July 26, 1960 M. R. JONES 2,946,386

LATCHING OVERSHOT WELL BLOWOUT CLOSURE DEVICE

Filed Aug. 2, 1957 2 Sheets-Sheet 1

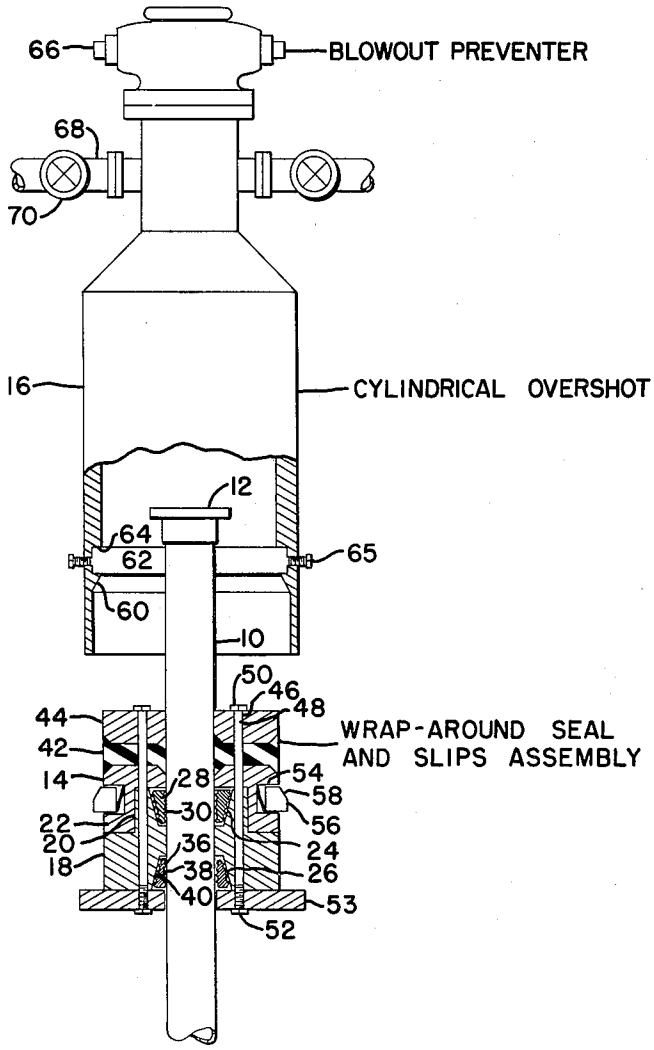

FIG.-1

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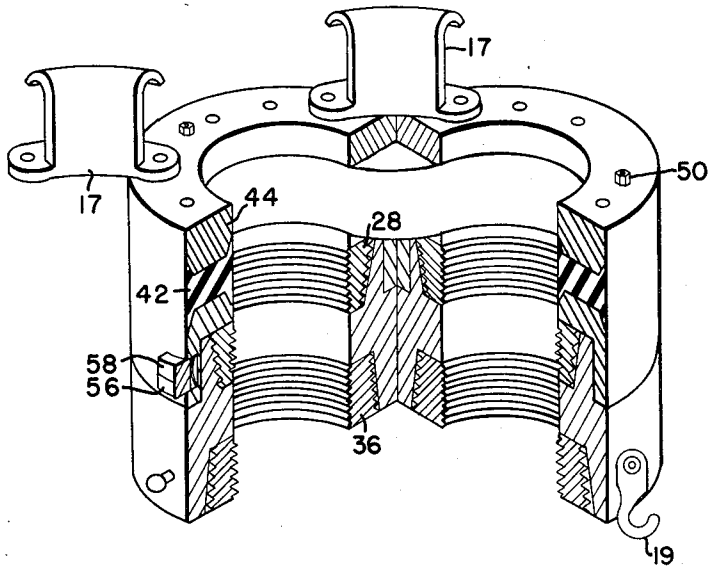

FIG.-2

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LATCHING OVERSHOT WELL BLOWOUT CLOSURE DEVICE

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5 Claims. (Cl. 166—95)

This invention relates to an apparatus and method for stopping the escape of fluids from the open end of a pipe which is not provided with effective pressure-control equipment, or when such equipment has been broken off or damaged. It relates more particularly to an apparatus for bringing under control a wild petroleum well from which fluids are escaping under pressure in an uncontrollable manner.

When a well is being drilled for the production of oil or gas, there exists a danger that the well will get out of control and that it cannot be closed off with existing equipment. For example, the pressure-control equipment or the wellhead equipment may become damaged or broken off due to various forms of accidents, corrosion, or other failure; or an unexpectedly high pressure formation may be penetrated which subjects the wellhead equipment to a higher pressure than it is designed for, thus resulting in failure of such equipment. It is also possible that wellhead equipment of a producing well may also be damaged or destroyed. When this occurs, the pressure in the producing formation forces oil and gas to flow rapidly and uncontrollably through the open end of the casing from which the pressure-control equipment has been broken. Oil and gas will escape over the surrounding landscape, which produces a fire hazard and dangers to property and human life and also causes enormous waste of valuable natural resources. Usually, when a well failure of this nature occurs, the casing which has been cemented to at least a part of the wall of the borehole remains secured to the earth and protrudes upwardly above the surrounding ground or water. The end of the casing may be completely severed and be free of any existing wellhead equipment, or there may be a damaged flange or other equipment still attached to the end of the protruding casing. The fluid from a wild well rushes outwardly through the casing in an uncontrollable manner and must be brought under control. The present invention discloses a novel and improved device and method of bringing such a wild well under control.

An object of this invention is to provide a well blowout closure device which may be installed on the protruding casing of a wild well and effectively bring such wild well under control.

The invention utilizes in combination a wrap-around seal and slips assembly adapted to surround and engage a portion of the protruding pipe, with slips being provided to prevent upward or downward movement of the assembly and a cylindrical overshot adapted to pass over the open end of the pipe and around the assembly. An overshot as used herein means a hollow, usually substantially cylindrical or tubular body adapted to be lowered over a casing normally protruding from the earth or body of water, with one end of the body open and means for opening and closing the other end of the body. A more detailed description of the overshot will be obtained from the drawing and the detailed description found further herein. Interengaging means are provided for securing the overshot to the assembly. Means are also provided

for opening and closing the end of the overshot protruding beyond the open end of the pipe. Such means is in an open position while the overshot is being lowered into place and is closed after the overshot is secured to the slips assembly which has a seal and slips assembly adapted to utilize the pressure of the well to effect fluid-tight seals between the assembly and the pipe, and between the assembly and overshot, thus effectively closing the end of the pipe and stopping the flow of fluids. Well-killing fluids or cement may then be injected through ports provided in the overshot.

The method and apparatus of the present invention may be fully understood from the following detailed description when read in conjunction with the accompanying drawing which illustrates one preferred embodiment of the invention.

In the drawing:

Fig. 1 is a longitudinal, partially cut-away view of a wellhead closure device, showing the wrap-around slips and seal assembly in position around a tubular member with the cylindrical overshot in position for lowering into place over the slips assembly.

Fig. 2 is a perspective view illustrating the hinging arrangement of the slips assembly.

Referring to the drawing, there is shown a casing or pipe or tubular member **10** protruding from the ground. Casing flange **12** is shown as being attached to the upper end of the casing. However, the casing might be severed below the flange, leaving only a jagged edge protruding at its open end. Wrap-around seal and slips assembly **14** is shown in cut-away view as being placed around casing **10**, and it is in position for the cylindrical overshot **16** to be lowered over the slips assembly **14**. The wrap-around seal and slips assembly **14** is a sectionally hinged casing hanger similar to and attains sealing in the same manner as the McEvoy "CF" slips in Type SB–2 casing hanger illustrated on the third page of Bulletin 201 of the McEvoy Company, Texas and Milby Streets, P.O. Box 3127, Houston 1, Texas. As the slips assembly **14** is hinged, it can be opened and then wrapped around casing **10** without having to be lowered over the top of the casing, which may have flanges or other equipment thereon. As shown in Fig. 2 the slips assembly is usually in two longitudinal sections that are hinged together by hinging means **17** to permit the sections to be relatively rotated on the hinges so that the unit may be opened and then closed about the casing similarly as a clamp. Hooks **19**, latches, or other type fasteners are provided for attaching the sections together. It is readily seen that the wrap-around feature reduces the size of the complete seal and slips assembly as it does not have to be made large enough to go over a broken flange or other equipment of a larger diameter than the well casing.

The wrap-around seal and slips assembly **14** is composed of a slip bowl **18** which has outer wall **20**, which may normally be L-shaped and dimensioned to receive an annular support member which is fitted to complement the outer wall **20** of the slip bowl. The bore of slip bowl **18** has an upwardly and outwardly inclined face **24** and a downwardly and outwardly inclined face **26**, with the downwardly inclined face **26** being on the opposite end of the bore of slip **18** from face **24**. A plurality of arcuate pipe-gripping slips **28** are mounted in the bore of bowl **18** and are provided on their inner faces with pipe-gripping teeth **30** and the rear faces of the slip being tapered so as to complement the inclination of face **24**. The rear faces of the slips **28** may preferably have dull teeth which aid in controlling the slip bowl friction. A plurality of arcuate pipe-gripping slips **36** are mounted in the lower portion of bowl **18** and are provided on their inner faces with pipe-gripping teeth **38**, the rear faces of

the slips being tapered to complement the inclination of face 26 of the slip bowl. The rear face 40 of slips 36 may preferably be provided with teeth to control slip bowl friction. With this arrangement, it will be understood that the tooth faces of slips 28 are engaged with the outer wall of tubular member 10 and are designed to resist upward movement of slips assembly 14. Slips 36 is arranged to engage the outer wall of tubular member 10 and resist downward movement of slips assembly 14. It is to be understood that, in some instances where there is no problem of downward movement of the slips, it may not be necessary to provide slips 36 and face 26 of the slip bowl 18. It will be understood that normally the inclusion of slips 36 as illustrated is preferable. When not in operation, the slips 28 and 36 are held in place in the slips assembly by means of bolts, or screws, or by means not shown in the drawing but which are known to those skilled in the art.

The wrap-around seal and slips assembly 14 includes an annular support member 22 which is fitted to complement slip bowl 18 and to provide a loose fit about tubular member 10. A resilient, compressible sealing ring 42 is mounted on the upper surface of annular support member 22. Sealing ring 42 in its normally uncompressed condition is manufactured to fit slidably in the annular space between the exterior of tubular member 10 and the interior of a cylindrical overshot 16. It is to be noted that other sealing means could be used such as using two concentric sealing rings. A compression ring 44 is mounted on top of sealing ring 42. An annular bottom support plate 53 of larger exterior diameter than the rest of the slip assembly may be utilized as a support for overshot 16 with the bottom rim of the overshot resting on the upper portion of plate 53 which extends outwardly. A plurality of angularly spaced, axially positioned holes 46 are provided, respectively, in compression ring 44, sealing ring 42, annular support member 22, slip bowl 18 and bottom support plate 53 through which bolts 48 may extend. The bolts may have an integral upper head 50 and conventional threads at its lower end for nut 52. The holes in annular support member 22 and sealing ring 42 through which bolts 48 pass have larger diameter than that of the bolts, so that the bolts may slide freely through these annular members in response to the axial movement of the slip bowl and compression ring relative to the annular support member 22 and sealing ring 42.

Annular support member 22 is provided with recesses 54 which contain latching dogs 56 which are spring-loaded to normally protrude from the periphery of the annular support member 22. Latching dogs 56 are provided with tapered faces 58 which, when the cylindrical overshot is lowered into place, come into contact with tapered or rounded surface 60 at the bottom of overshot 16. The overshot in being lowered thus depresses latching dogs 56 into recesses 54, and the inner wall of the overshot passes by the latching dogs 56 until recess section 62 is reached, at which points the latching dogs again protrude in their normal position. Internal shoulder 64 in the recessed portion of the inner wall of the overshot 16 effects interengagement or attachment between the slips assembly 14 and the overshot 16. Disengaging screws 65 are provided in the walls of the overshot behind recess 62 for depressing latching dogs 56. It is to be understood that other types of engaging means other than the latching dogs assembly may be utilized, such as flanges, bolts, screws, or various hooking arrangements. Recess 64 is preferably so spaced from the bottom of overshot 16 that when the overshot is resting on support plate 53, latching dogs 56 are in an engaging position.

The top of the overshot 16 is normally provided with a conventional blind ram blowout preventer 66 which may be attached thereto by flange, screws, or other methods. At least one well-killing port 68 is provided in the upper portion of the cylindrical overshot and is provided with valves 70.

It is to be understood that the size and strength of the slips assembly and overshot will be engineered and designed in accordance with pressure encounter, the nature of the fluid, and size pipe or casing used.

In operation, the wrap-around slips and seal assembly 14 is wrapped around and mounted about cylindrical member 10 through which gas, oil, or other fluid is escaping at an uncontrollable rate and manner. The slips 36 prevent downward movement of the slips assembly 14. The cylindrical overshot 16, with the blowout preventer in open position, is then lowered by use of a crane, or winch, or other conventional manner over the tubular member and slips assembly 14 and is secured thereto by latching dogs 56 engaging inner shoulder 64 of the overshot. After overshot 16 is in position and securely interengaged with the slips assembly, the well-killing ports and the blowout preventer 66 are closed. The pressure in cylindrical overshot 16 is quickly built up, with the built-up pressure attempting to blow overshot 16 up and off the tubular member 10. Latching dogs 56 resist this upward thrust; and, in so doing, annular support member 22, which holds and supports latching dogs 26, compresses sealing ring 42 against compression ring 44 which is prevented from upward movement by being dependently connected with slip bowls 18 which are prevented, in turn, from upward movement by slips 28 whose teeth are biting into tubular member 10. As sealing ring 42 is compressed its inner periphery effects a fluid-tight seal between the assembly and the outer wall of tubular member 10; and the outer periphery of sealing ring 42 effects a fluid-tight seal between said assembly and the inner wall of the overshot. In addition to the sealing effect of the upward thrust of member 22, bolts 52 may be tightened if small leakage should occur. With the effecting of these seals and the subsequent closing of blowout preventer 66 and valve 70 of ports 68, the well blowout closure device has stopped the flow of fluid from the tubular member. Well-killing fluid of cement may now be injected through port 68; and, of course, after the well has been killed, permanent-type wellhead equipment of proper weight may be installed.

The latching dogs may, if desired, be installed to protrude from the inner wall of the overshot and with the shoulder being positioned in the slips assembly. However, this is normally not preferred, as protruding latching dogs on the inner wall of the overshot might reduce the effective clearance area which would be available for clearing wrecked equipment or metal that might be present on the outer area of tubular member 10.

As the slips assembly 14 is hinged and may be wrapped around and hooked, the assembly may be made to fit the tubular member 10 without having to be designed sufficiently large to clear junk which may be attached to the end of the tubular member.

The combination apparatus as disclosed has advantages of much lower weight and bulk than single units normally used; and, therefore, it is much easier to transport and install and will likewise result in an economic savings. As the combination apparatus of this invention can be constructed relatively smaller than a one-piece assembly, there is much less interior area of the unit exposed to pressure; therefore, the combination apparatus has a much higher pressure capacity. Also, the use of the overshot over the slips assembly in the manner described povides a positive seal of the lower end of the overshot.

It is to be understood that many variations and modifications of this invention can be made without departing from the spirit thereof. It is intended, therefore, that this invention be limited only by the subjoined claims.

What is claimed is:

1. A latching overshot well blowout closure device for use in shutting off flow from a cased well having casing

extending upwardly out of the well which comprises a slips and seal assembly for sealingly engaging said casing, said slips and seal assembly including an upper sectionalized annular plate and a lower sectionalized annular plate, a sectionalized slip bowl with pipe gripping slips adapted to resist upward movement of said slip assembly, an annular sectionalized member above said bowl, a resilient sectionalized annular sealing means disposed on said annular member and below said upper plate, the sections of said slip bowl, said annular member, said sealing means, said upper plate, and said lower plate being vertically aligned, means for securing the sections of said upper plate together so as to form an annular assembly, connecting members for securing said upper and lower plates together in a substantially fixed space relationship, said annular member being slidably mounted on said connecting members so as to have longitudinal movement with respect to said bowl and said upper plate, a cylindrical overshot of a character to pass over the open end of said casing and around said assembly, means to open and close the end of the overshot protruding beyond the open end of said casing, interengaging means between said overshot and said annular member whereby upward thrusts of the overshot as by pressure of the fluid in the casing forces said annular member against said sealing means whereby said sealing means is compressed against said upper plate and expands laterally against the inner wall of said overshot and the outer wall of said casing.

2. An overshot well blowout closure device for use in shutting off the flow from a cased well having casing extending upward out of the well and to be used in combination with a wrap-around seal and slip assembly having outer engaging means, slips of a character to resist upward motion of said assembly, an expansible sealing member adapted to be extruded inwardly against the walls of said casing and outwardly upon upward movement of the engaging means relative to said slips, which comprises a cylindrical housing of a character to pass over the open end of said casing and around said assembly, means to open and close the upper end of said housing, internal recess in the wall of said overshot adapted to receive said engaging means of said assembly whereby said sealing member is compressed and forced against the inner wall of said housing and the outer wall of said casing upon upward movement of said housing responsive to the pressure within said casing when said end of housing is closed and

means to disengage said engaging means of said assembly from said cylindrical housing.

3. An apparatus for stopping the escape of fluids from an open end of a pipe which comprises in combination: a wrap-around seal and slips assembly, said slips and seal assembly including a sectionalized annular plate, a sectionalized slip bowl, said bowl having an upper interior inclined face opening outwardly toward the open end of said pipe, sectionalized pipe gripping slips of a character to complement said inclined face of said bowl to resist upward movement of said slip and seal assembly with respect to said pipe, an annular sectionalized compression member between said bowl and said annular plate, and a resilient sectionalized annular sealing means disposed between said annular sectionalized member and said plate; connecting members extending from said plate to said bowl such that the maximum movement toward said open end of said pipe of said plate with respect to said slip bowl is fixed by said connecting members, said sealing means and said annular member being slidably mounted on said connecting members; means for securing the sections of said plate together so as to form an annular assembly; outwardly biased latching dogs means on said annular member; a cylindrical overshot of a character to pass over the open end of said pipe, said overshot having an internal recess of a character to receive said latching dogs means; and means to open and close the end of the cylindrical overshot protruding beyond the open end of said pipe.

4. An apparatus as defined in claim 3 with the further improvement of providing said cylindrical overshot with disengaging means to disengage said latching dogs from said recess.

5. An apparatus as defined in claim 3 with the further improvement of providing said slip bowl with a lower interior inclined face opening outwardly away from the open end of said pipe; sectionalized pipe gripping slips of a character to complement said lower inclined face of said bowl to resist downward movement of said slips assembly, and a lower annular plate below said slips bowl to retain said slips in said lower face.

References Cited in the file of this patent

UNITED STATES PATENTS

1,485,862	Lester	Mar. 4, 1924
2,793,700	Eckel	May 28, 1957