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Walker, Jr. et al.

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[54] **WELL CAPPING DEVICE**

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[52] **U.S. Cl.** **166/55**

[51] **Int. Cl.** **E21b 29/00**

[58] **Field of Search** 166/55, 100; 251/1

[56] **References Cited**

UNITED STATES PATENTS

3,057,295 10/1962 Christopher ..... 166/55 X

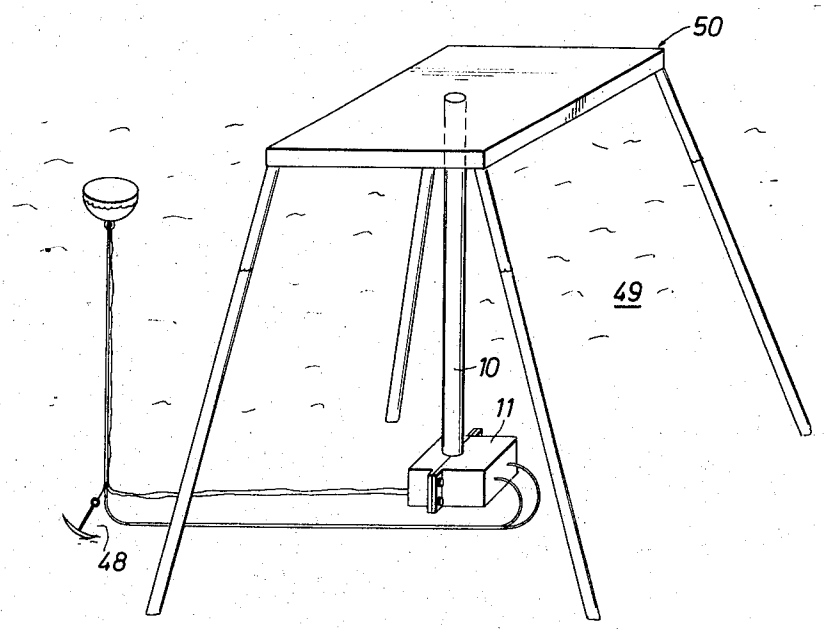
3,716,068 2/1973 Addison 166/55

Primary Examiner—Geo. V. Larkin

[57] **ABSTRACT**

A well capping device for shutting off flow through a conductor includes explosive means to cut the conductor and means for moving a valve plate across the conductor subsequent to explosively cutting the conductor.

6 Claims, 4 Drawing Figures



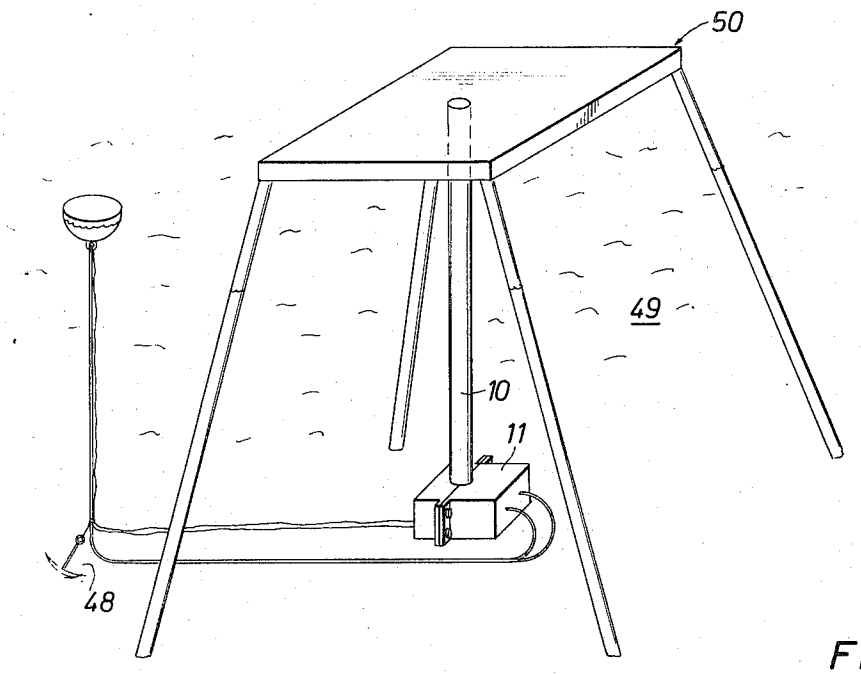


FIG. 1

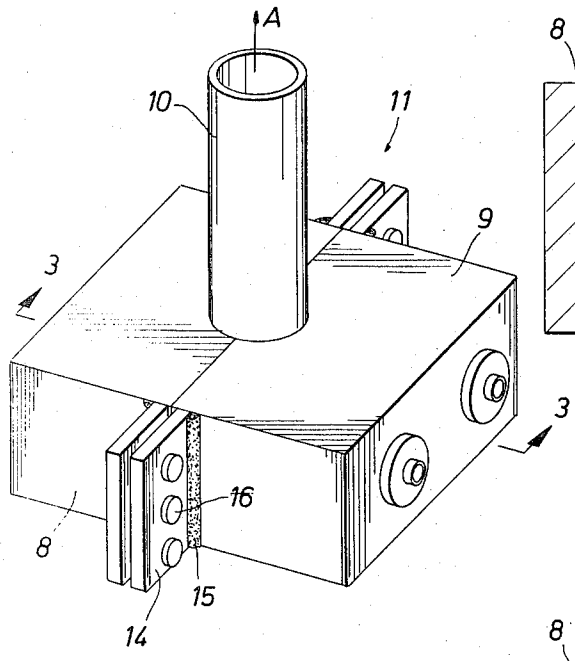


FIG. 2

FIG. 4

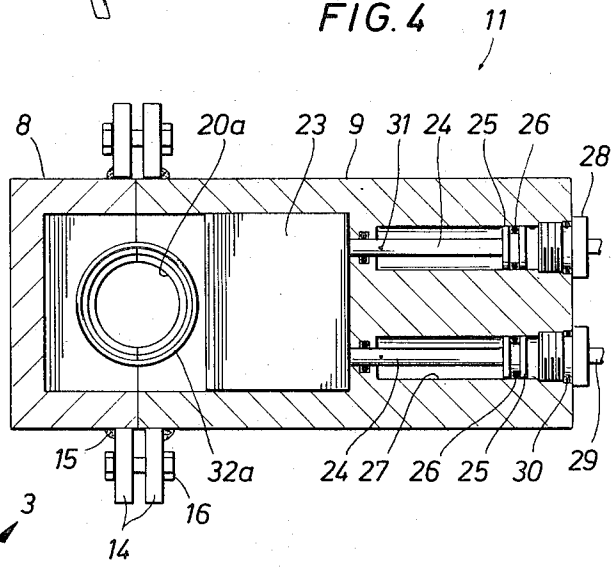
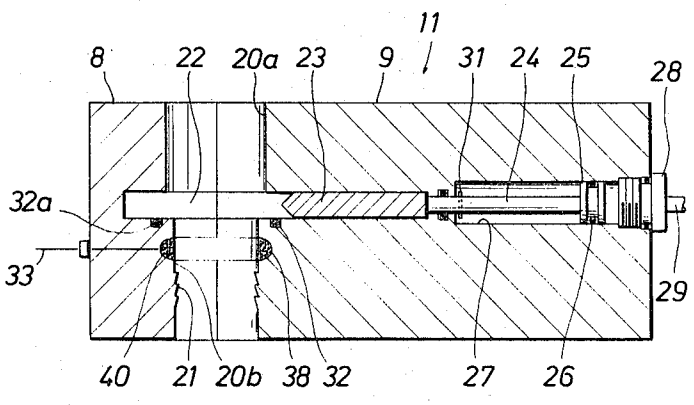


FIG. 3



WELL CAPPING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a device which may be utilized to cap a well when the surface equipment has been destroyed by fire, explosion or other means. The device is utilized only in an emergency condition.

2. Description of the Prior Art

Numerous approaches have been proposed to shut off flow from a well over which control has been lost due to abnormal formation pressures, malfunction of equipment at the surface or those caused by an underground blowout, losing the mud column, causing an underbalanced condition as related to the formation pressure.

One effective method of controlling a well which has blown-out is to install a shut-off valve at the surface. This can be done only when the conductor pipe at the platform level has not been destroyed. It would be accomplished by utilizing a boom that can be controlled remotely from a barge adjacent the platform. Another method is the installation of storm valves in the conductor string at approximately the mud line. This type of valve is usually held open by positive pressure applied from the surface by way of a control line and if the platform should be destroyed or the conductor string destroyed, pressure would be lost in the control line and the valve would automatically close. Such apparatus are usually installed in a producing well and are not adapted for application to a drilling well.

Another technique in use in offshore areas in instances where the well-head connection has been completely destroyed, is to drill a relief well adjacent the wild producing well and upon reaching total depth, heavy mud is pumped down the relief well and into the producing formation until communication is established with the well bore of the wild well. This is a costly and time consuming operation and is usually employed when pollution or potential pollution hazard is significant.

An even further method that has been proposed where the conductor string has not been destroyed is to pump a heavy fluid or some other weighting material such as lead balls down the conductor string and hopefully killing the well in this manner.

The present invention is intended to be applied in an emergency type operation and is applicable to a producing well as well as a drilling well. The device of the present invention is compatible with most of the methods hereinbefore described and would supplement these methods in killing a well over which control has been lost.

SUMMARY OF THE INVENTION

The present invention offers the significant advantages of simplicity of design and positive acting to shut off flow through a conductor pipe to the surface.

A second significant advantage is that the device of the present invention can be permanently installed as soon as the conductor pipe has been set and prior to commencing the drilling of the well to total depth.

A further advantage of the present invention is that it may be operated from a remote location such as from a buoy located some distance from the platform. The device significantly reduces the probability of platform damage in the event that a well is lost and a fire or explosion results.

These and other advantages are provided in the device of the present invention which comprises a member having a cylindrical bore through which a conductor string passes. The member is provided with an elongated slot in which a movable plate is positioned, the slot being substantially perpendicular to the cylindrical bore in the member. Means are provided in the device to move the plate within the slot and across the cylindrical bore shutting off any flow through the cylindrical bore. The device is further provided with gripping means adapted to engage the conductor and anchor the device to the conductor string.

BRIEF DESCRIPTION OF THE DRAWING

The nature and extent of the present invention will be more fully appreciated with reference to the drawing in which:

FIG. 1 shows the device of the present invention installed around a conductor pipe at an offshore platform;

FIG. 2 is an enlarged view of the well capping device shown installed on a well conductor;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2; and

FIG. 4 is a top view of FIG. 3.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. 2, there is shown well capping device **11** surrounding a well conductor **10.** The device is installed at the base of the conductor **10** as shown in FIG. **1** and near the sea floor **48.** The device can also be installed toward the upper end of the conductor **10** or above the water surface **49** or it could be positioned on the platform working deck. Clamp-up flanges **14** have provided, as by welding **15,** on each of the mating halves **8** and **9.** The clamp-up flanges **14** have perforations therethrough for installing a plurality of bolts **16** or equivalent means to join the two halves **8** and **9.**

Referring to FIG. **3,** the well capping device **11** has cylindrical bores **20***a* and **20***b* through which the well conductor **10** passes. The diameter of cylindrical bore **20***a* is slightly greater than **20***b* in order that the conductor **10** is not restrained after it has been explosively cut. The lower cylindrical bore, **20***b*, has gripping means **21** for gripping the well conductor **10** and anchoring the device **11** to the conductor **10.** The gripping means **21** can also be attached to the lower surface of the device **11** to engage the conductor **10.** A slot **22** extends transversely across bore **20***a* and in which a valve plate **23** may move to seal the well conductor **10** below the valve plate **23** thereby shutting off flow through the well conductor **10.** The slot **22** may have a wedge shaped cross section to further aid in sealing and shutting off flow. The slot **22** has a recess **32** in its lower face, which may be concentric to the conductor **10** but it may be any other suitable shape such as rectangular. A seal **32***a* is installed in the recess **32** with the seal **32***a* in sealing engagement with the valve plate **23** when it is in a closed position or alternatively the seal **32***a* can be installed in the bottom surface of plate **23.** One or more hydraulic cylinders **27** with a piston **25** and rod **24** can be used to move the valve plate **23** along slot **22** and across well conductor **10.** Each hy-

draulic cylinder **27** has an end plate **28** with a boss **29** through which hydraulic fluid may be introduced to the hydraulic cylinder **27.** A shear pin **31** may be installed in the rod **24,** if desired, to deliver an impact force to drive the valve plate **23** through the conductor **10.** The leading edge of the valve plate **23** may also be triangular in cross-section to further aid in assuring a complete closure to flow through the conductor **10.** The cylindrical bore **20***b* has a recess **38** into which a conventional explosive charge **40** or a shaped explosive charge is inserted or placed prior to clamping the two halves **8** and **9** of the well capping device together. Primacord or an electrical wire **33** may be connected to the shaped charge **40** and run to a remote location such as a buoy situated some distance from the platform **50.** A similar charge may also be installed in the hydraulic cylinder **27** with suitable connections out the boss **29** with primacord or electrical wire running to the same buoy as the wire **33.** In this way, the piston **25,** provided with seal **26,** may be used to drive the valve plate **23** across the well conductor **10.**

To install a well capping device around the well conductor **10,** the two halves **8** and **9** would be assembled using the clamp up flanges **14.** One side, if desired, could be hingably connected, but preferably, both sides would be provided with clamp up flanges **14** so that the seal **32***a* and the explosively shaped charge **40** could be installed without difficulty.

In operation, as would be the case with a well out-of-control, the linear shaped charge would be set off cutting well conductor **10** and the upward flow of fluid (arrow A) would carry or lift the well conductor up and out of the cylindrical bore **20**a. The valve plate **23** would then be driven to its closed position shutting off flow from the well. Well killing operations could then be initiated without undue danger to personnel conducting the control operation.

We claim as our invention:

1. A device for shutting off fluid flow through a well conductor, comprising:

a housing member having a cylindrical bore therethrough for receiving said conductor, said member being divided into two mating halves along the longitudinal centerline of the cylindrical bore with each mating half having connector means for joining the two mating halves;

an elongated slot formed in said member and being substantially perpendicular to the longitudinal axis of said cylindrical bore;

a laterally movable valve plate positioned within said slot;

means for moving said valve plate within said slot;

means for moving said valve plate within said slot and across said cylindrical bore;

a explosive-charge recess disposed in the wall of said cylindrical bore and positioned below said elongated slot; and

gripping means carried by said housing member to anchor said housing member to said conductor.

2. The device of claim **1** wherein said slot is provided with a recess in its lower face and having a seal installed therein to sealingly engage said valve plate when said valve plate is in its closed position.

3. The device of claim **1** wherein said recess contains an explosive for cutting said conductor.

4. The device of claim **3** wherein said explosive is a shaped type of explosive.

5. The device of claim **1** wherein said means for moving said valve plate comprises at least one hydraulic piston and piston rod assembly operatively connected to said valve plate.

6. The device of claim **1** wherein the recess contains an explosive for cutting said conductor and the means for moving said valve plate within said slot comprises two hydraulic pistons and piston rod assemblies operatively connected to said valve plate.

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