

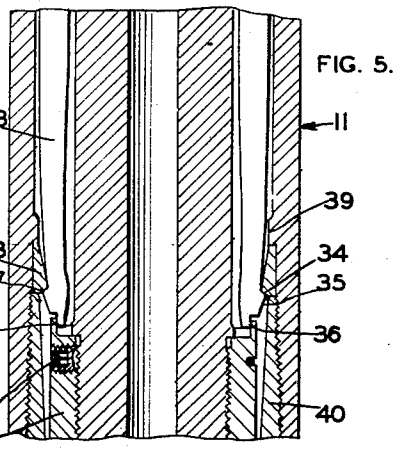
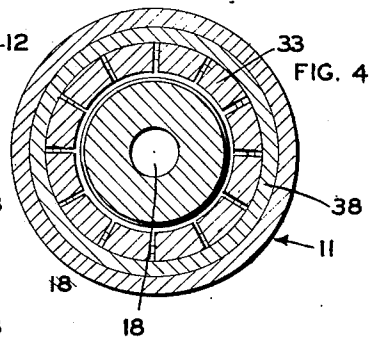
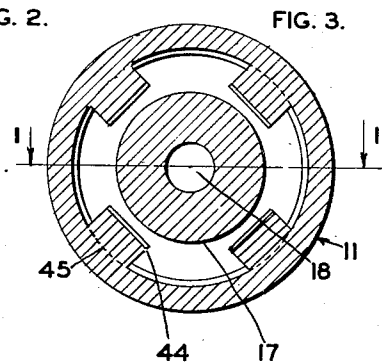
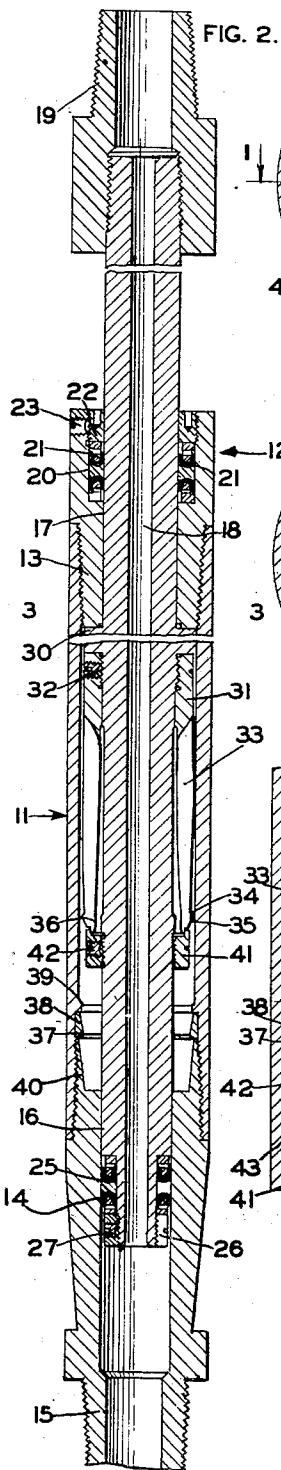
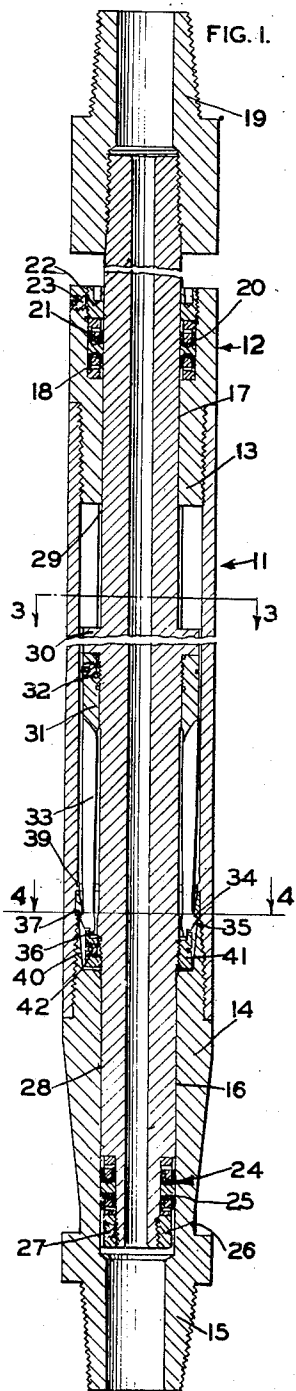
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L. W. NEWSOM

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JAR FOR DRILLING OPERATIONS

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INVENTOR  
LEWIS W. NEWSOM

BY *Hazardous Miller*

ATTORNEYS

# UNITED STATES PATENT OFFICE

LEWIS W. NEWSOM, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO ERWIN BURNS AND  
GEORGE M. BOULTER, BOTH OF LOS ANGELES, CALIFORNIA

## JAR FOR DRILLING OPERATIONS

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My invention is a jar for drilling operations for removing bits and other tools from a well.

An object of my invention is the construction of a jar suitable for a rotary drilling tool in which a straight upward pull actuates the jar without a rotary movement if the pull becomes excessive; that is, if the drill or other tool is stuck in the well.

A further object of my invention is a construction by which the jarring elements of the tool may be reconnected by a straight downward movement of the mandrel and on subsequent upward pulls the jarring stroke may be produced.

Another object of my invention is constructing a jar in which the interior of the shell may be filled with oil and having a suitable packing so that the mandrel may slide freely up and down, the oil being transferred from one position to another to allow the jarring action without retarding or lessening the force of the stroke.

A further object of my invention is the construction limiting the outward movement of the spring fingers so that when the mandrel and shell are released these fingers will not come in contact with the shell.

In my invention I utilize a cylindrical shell with a capping piece forming a mandrel secured thereto by internal threads; and at the bottom I employ a shoe-type of structure which may have a pin for connecting to a drill or other suitable tool. A tubular mandrel is slidably mounted in the capping piece and in the shoe and has a heavy annular portion forming a hammer to strike against the anvil of the capping piece. Below the hammer I have a collar with depending spring fingers, these fingers being tensioned to spring outwardly and engage a ring fixedly secured to the shell with a beveled engagement to allow slippage when the upward pull becomes excessive.

The mandrel may be connected to a drilling string and rotation is transmitted from the mandrel to the shell by means of splines and keys fitting therein. On the mandrel below the ends of the spring fingers I have an adjustable collar with a rim, this rim engaging

the lower ends of the spring fingers when they spring outwardly and limit the movement so that the fingers do not come in contact with the shell. On the capping piece and at the lower end of the mandrel I provide packings to prevent escape of oil in the movement of the mandrel.

My invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a vertical section through my jarring tool in position for drilling operation, this section being on the line 1—1 of Fig. 3 taken in the direction of the arrows,

Fig. 2 is a section similar to Fig. 1 which shows the position of the tool at the instant of the jarring impact; that is, with the mandrel pulled upwardly,

Fig. 3 is a horizontal section on the line 3—3 of Fig. 1 in the direction of the arrows,

Fig. 4 is a horizontal section on the line 4—4 of Fig. 1 in the direction of the arrows,

Fig. 5 is a partial elevation of Fig. 1 on an enlarged scale showing the engagement of the spring fingers and the ring on the shell.

In constructing my invention I utilize a cylindrical shell 11 which has a capping piece 12 secured at the upper end, this having an internal screw-threaded connection and part of the capping piece fitting against the upper edge of the shell. The lower section of the capping piece inside the shell forms the anvil 13. At the lower end of the shell there is secured an elongated tubular shoe 14; this having an internal screw-threaded connection and abuts against the lower edge of the shell. This shoe is provided with a pin 15 at the lower end adapted for attachment of a drill or a lower string of drill pipe. The shoe has a bore 16 and the capping piece has a bore 17 of the same diameter.

The mandrel designated generally by the numeral 18 is formed tubular and has a pin 19 screw threaded on the upper end for attachment to a string of drill pipe. The mandrel passes through the bore 17 in the capping piece, there being a counterbore 20 with packing 21 therein. The packing is held in place by a ring 22 screw threaded in the counterbore 20 and retained by set screws 23. This construction prevents leakage of oil past the

mandrel in its up and down movement. The bottom of the mandrel is provided with a reduced end 24 having packing 25 mounted therein held in place by a ring 26 with a rotating set screw 27. This lower packing confines the oil at the lower end of the mandrel. This lower part 28 of the mandrel slides in the bore 16 and therefore is of the same diameter as the upper portion 29 of the mandrel.

An enlargement on the mandrel forms a hammer structure 30 which is adapted to strike against the anvil 13 connected to the shell in a manner hereunder set forth.

A collar 31 is screw threaded on the mandrel immediately below the hammer section, being held in place by set screws 32; and projecting downwardly from this collar there are a plurality of spring fingers 33. Each of these fingers has an outwardly sloping shoulder 34 adjacent the lower end, and an inwardly beveled portion 35 therebelow. A fingertip portion 36 forms the ends of the fingers.

The shoulders 34 engage a sloping annular surface 37 on an abutment ring 38 which is fitted internally of the shell and this ring bears against an abutment section 39 of the shell and is maintained in its uppermost position by a threaded upper extension 40 of the shoe. An adjustable collar 41 is threaded on the mandrel below the fingers and has an upwardly extending rim 42 adapted to engage the tips 36 of the fingers. This collar is maintained in place by set screws 43. The enlarged hammer section of the mandrel is constructed with a plurality of longitudinal splines 44 in which fit keys 45 constructed internally of the shell. These allow a relatively sliding motion of the mandrel and the shell and are utilized to transmit rotation from the mandrel to the shell.

The manner of operation and functioning of my jar is substantially as follows: In Fig. 1 the tool is shown in a position for drilling; that is, the fingers are caught underneath the abutment ring 38, and when in this position a rotary driving force may be transmitted to the bit. Presuming the bit is stuck and requires a jarring operation to release it an upward tension is exerted on the drill string, and when the tension is sufficient the spring fingers are forced inwardly due to the contact of the abutment 34 on the fingers engaging the annular sloping surface 37 on the abutment ring 38.

Therefore, the fingers are caused to release and allow the upward movement of the mandrel relative to the shell. This causes a jarring blow to be delivered by the hammer section 30 of the mandrel against the anvil section 13 of the capping piece secured to the shell. In the upward movement of the mandrel the spring fingers which are normally tensioned to spring outwardly can do so to

the limit caused by the fingertips 36 engaging the rim 42 of the ring 41. This prevents the fingers contacting with the inner surface of the shell.

Another feature of my invention is that the interior space between the mandrel and the shell may be filled with oil; therefore, the space between the spring fingers and the vat between the hammer section and the anvil when in its lower position may carry oil, and there is sufficient space to allow a free upward and downward flow of this oil in the jarring operation without lessening the force of the jarring blow. This oil is prevented from leaking outwardly by the packing at the top and bottom of the mandrel, and prevents the slushing fluid from working into the shell. With my construction there is no tendency of the mandrel in the jarring operation of exerting a pumping action as there is sufficient space for the to and fro movement of the oil in the shell between the capping piece and the shoe. Thus there is no tendency to force oil out of the shell.

It will be noted that the tubular mandrel 18 is provided with a central bore 18', which at all times establishes unobstructed communication between the length of tubing into the lower end of which the pin 19 is screwed, and the length of tubing into the upper end of which the pin 15 is screwed. Thus at all times a continuous flow of fluid may take place to and through the jar structure irrespective of the relative longitudinal position of the jar elements.

Attention is also called to the fact that while desirable limited longitudinal movement between the mandrel 18 and its shell 11 may be affected, it is also possible to impart rotary movement from the mandrel to the shell at all times by a simple method of manipulation.

Various changes may be made in the principles of my invention without departing from the spirit thereof, as set forth in the description, drawings and claims.

I claim:

1. In combination with a tubular drill string, a jar interposed at a point in the length thereof, said jar comprising a tubular shell secured to one length of said drill string, a tubular mandrel secured to the other length of said drill string and telescoping into the shell, means forming a fluid seal between the shell and the mandrel whereby fluid may have unrestricted flow through the drill string and the jar without leaking therefrom, means permitting limited longitudinal movement between the jar and shell to create a jarring action, and means normally holding said mandrel and shell against relative longitudinal movement while releasing under excessive pull to permit said jarring action, the last named means including fingers mounted on the mandrel and a latch construction having

a portion of the fingers interengaging with a sloping abutment structure connected with the shell.

2. In combination with a tubular drill string, a jar interposed at a point in the length thereof, said jar comprising a tubular shell secured to one length of said drill string, a tubular mandrel secured to the other length of said drill string and telescoping into the shell, means forming a fluid seal between the shell and the mandrel whereby fluid may have unrestricted flow through the drill string and the jar without leaking therefrom, means permitting limited longitudinal movement between the jar and shell to create a jarring action, means normally holding said mandrel and shell against relative longitudinal movement while releasing under excessive pull to permit said jarring action, the last named means including fingers mounted on the mandrel and a latch construction having a portion of the fingers interengaging with a sloping abutment structure connected with the shell, means to impart rotary motion from one element of the jar to the other, irrespective of the longitudinal relationship of said elements.

3. A drilling jar comprising in combination a shell, a mandrel slidable therein, having a plurality of spring fingers mounted thereon, a latch construction having a portion of the fingers interengaging with a sloping abutment structure connected to the shell holding the mandrel in a lower position, said latch construction releasing on a straight upward pull on the mandrel, and interacting means between the mandrel and the shell to give a jarring blow.

4. A drilling jar as claimed in claim 3, a restraining means mounted on the mandrel and limiting the outward movement of the spring fingers after release of the latch construction.

5. A drilling jar comprising in combination a shell, a mandrel slidable therein and having means adapted to convey rotation to the shell, a plurality of spring fingers connected to the mandrel, a latch construction utilizing the lower portion of said fingers, an abutment structure on the shell, said latch construction releasing on a straight upward pull on the mandrel, and interacting means on the mandrel and the shell to give a jarring blow.

6. A drilling jar as claimed in claim 5, the spring fingers being connected to a collar mounted on the mandrel.

7. A drilling jar as claimed in claim 5, an adjusting collar mounted on the mandrel and having a rim to engage the tip ends of the fingers limiting their outward movement.

8. A drilling jar comprising in combination a shell, a mandrel slidably mounted therein and having a collar with a plurality of spring fingers connected thereto, said spring

fingers having inclined shoulders engaging an abutment ring on the shell and forming a latch construction, the fingers being releasable from the abutment ring on a straight upward pull on the mandrel, and interacting means between the mandrel and the shell to give a jarring blow.

9. A drilling jar as claimed in claim 8, the shoulders on the fingers being outwardly and downwardly sloping and engaging an upwardly and inwardly sloping annular surface on the abutment ring.

10. A drilling jar comprising a shell having an anvil connected thereto, a mandrel having a hammer section slidably mounted in the shell and having means adapted to transmit rotary motion, a collar mounted on the mandrel and having spring fingers extending downwardly therefrom, each having an abutment engaging with an abutment ring secured to the shell, an adjusting ring mounted on the mandrel and having a rim to engage the tip ends of the fingers and restrain their outward movement, said fingers being releasable from the abutment ring on a straight upward pull on the mandrel, the hammer striking the anvil on such release and giving a jarring blow.

11. A drilling jar as claimed in claim 10, the anvil forming part of the capping piece mounted on top of the shell, a shoe connected to the lower part of the shell with the lower part of the mandrel slidable therein, and a packing between the mandrel and the capping piece and the mandrel and the shoe.

12. A drilling jar comprising in combination a shell having a capping piece at the upper end with a portion forming an anvil and a shoe at the lower end, a mandrel slidably mounted in the capping piece and the shoe and having a hammer structure with means adapted to transmit rotation to the shell, a collar mounted on the mandrel and having spring fingers each with a sloping shoulder, an abutment ring secured to the shell engaging the said shoulders, an adjusting collar mounted on the mandrel and having a rim engaging the tip ends of the fingers, a packing in the capping piece bearing against the mandrel, and packing in the lower end of the mandrel bearing against the shoe.

13. A drilling jar comprising a shell, a mandrel slidable therein, a latch structure interconnecting the mandrel and the shell, said latch structure being releasable on an upward pull of the mandrel, means to convey a striking blow from the mandrel to the shell, there being a hollow space in the shell between same and the mandrel, with space to allow free flow of oil from one portion to the other during the striking blow without forcing the oil outwardly from the shell.

14. A drilling jar comprising in combination a shell having a capping piece at the top

and a shoe at the bottom, a mandrel slidable  
in the capping piece and the shoe, a latch  
structure interconnecting the mandrel and  
the shell, said latch structure being releasable  
6 on an upward pull of the mandrel, means to  
convey a jarring blow between the mandrel  
and the shell, there being a space in the shell  
between the capping piece and the shoe to  
contain oil, and a free communication around  
10 the portions of the mandrel enclosed therein  
to allow free flow of oil without a pressure  
forcing the oil out of the shell.

15 15. A drilling jar as claimed in claim 14,  
a packing in the capping piece engaging the  
mandrel and on the mandrel engaging the  
shoe, said packing preventing the escape of  
oil.

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

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LEWIS W. NEWSOM.

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