

Nov. 19, 1929.

J. D. NIXON

1,736,009

JOINT BREAKING APPARATUS

Filed April 18, 1927

4 Sheets-Sheet 1

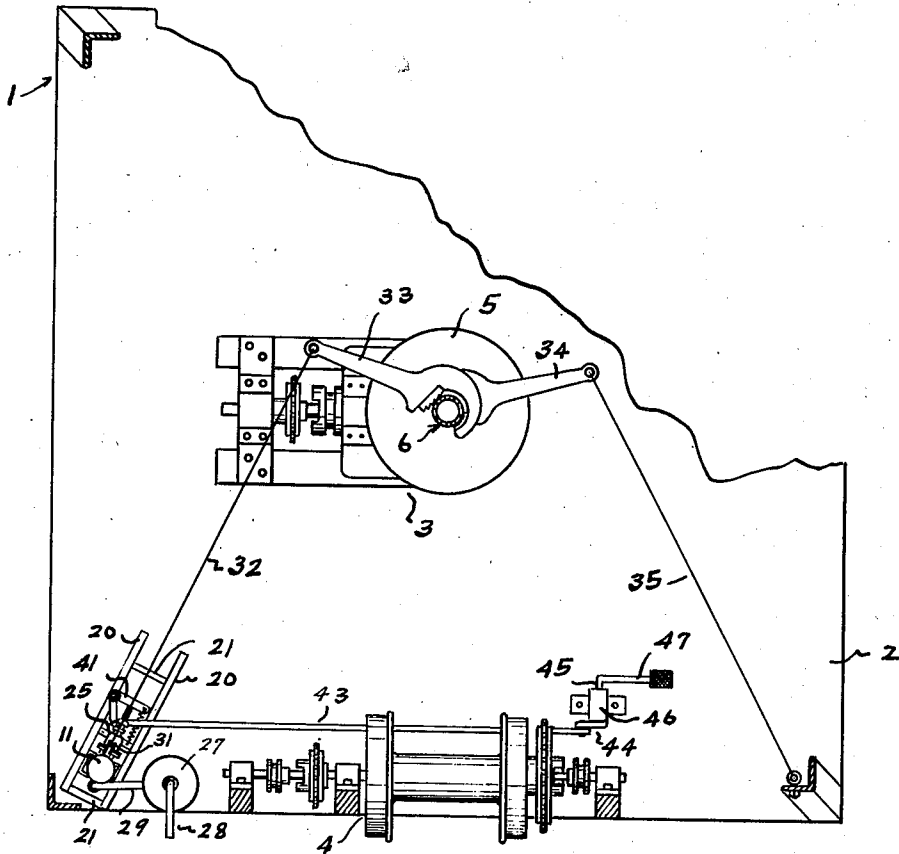


Fig. 1.

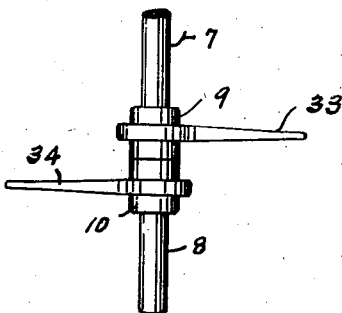


Fig. 2.

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4 Sheets-Sheet 2

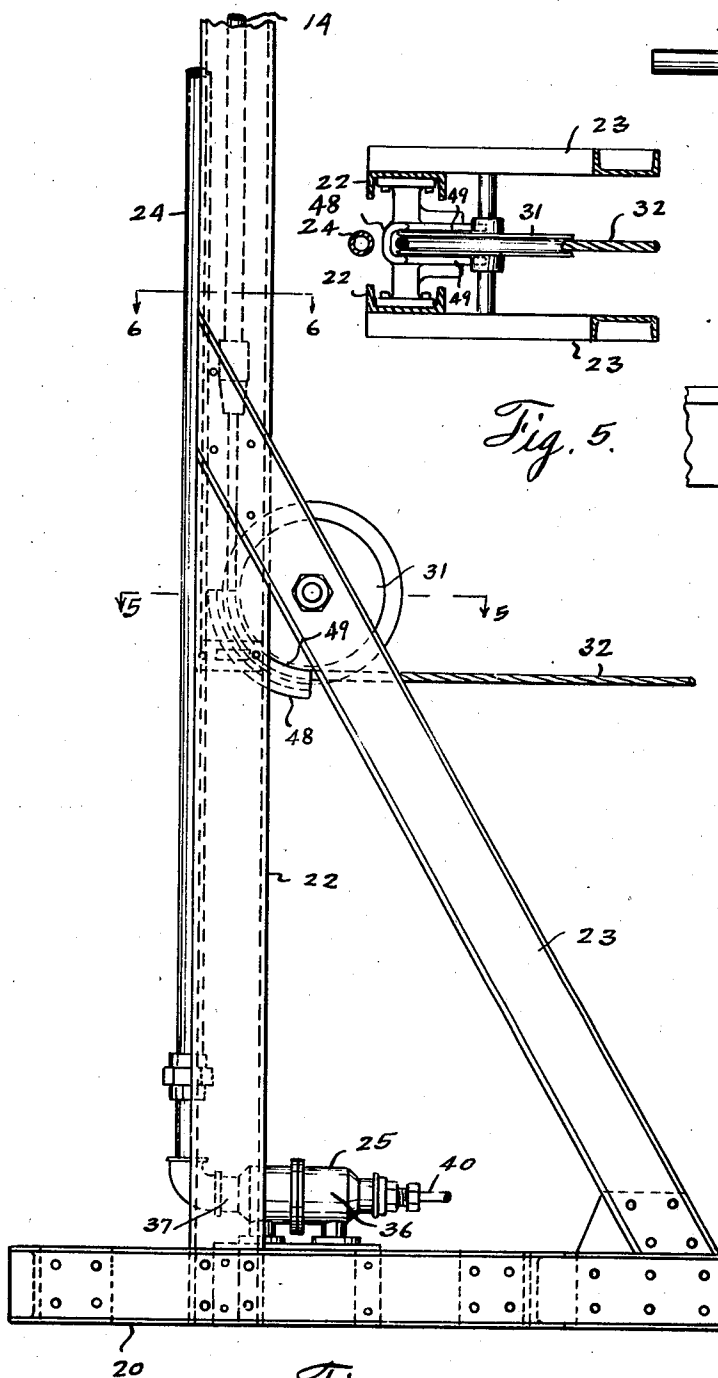


Fig. 3.

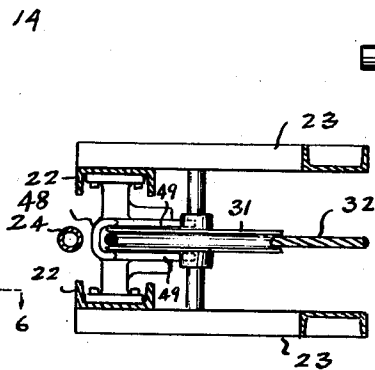


Fig. 5.

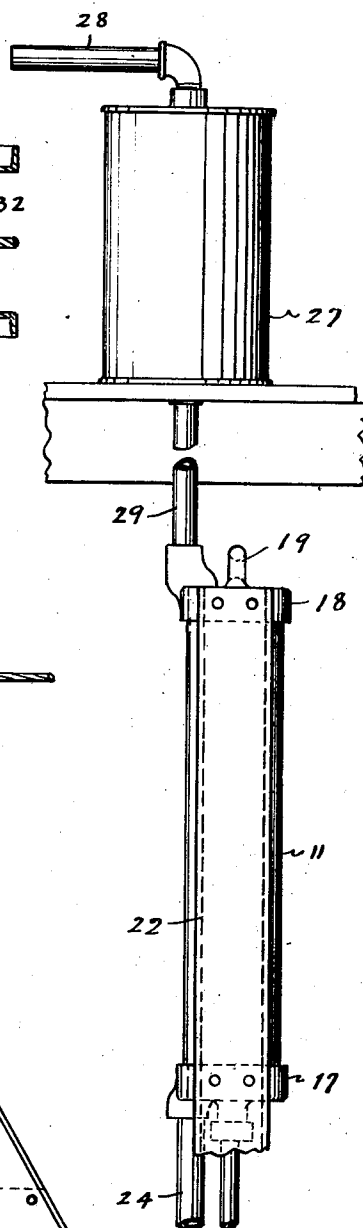


Fig. 4.

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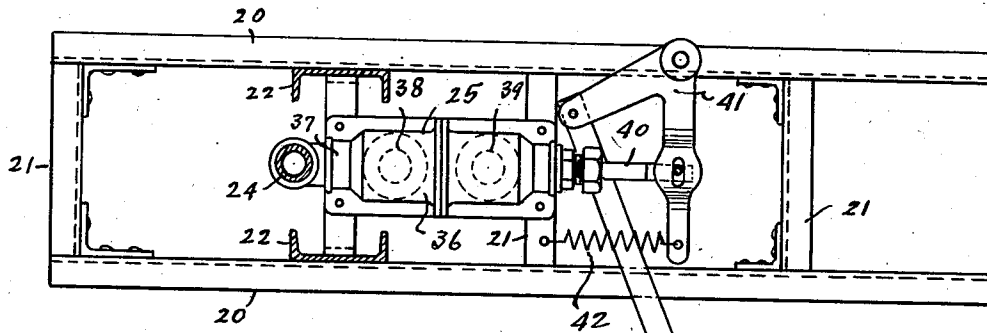


Fig. 6.

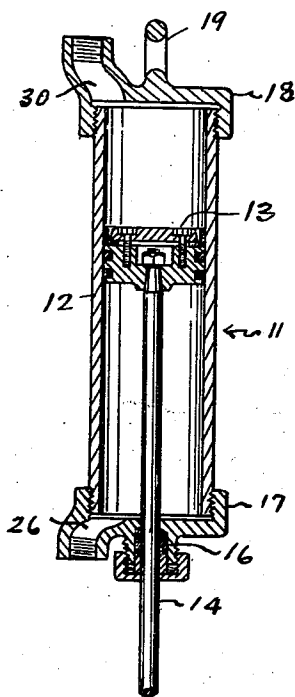
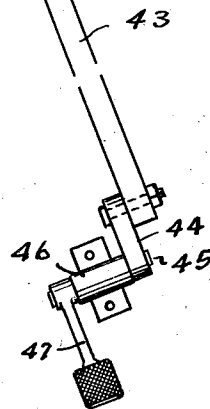


Fig. 7.



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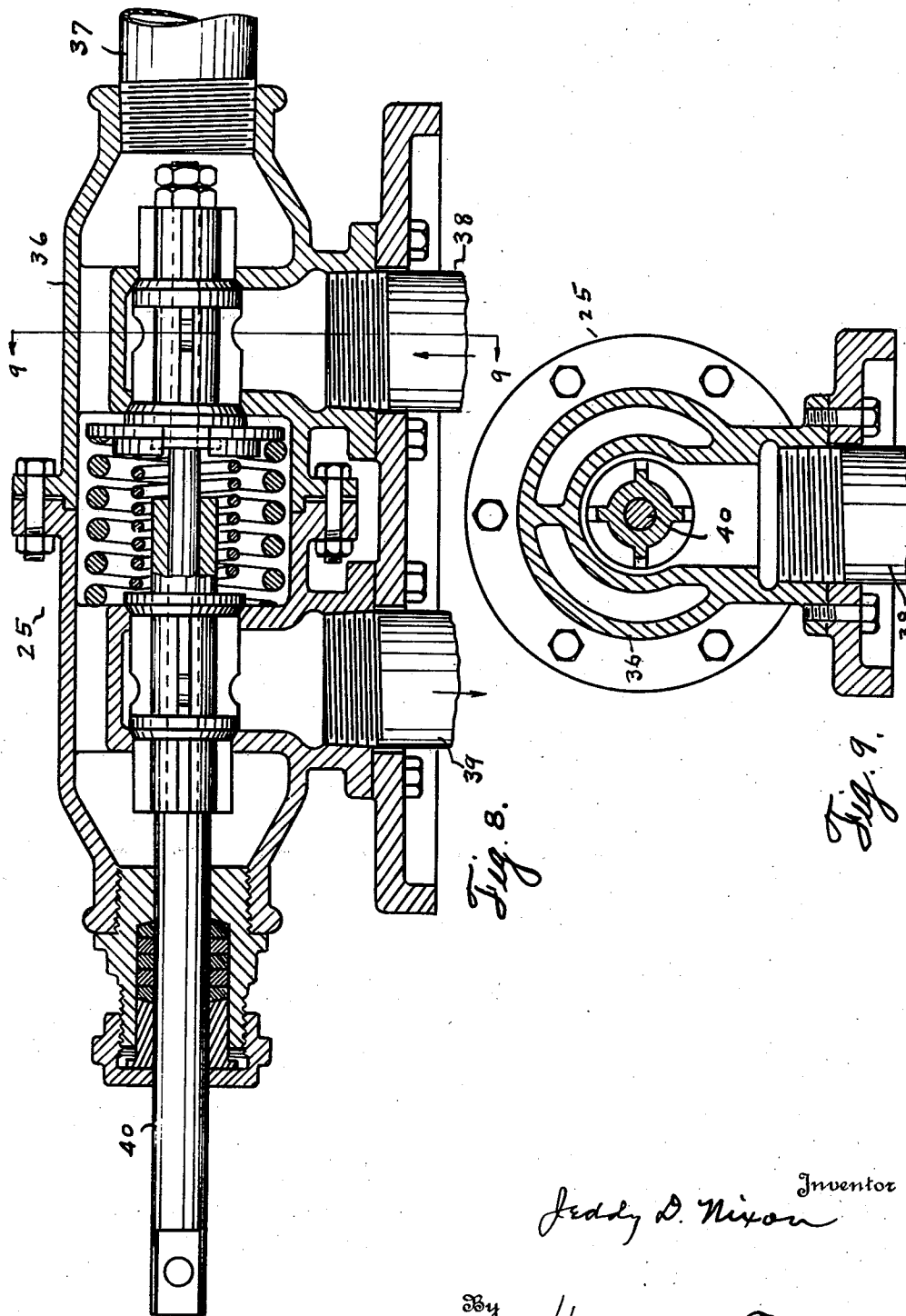
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1,736,009

JOINT BREAKING APPARATUS

Filed April 18, 1927

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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JOINT-BREAKING APPARATUS

Application filed April 18, 1927. Serial No. 184,617.

One object of the invention is to provide a novel apparatus of the character described specially designed for the purpose of breaking, or loosening the joints of a rotary drill stem, or other pipe, used in drilling oil or other wells.

Another object of the invention is to provide a power actuated means, or gun, for rotating or unscrewing, one member of the joint to be broken while the other member of the joint is held against rotation and the invention embodies a construction in which the tong actuating element will return automatically into active position after each power stroke thereof, so as to be in position for application to another joint to be broken.

A further feature of the device resides in a novel means for cushioning, or retarding, the tong actuating element, upon the application of power thereto, so as to diminish the violence of the power stroke of said element, after the joint has been broken.

With the above and other objects in view this invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:—

Figure 1 shows a fragmentary cross sectional view of a derrick showing a rotary drilling machine, and draw works mounted thereon, and showing the joint breaking apparatus associated therewith.

Figure 2 shows a fragmentary side elevation of a drill stem with breaking tongs applied, one to each joint member connecting adjacent sections of said stem.

Figure 3 shows a side view of the lower end of said apparatus.

Figure 4 shows a side view of the upper end thereof.

Figure 5 shows a cross sectional view thereof, taken on the line 5—5 of Figure 3.

Figure 6 shows a cross sectional view thereof taken on the line 6—6 of Figure 3.

Figure 7 shows a longitudinal sectional view of the gun employed.

Figure 8 shows a longitudinal sectional view of a controlling valve employed, and

Figure 9 shows a cross sectional view taken on the line 9—9 of Figure 8.

Referring now more particularly to the drawings, wherein like numerals of references designate similar parts in each of the figures, the numeral 1 designates the derrick as a whole having the floor 2 whereon a rotary drilling machine 3 and the draw works 4 are mounted and which are of conventional and well known construction. Extending vertically through the table 5 of the rotary drilling machine there is a drill pipe 6, which is made up of sections, as 7, 8, whose ends are connected by the tool joint members 9 and 10, the former having a pin which is outwardly threaded and screwed into an inwardly threaded box, of the other member.

The parts hereinabove described are of conventional construction and form no part of this invention. This invention comprises a breaking gun 11 which includes a vertically disposed cylinder 12, a piston 13 and a piston rod 14 whose upper end is connected to said piston and which works through the stuffing box 16, carried by the lower head 17 of the cylinder which is screwed on to the lower end of said cylinder. Screwed onto the upper end of the cylinder there is an upper head 18 which is formed with an eye 19 by means of which the gun may be handled, or elevated into position. Mounted on the derrick floor there is a gun supporting frame or bracket having a base composed of the foot, or side members 20, 20, suitably anchored together by the cross braces 21, 21, and upstanding from which are the spaced side supports 22, 22, which are braced by the angle bars 23, 23, and between the upper ends of which the gun 11 is mounted, the lower and upper head 17, 18, of the gun being bolted to said side supports 22, 22, as illustrated in Figure 4. A fluid pressure line 24 leads from a controlling valve 25 into the lower end of the cylinder through the inlet conduit 26 into which the upper end of said line 24 is connected. Mounted in the derrick above the gun 11 there is a fluid container 27 having the overflow outlet 28 connected into its upper end and the pipe 29 has one end connected into the lower end of the container 27 and its

other end is connected into the cylinder 12 above the piston 13 through the conduit 30 into which the lower end of the pipe 29 is connected. Rotatably mounted between the angle bars 23 there is a pulley 31 and a cable or other flexible line 32 is connected to the lower end of the piston rod 14 and operates around said pulley 31 and has its other end connected to the outer end of the handle of the tong 33, which is applied to the pin member 9 of the drill pipe. Another tong as 34 is applied to the box member 10 of the drill pipe joint. The outer end of the tong 34 is connected to one end of the cable 35, the other end of said cable being connected to the leg of the derrick so that said tong 34 will hold the joint member 10 against turning. These tongs 33, and 34 may be suspended in the derrick if desired in the conventional and well known manner. The valve 25 is provided for the purpose of controlling the application of steam or other pressure fluid to the gun and any conventional type of valve suitable for this purpose may be employed. The valve shown is of the general type of balanced valve mechanism described in my copending application filed October 26, 1926, under Serial No. 144,215, and embodies the valve casing 36 and fluid pressure line 24 is connected into the fluid pressure chamber of the valve by means of the suitable nipple 37. Fluid pressure is supplied to said chamber through the supply line 38 and is exhausted through the exhaust line 39. The controlling valves within said casing are connected to and operated by the valve rod 40 whose outer end is connected, at an intermediate point, to one arm of the bell crank 41 and the free end of this arm has a pull spring 42 connected thereto at one end and whose other end is connected to one of the cross bars 21 connecting the side members 20 and this spring, normally operates to hold the valve closed. One end of the reach rod 43 is connected to the free end of the other arm of the bell crank 41 and its other end is pivotally connected to the free end of the downwardly extended arm 44 which is fixed on one end of the stub shaft 45, rotatably mounted in a bearing 46 mounted on the derrick floor. A foot pedal 47 is fixed to the other end of the shaft 45. By pressure on this pedal the valve may be opened and fluid under pressure thus admitted through the line 24 into the cylinder 12 beneath the plunger and said plunger will be thereupon forced upwardly whereupon a sudden pull will be exerted on the tong 33 through cable 32 and the box member 10 being held by the tong 34 the pin member 9 will be suddenly turned and partially unscrewed, thus breaking the joint. The joint being broken the upper section 7 may then be readily unscrewed and detached from the lower section 8 in any desired manner.

When fluid, under pressure, is applied to

the plunger 13 it is actuated with considerable force, the same being required to break the joint but when the joint is broken the violence of the pressure stroke should be cushioned or diminished. The container 27 is kept filled, or partly filled, with water, or other fluid, so that the plunger, on a power stroke will work against the fluid in the cylinder 12 above the plunger 13 and gradually force the same up through the pipe 29 into said container, thus producing the desired result.

When the pedal 47 has been depressed it should then be immediately released and the spring 42 will close the valve 25 and prevent further inlet of the pressure fluid and the valve structure is such as to then permit the discharge of the pressure fluid from the cylinder 12 underneath the plunger 13 through the line 24 and out through the discharge 39. The plunger 13 will descend by gravity, assisted by the pressure of the fluid above it from container 27 and will thus be automatically restored to active position, that is, in position so that when the tong 32 is again applied to the joint member 9 the plunger 13 will be in position to impart another power stroke upon application by fluid pressure thereto, as hereinabove explained.

In order to retain the cable 32 on the pulley 31 an arcuate guide 48 is anchored between the side supports 22 and has the arcuate side flanges 49, 49, which embrace the adjacent side of the pulley and serve to confine said cable on said pulley.

What I claim is:—

1. A joint breaking apparatus comprising gripping means adapted to be applied to a pin and a box of a drill pipe joint a breaking gun fixed in approximately vertical position, said gun including a cylinder, a plunger therein movable in one direction by gravity and in the other direction by fluid pressure means for applying a liquid cushion against the plunger as it moves in the last named direction, a flexible member adapted to connect one of said gripping means to said plunger.

2. A joint breaking apparatus comprising gripping means adapted to be applied to a pin and box of a drill pipe joint, a breaking gun fixed in approximately vertical position, said gun including a cylinder, a plunger therein movable in one direction by gravity and in the other direction by fluid pressure, liquid containing tank above and connected in to the upper end of the cylinder, a flexible member adapted to connect one of said gripping means to said plunger and a guide over which the flexible member operates.

3. A joint breaking apparatus including gripping means adapted to be applied to the pin and box of a pipe joint, a breaking gun fixed in approximately vertical position

and including a cylinder and a plunger therein, means for supplying fluid under pressure into the cylinder on one side of the plunger and for relieving the pressure fluid therefrom, means for applying static liquid
 5 pressure against the other side of the plunger, a flexible member connecting said plunger and one of said gripping means and a guide over which said flexible member operates.

10 4. A joint breaking apparatus including gripping means adapted to be applied to the pin and box of a drill pipe joint, a breaking gun comprising a cylinder, a plunger in the cylinder, means connecting the plunger
 15 to one of said gripping means, means for supplying static fluid into, and for relieving the same from, the cylinder on one side of the plunger and means for supplying fluid under pressure into, and for relieving the
 20 same from, the cylinder on the other side of the plunger.

5. A joint breaking apparatus including gripping means adapted to be applied to the pin and box of a drill pipe joint, a break-
 25 ing gun comprising a cylinder and a plunger therein, means for connecting said plunger to one of said gripping means, means for applying fluid under pressure into the cylinder on one side of the plunger to actuate
 30 said plunger in one direction to break said joint, and means for supplying other fluid with constant uniform pressure into the cylinder on the other side of said plunger, said last named means permitting the es-
 35 cape of said other fluid when said plunger is so actuated.

6. A joint breaking apparatus including gripping means adapted to be applied to the pin and box of a drill pipe joint, a break-
 40 ing gun comprising a cylinder, a plunger in the cylinder, means connecting the plunger to one of said gripping means, means for applying fluid under pressure into the cylinder on one side of the plunger, a fluid
 45 container above the cylinder and a pipe connecting said container into the cylinder on the other side of said plunger.

7. A joint breaking apparatus including a gripping means adapted to be applied
 50 to a pin and box of a pipe joint, a breaking gun having a movable element, means for connecting said movable element to one of said gripping means, means for apply-
 55 ing fluid under pressure to the gun to actuate said element in one direction to break said joint and other means for supplying liquid to the gun to retard such actuation of said element.

8. A joint breaking apparatus including
 60 gripping means adapted to be applied to a pin and box of a pipe joint, a breaking gun including a movable element, means for connecting said movable element to one of
 65 said gripping means, means for supplying fluid under pressure to the gun, on one side

of said element to actuate it in one direction to break said joint and means for supplying liquid to the gun on the other side of said element.

In testimony whereof I have signed my name to this specification. 70

JEDDY D. NIXON.

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