakage between the clamp or clamps, the housing and the pipe string. The initial seating of the clamp is secured by the application of hydraulic or pneumatic force exerted without the assembly. The final seating is secured by the upward thrust of the flowing fluids which forces the upward biting teeth to sink into the pipe string to secure a positive seating.

In some cases, it may be desirable to shut in a well which has a well head flange of substantially larger diameter than the pipe string at the top of the pipe string. To accommodate situations such as this, the design can be arranged such that the slips in the uppermost position will

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clear the flange and yet the lower sloping surface 6 will bring them in tightly against the pipe under the flange and permit sealing against the pipe. Such an arrangement requires that clamping element 7 be sufficiently thick and links 13 be sufficiently long to permit bridging the space 5 between the flange diameter and the pipe string.

What is claimed is:

1. A device adapted for bringing under control wild wells having a pipe string extending above the surface of the earth which comprises a housing adapted to be positioned over the end of the pipe string, said housing being characterized by having at its lower end thereof an inwardly continuous and uninterrupted sloping shoulder member, a clamping device adapted to slide downwardly and inwardly along said shoulder member so as to make tight contact with said pipe string, said clamping device being characterized by containing on its inner surface upwardly biting teeth elements, driving means for moving said clamp along said shoulder and to seat said clamp along said pipe means for inserting a sealing fluid into said housing above said clamping device, and means for closing off the upper end of said housing.

2. Apparatus as defined by claim 1 wherein said means for inserting a sealing fluid includes a port provided in the housing intermediate the top of said shoulder member and said driving means.

3. Device as defined by claim 2 wherein said housing is provided with a port member communicating with the area within said pipe string.

4. Apparatus as defined by claim 1 wherein said clamping device comprises a plurality of discontinuous elements about the pipe string.

5. An apparatus adapted for bringing wild wells under control which comprises a housing adapted to be positioned over the end of a pipe string, said housing having 35

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an upper section and a lower section with said lower section being characterized by having at its lower end thereof an inwardly continuous and uninterrupted sloping shoulder member, said housing being further characterized in that the lower end of said upper section and the upper end of said lower section have outwardly facing external circular splines, a split clamp ring for holding said upper and said lower sections together with said split ring being characterized by having internal female circular grooves which register with said corresponding male circular splines, a clamping device adapted to slide downwardly and inwardly along said shoulder member so as to make tight contact with said pipe string, said clamping device being characterized by containing on its inner surface upwardly biting teeth elements, driving means for moving said clamp along said shoulder and to seat said clamping device along said pipe, a port in the lower portion of said upper section of said housing intermediate the top of said shoulder member and said driving means whereby sealing fluid may be inserted above said clamping device, and means for closing off the upper end of said housing.

6. An apparatus as defined in claim 5 wherein said upper section of said housing is provided with a port member communicating with the space within said pipe string whereby well killing fluid may be injected into said pipe string.

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