July 14, 1936. H. H. GREENE 2,047,774

DEEP WELL BRIDGE

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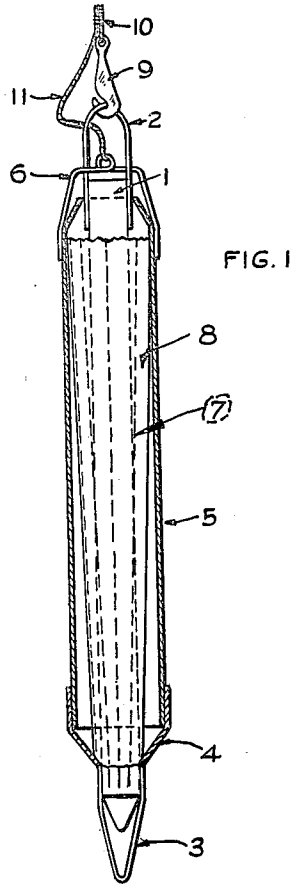


FIG. 1

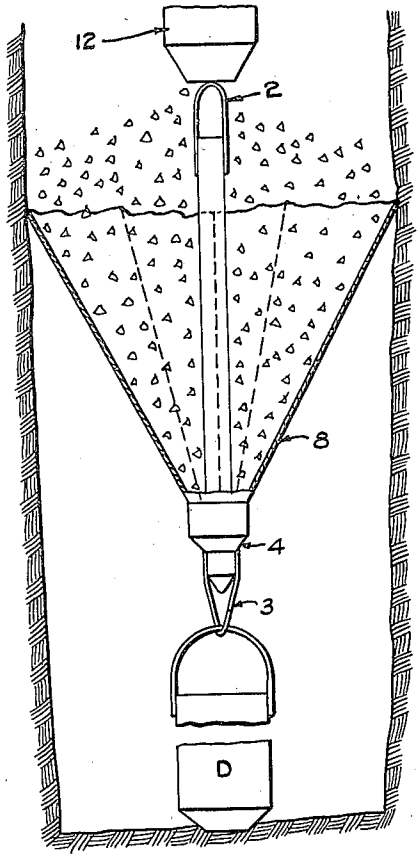


FIG. 3

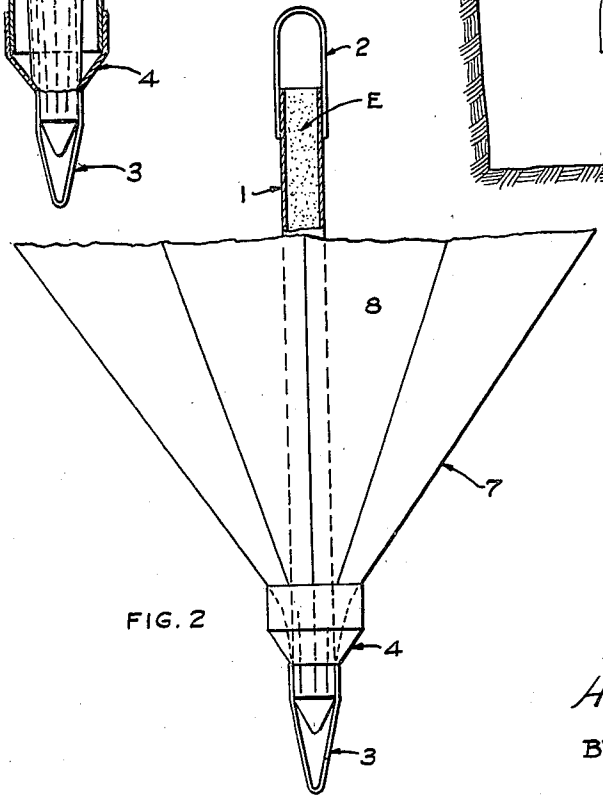


FIG. 2

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DEEP WELL BRIDGE

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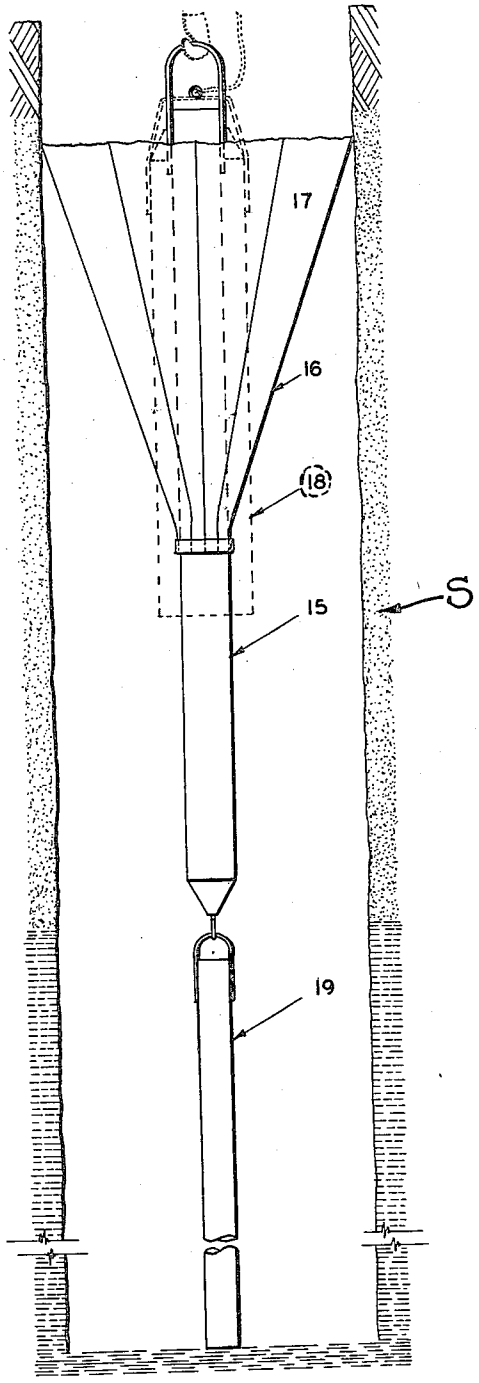


FIG. 4

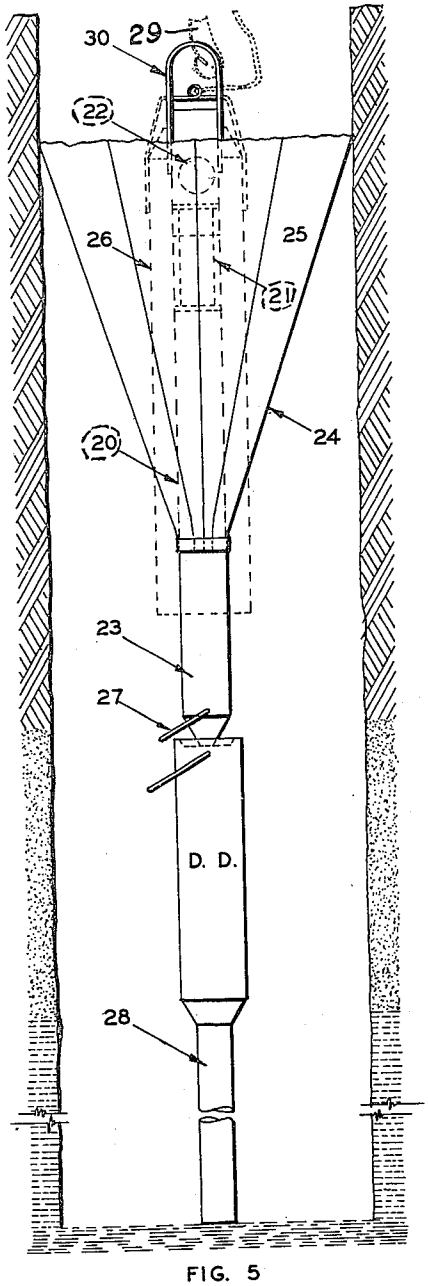


FIG. 5

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DEEP WELL BRIDGE

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Application March 18, 1935, Serial No. 11,579

8 Claims. (Cl. 102—4)

The invention relates to the deep well art and consists in a bridging device for plugging the well near the bottom thereof, or near any other support therefor.

One of the objects of the invention is to facilitate the lowering of a bridge device to the bottom of the well irrespective of the presence of water, oil, or gas in the well. The present bridge contemplates the use of a canvas or other flexible sheeting to form a pocket for plugging material, and it is another object of the invention to avoid the catching or fraying of such material by engaging the sides of the casing or bore as the device is lowered in the well.

Bridge devices of the general type involved are frequently lowered into the well with explosive charges suspended therefrom, and it is a further object of the invention to enable the device to be lowered or raised throughout the well depth irrespective of the presence of such a charge or other weight.

A bridging device of the general type referred to, particularly when plugging material has been poured into the well to rest upon the bridge, has a substantial vertical extent and a detonating bomb resting on top of the bridge or the plug might not affect the main explosive charge below the bridge. It is a further object of the invention to insure the firing of the main explosive discharge even though the detonating bomb is spaced a substantial distance therefrom.

Another object of the invention is to provide a firm support for a time bomb, or other detonating charge, on top of the bridge, or in some instances to firmly support a second bridge resting upon the top of the first bridge.

In the accompanying drawings illustrating the invention—

Figure 1 is a longitudinal section through the outer housing of the device, the inner parts being shown in elevation. The figure illustrates the device with all of the parts assembled and in position to be lowered into the well.

Figure 2 illustrates the device with the outer housing removed, a portion of the inner part being sectioned.

Figure 3 illustrates the device in operating position at the bottom of a well.

Figure 4 illustrates a modified form of the device.

Figure 5 illustrates another modified construction.

The device as illustrated in Figures 1, 2, and 3 includes an inner body member 1 comprising an elongated tube of relatively small diameter having an upstanding rigid bail 2 at its upper end whereby the device may be suspended, and a depending bail 3 at its lower end to which a main explosive may be attached. The lower end of tube 1 also has a cup-like collar 4 which receives and frictionally engages an outer housing 5 having an open bottom and having a suspension bail 6 at its upper end.

A plurality of spring wires 7 are secured to the lower portion of body 1 and these wires tend to thrust their upper ends outwardly, as shown in Figures 2 and 3. A sheet or web 8 of canvas, or similar flexible material, is applied over wires 7 much as the covering of an umbrella is applied to the ribs thereof. Wires 7 and web 8 may be folded or retracted and confined within housing 5, as illustrated in Figure 1.

During lowering of the device into a well, the same is suspended by bail 2 engaged by hook 9 carried on the ordinary line 10, and a main explosive charge D is attached to the lower bail 3. During such lowering, the connection 11 between line 10 and bail 6 on the housing has no function. If the bottom of the device comes to rest upon a firm support, further lowering of line 10 will disengage hook 9 from bail 2 and subsequent raising of line 10 will cause housing 5 to be pulled out of the cup 4 and disassembled from the remainder of the device, permitting the wires 7 to expand and, with fabric 8, form a substantial partition or closure for the well. Housing 5 may then be withdrawn and rock, sand, or other débris poured into the well to form a plug, as shown in Figure 3.

A time bomb, as indicated at 12, or a drop squib may be lowered into the well to detonate the explosive charge D, and in such an explosion the bridge and plug will serve to prevent dissipation of the force of the explosion upwardly and will also serve to prevent mud and other débris from being forced into the oil sand or productive formation by the explosion.

Preferably the inner body member 1 will be filled with explosive E which serves to insure the discharge of the main explosive mass D by the detonating device irrespective of the fact that there may be several feet of plugging material separating the main charge and the detonator. If for any reason it is desired not to use this feature of the device, the tube can be filled with ballast material to facilitate the lowering of the device through oil, water, and mud.

The device illustrated in Figure 4 involves a substantially larger body tube 15 which may be filled with explosive material and form in itself

he main explosive charge, the bridge forming ires 16 and fabric 17 being mounted preferably n the upper portion of the body 15 and the housng 18 being substantially shorter than the main ody 15 but long enough to receive and confine he bridge forming elements 16 and 15.

This device is shown in position to shatter a trata S of sand which does not extend to the ottom of the well, the device being supported in levated position by an anchor bar 19 as long as ecessary to position the device as desired.

The device is lowered into the well, the housing emoved, and the explosive discharge similarly to he operations described in connection with the howing of Figures 1 to 3.

Figure 5 illustrates the invention embodied in a ime bomb adapted to detonate a main explosive harge. In this structure the tubular body 20 ouses a battery 21 and clock 22, and wiring, ercussion-cap and primer equipment (not hown) such as are used in bombs of this general ype, and this portion of the device may embody he structure illustrated, for example, in Winder Murrow Patent 1,686,481. The lower portion 23 f the body will house a detonating charge. The pring elements 24 and fabric 25 will be confined y the housing 26 during lowering of the device nd will be released and form a bridge in a manner similar to that previously described. The nain explosive charge may be suspended from he bomb-bridge by a bail 27, or the main charge D—D may have been lowered into the well previously to the lowering of the bridge, and more han one of such main charge cartridges may ave been lowered into the well and supported at ifferent depths by using different lengths of anhor rods 28.

In this device, the weight of the bomb will be ufficient to resist the frictional engagement of he housing 26 by the ribs 24 so that the housing nay be pulled up off the remainder of the device fter the hook 29 is disengaged from the bomb ail 30.

In all forms of the device, the spring elements nd the fabric attached thereto pass through the vell without contact with the sides thereof and annot be injured or catch in such manner as to elease the weight on the cable and thereby deach the suspension hook before the desired depth s reached.

If it is desired to build up an explosive charge f greater depth than provided by cartridges, the longated central tube of the bridge device, being illed with explosive, forms a continuous detonating medium which would not be present if ordinary bridge structure were used, such as may be ormed by lowering yielding tree forks into the vell.

These and other objects and advantages obious to those skilled in the art are attained by he use of my invention, which may be embodied n forms other than the modifications illustrated, nd I contemplate the exclusive use of all modifiations coming within the scope of my claims.

I claim:

1. In a deep well bridge device, elements arranged to expand laterally to engage the sides of he well, a web between said elements arranged to partition the well when said elements expand, a tructure normally enclosing and confining said lements and web, and means for effecting withdrawal of said structure from said elements and veb after the device has been lowered into the vell.

2. In a deep well bridge device, a rigid body member, spring elements thereon tending to spread outwardly from said member to engage the sides of the well, a web between said elements arranged to partition the well when said elements spread outwardly, a housing of less diameter than the well normally receiving said body member and confining said elements, and means for removing said housing after the device has been lowered into the well.

3. In a deep well bridge device, an inner member, structure on said member including spring construction tending to thrust portions of the structure outwardly from said member, an open bottom tubular housing receiving said inner member and confining said structure in position closely alongside of said inner member, elements for suspending said inner member from a line, said elements being disengageable upon downward movement of said line relative to said member, and means connecting said line with said housing whereby the latter may be pulled up and separated from said inner member when said suspending elements are disengaged thereby releasing said spring structure so it may engage the sides of the well.

4. In a deep well bridge device, a body member having outwardly thrusting spring elements, a housing for enclosing and confining said spring elements, means providing frictional engagement between said member and housing to yieldingly hold them in assembled relation, and means for lowering and operating the device, said lowering means being normally attached to said inner member but constructed and arranged to be disengaged therefrom upon interruption of the downward movement of the device, and a connection between said line and housing for raising said housing and separating the same from said member against the frictional engagement thereof after said means has been disengaged.

5. In a deep well bridge device, a body member forming a substantially closed compartment for receiving loose material, spring ribs extending longitudinally and outwardly from said body member, an apron of canvas or similar flexible material applied to said ribs so as to be spread by the latter when they expand, a housing slidable over said body member, ribs, and apron with said ribs and apron in folded and compressed position, means for lowering said parts assembled as described into a deep well and then removing said housing to release said ribs and apron to form a bridge across the well.

6. In a deep well bridge device, an elongated tubular body for containing a detonating charge, outwardly thrusting spring elements secured to said body, flexible sheet material carried by said elements, said elements and material normally functioning to form a bridge, means at the lower end of said body for suspending a main explosive charge, a line connection at the upper end of said body, a housing for enclosing and confining said spring elements and sheet material so they cannot function as described, and means operable when the device is at the bottom of a well for withdrawing said housing from the other parts of the device.

7. In a deep well device, a body, a timing bomb therein, spring and web elements for forming a partitioning bridge structure mounted on the outside of said body, a housing for confining said structure in non-functioning position during lowering of the device into the well, and means for removing said housing from said body and elements

in the well to permit said structure to form a bridge.

8. In a deep well bridge device, a central member of substantially less diameter than the well in which the device is to be used, spring ribs extending longitudinally of the exterior of said member and tending to spring outwardly therefrom, a flexible apron carried by said ribs so as to be spread by the latter when they spring outwardly, a retainer slidable over said member, ribs, and apron with said ribs and apron in retracted position, means for lowering said parts assembled as described into a deep well and then operable to release said ribs and apron to form a partitioning bridge across the well.

HOWARD H. GREENE.