Jan. 21, 1941. H. L. McLAUGHLIN 2,229,581

WELL SHOOTING BRIDGE

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Fig. 1

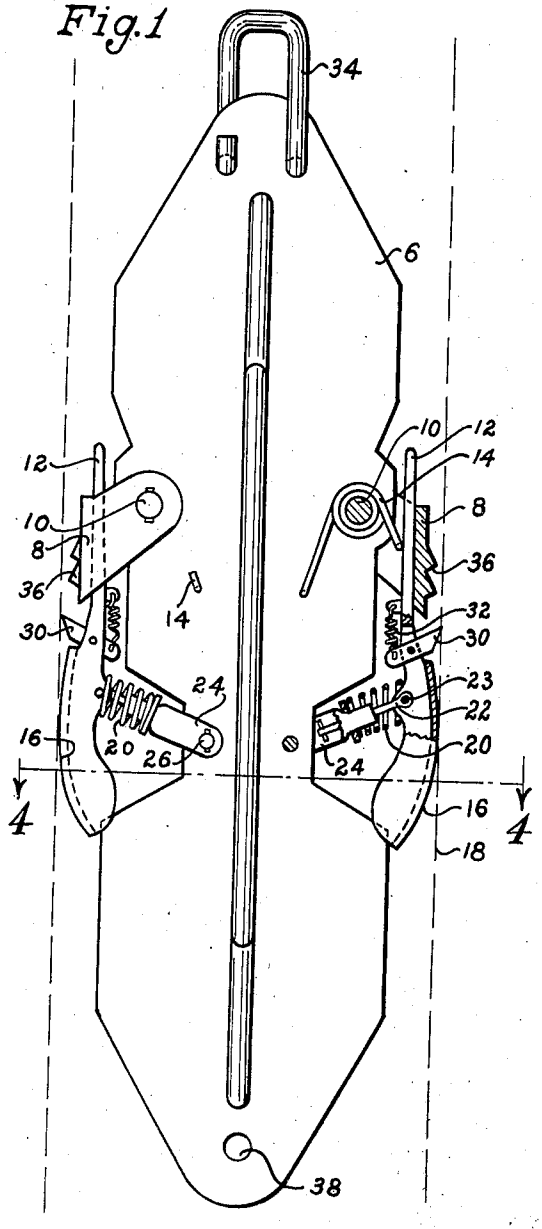
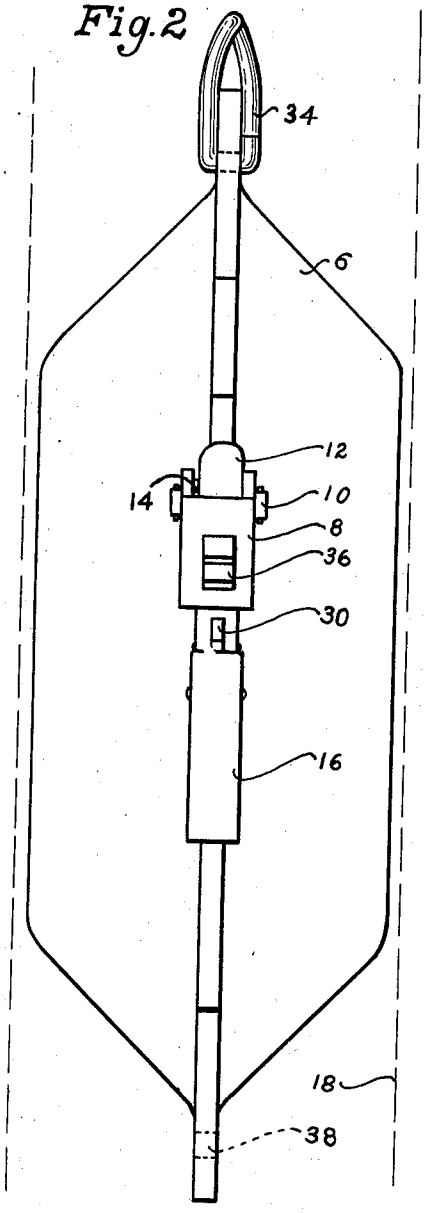


Fig. 2



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Fig. 3

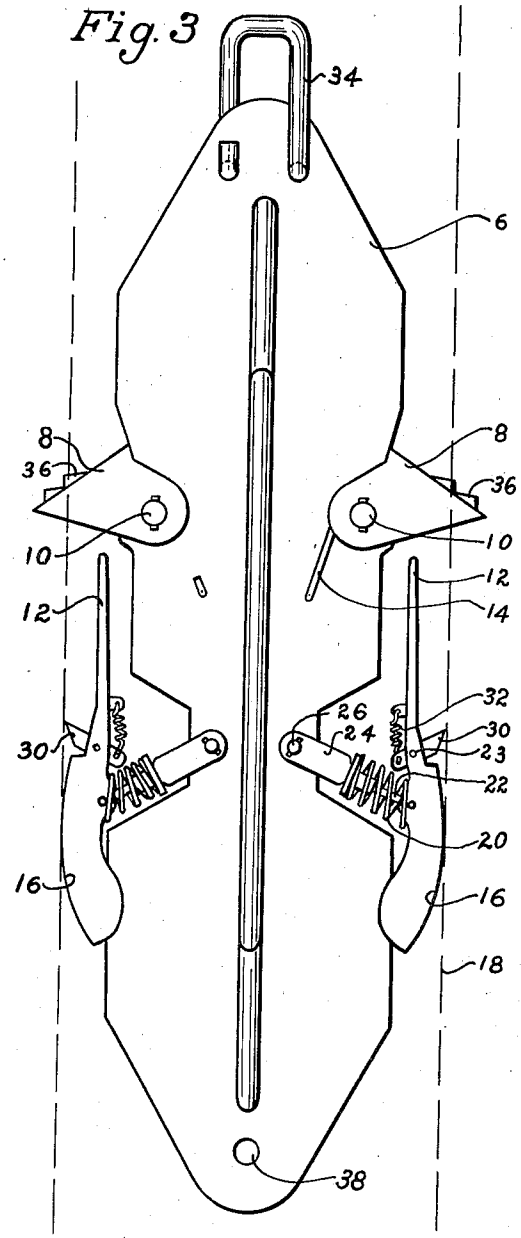


Fig. 4

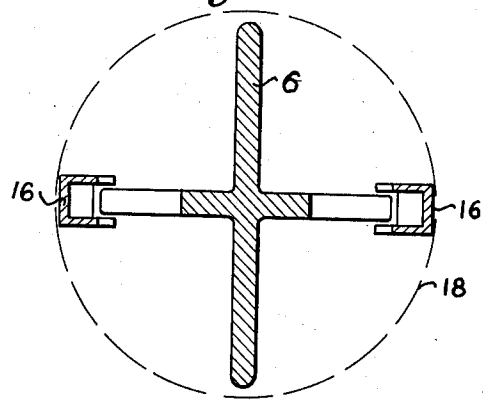


Fig. 5



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UNITED STATES PATENT OFFICE

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WELL SHOOTING BRIDGE

Hugh L. McLaughlin, Shamrock, Tex.

Application October 15, 1937, Serial No. 169,284

13 Claims. (Cl. 166—13)

This invention relates to an improvement in bridges used in connection with the shooting of oil wells with nitroglycerin or other explosives.

Various kinds of bridges have been suggested heretofore, but in general they had to be positioned at the desired depth in the well and held there under various conditions until the charge of nitroglycerin had been introduced and detonated.

The primary object of this invention is to successfully overcome these objections by providing a bridge that can be placed at any desired depth in a well and secured there against further downward movement.

Another object of this invention is to provide for the escape of gas from an obstruction in the well and at the same time holding in place a charge of nitroglycerin or other explosive until such time as the explosive is set off.

A preferred embodiment of this invention is set forth in the accompanying drawings, in which:

Fig. 1 is a side elevation of this improved bridge, partly in section;

Fig. 2 is a side elevation taken at right angles to Fig. 1;

Fig. 3 is a view similar to Fig. 1, showing the engaging lugs in set position;

Fig. 4 is a transverse section on the lne 4—4 of Fig. 1, looking in the direction indicated by the arrows; and

Fig. 5 is a perspective view of the lug spring detached.

With more detailed reference to the drawings, the numeral 6 represents the body of the tool which is formed of flat webs turned at right angles to each other, in the shape of a cross in cross section and having tapered upper and lower ends to facilitate the insertion into and removal from the well as shown in Figs. 1 and 2. The crossed shape of the body portion 6 causes it to obstruct the well sufficiently to permit a container of nitroglycerin or other explosive to be held firmly against downward movement thereby and yet permit the escape of gas from within the well, so that the bridge will not be moved upward by gas pressure.

Wall engaging lugs 8 are mounted on opposite sides of the body 6, each lug being U-shaped with its sides embracing an edge of the web, and being pivotally secured thereto by a pin 10. Triggers 12 extend upwardly within the U-shaped lugs 8 and bear thereagainst, being held firmly by a spring 14 coiled about each of the pins 10, with one end of each spring bearing against the trigger 12 and the other end anchored to the web. These springs 14 hold the triggers firmly in place as long as the device is moving downwardly in the well.

The lower end of each trigger 12 has a curved wall-engaging surface 16, adapted to slidably bear against the wall of the well, which is designated generally by the numeral 18, being pressed thereagainst by a coiled spring 20. The spring 20 is sleeved over a rod 22, pivoted at 23 to the inner side of the trigger 12, while the opposite end of the rod 22 is slidably received in a clevis 24, which in turn is pivoted by a pin 26 to the web of the body 6. The coiled spring 20 is interposed between the clevis 24 and the trigger 12, and the pivotal connection of the trigger with the body permits the former to move downward from the position shown in Fig. 1 to the position shown in Fig. 3, whereup the lugs 8 dig into the wall of the well upon the body being raised, as shown in Fig. 3.

A pawl 30 is pivotally mounted on each trigger 12 with its point directed outwardly against the wall of the well 18, where it is urged by a spring 32. On the downward movement of the bridge, the pawls 30 do not engage the wall of the well, but upon upward movement of the tool therein, the points of the pawls 30 engage in the wall of the well and cause the triggers 12 to slide downward from their normal positions shown in Fig. 1 to the positions shown in Fig. 3, the upper ends of the triggers being separated from the lugs 8 and permitting the springs 14 to act directly thereon. This causes the lugs 8 to be turned outwardly against the wall of the well and upon downward movement of the bridge therein, the lugs 8 will dig into the wall to the positions shown in Fig. 3. At this point, the maximum engagement of the lugs is afforded, having their points in horizontal alignment with the pivot pins 10.

After the lugs have become engaged with the wall of the well, the cable used in lowering the bridge into the well may be disconnected from eye 34 attached to the upper end of body 6, as by any suitable trip means, and the bridge is allowed to remain in the well.

After the tool has been placed at the desired depth in the well, upward movement of only a few inches is sufficient to cause the lugs 8 to engage the side walls. Teeth 36 are provided on lugs 8 to grip the walls of casing or hard formations and provide a more secure engagement, where their use is needed. Should it become necessary to remove the bridge before the well is shot it is only necessary to recouple the cable

with the eye 34 and raise the tool upward as the lugs 8 will disengage the formation and permit easy removal of the bridge. The pawls 30 only engage into the formation deep enough to cause the triggers 12 to slide downward. After the triggers 12 are moved downward out of engagement with lugs 8 and springs 14 the upper ends will swing inward into recesses just below lugs 8. This will cause pawls 30 to move inward sufficiently to clear the walls of the well, should it be desired to remove the bridge without shooting the well.

A hole 38 is provided in the lower end of the bridge so that additional weight may be attached if desired, as may be necessary when gas pressure is great.

After the bridge is located in the well in the correct position and before the nitroglycerin charge is placed thereon, a drilling tool or bailer may be lowered until its weight tests the hold of the lugs on the walls of the well.

Most of the parts of the bridge are preferably made of a material, such as cast iron, that is readily broken up by the force of the explosion and does not remain in the well as an obstruction, the pieces being blown into the formation.

The engaging lugs are shown on only two edges of the device, but it will be readily appreciated that they can be placed on as many of the edges as is deemed necessary or desirable.

It will be evident that the usual purpose of the "bridge" in shooting an oil well with nitroglycerin is to form an obstruction within the well at a point above the bottom, where an oil producing strata is located. After the bridge is "set" in place a container of nitroglycerin is lowered into the well and allowed to come to rest upon the bridge. The nitroglycerin is then detonated in the usual manner. The bridge holds the charge in place until it can be set off.

I claim:

1. In a well bridge, a body having a cross-section in the shape of a cross, lugs pivotally mounted on the sides of said body, trip means arranged for engagement with said lugs and normally holding the lugs retracted, pawls so connected with the trip means as to permit free downward movement but to engage the wall of a well upon upward movement of the body relative thereto to release the trip means from the lugs, said lugs being arranged for engagement with the wall of the well after being tripped but permitting upward movement of the body relative thereto, and resilient means tending to urge the trip means outward against the wall of the well.

2. A well shooting bridge comprising a body having lugs pivotally connected therewith, trip means for the respective lugs acting directly on said lugs normally holding said lugs retracted, said trip means being constructed for release from the lugs upon tripping, said lugs being constructed for engagement upon downward movement of the bridge after being tripped and being disengageable upon upward movement of said bridge, and pawls pivotally connected with the trip means and arranged to permit downward movement of the bridge and engaging walls of the well upon upward movement of the bridge relative thereto.

3. A well shooting bridge comprising a body having anchoring lugs pivoted thereto, triggers pivotally connected with the body and bearing on the lugs normally holding the lugs in set positions, said triggers being detachable from the lugs for releasing the same, and means for holding the triggers in retracted positions after disengagement from the lugs.

4. A well shooting bridge comprising a body having anchoring lugs pivoted thereto, triggers pivotally connected with the body and bearing on the lugs, said triggers having means for bearing against walls of the well, resilient means acting on the triggers, and pawls connected with the triggers in positions to engage the walls of the well.

5. A well shooting bridge comprising a body constructed substantially in the shape of a cross in cross-section, anchoring lugs pivoted to said body at different sides thereof, triggers pivotally and yieldably connected with the body and extending into operative connection with the lugs, said triggers having portions extending into positions to engage walls of the well, and pawls connected with the triggers in positions to engage the walls of the well.

6. A well bridge comprising a body, and means for anchoring said body in a well to receive thereupon an explosive charge, said body being constructed in cross section in the shape of a cross with open passageways therethrough from end to end when anchored in the well providing for the flow of fluid thereby from within the well.

7. A well shooting bridge comprising a body, and means for anchoring the body in a well, said anchoring means including a lug connected with the body for outward movement relative thereto, resilient means in position to bear against the lug to move the same outward, means interposed between the lug and said resilient means, normally tending to prevent outward movement of the lug by the resilient means, and trip means connected with said interposed means for withdrawing the same for outward movement of the lug by the resilient means.

8. A well shooting bridge comprising a body, and means for anchoring the body in a well, said anchoring means including a lug connected with the body for outward movement relative thereto, resilient means in position to bear against the lug to move the same outward, means interposed between the lug and said resilient means, normally tending to prevent outward movement of the lug by the resilient means, and wall engaging means connected with said interposed means for withdrawing the same for outward movement of the lug by the resilient means.

9. A well shooting bridge comprising a body, and means for anchoring the body in a well, said anchoring means including a lug connected with the body for outward movement relative thereto, resilient means in position to bear against the lug to move the same outward, and a trigger having a wall engaging portion and a portion extending between the resilient means and the lug to prevent outward movement of the lug by the resilient means.

10. A well shooting bridge comprising a body, and means for anchoring the body in a well, said anchoring means including a lug connected with the body for outward movement relative thereto, resilient means in position to bear against the lug to move the same outward, a trigger having a wall engaging portion and a portion extending between the resilient means and the lug to prevent outward movement of the lug by the resilient means, and a pawl pivotally connected with the wall engaging portion of the

trigger in position to engage the wall to hold the trigger against movement relative thereto.

11. A well shooting bridge comprising a body, and means for anchoring the body in a well, said anchoring means including a lug connected with the body for outward movement relative thereto, resilient means in position to bear against the lug to move the same outward, and a trigger having a wall engaging shoe and an extended arm interposed between the resilient means and the lug to prevent outward movement of the lug by the resilient means, means pivotally supporting said trigger on the body, and resilient means bearing against the shoe tending to move the same against the wall.

12. A well shooting bridge comprising a body, a plurality of lugs connected with the body on different sides thereof, each of said lugs being U-shaped and embracing a portion of the body and pivoted thereto, resilient means arranged within each U-shaped lug in position to bear upwardly thereon, and a trigger for each lug having a portion interposed between the resilient means and said lug tending to prevent outward movement of the lug by said resilient means.

13. A well shooting bridge comprising a body, a plurality of lugs connected with the body on different sides thereof, each of said lugs being U-shaped and embracing a portion of the body and pivoted thereto, resilient means arranged within each U-shaped lug in position to bear outwardly thereon, a trigger for each lug having a portion interposed between the resilient means and said lug tending to prevent outward movement of the lug by said resilient means, said trigger having a wall engaging shoe, means supporting the trigger for movement relative to the body, and a pawl pivotally connected with the trigger in position to engage the wall of the well.

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