Sept. 3, 1935. G. W. BOWEN 2,013,127

ADJUSTABLE ROTARY JAR

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Fig. 1.

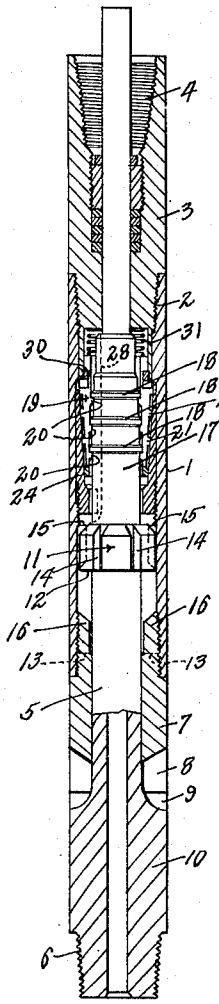


Fig. 2.

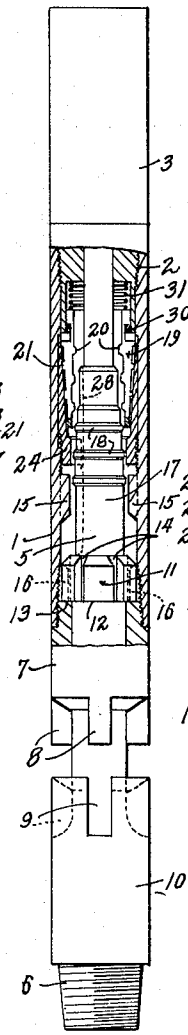


Fig. 3.

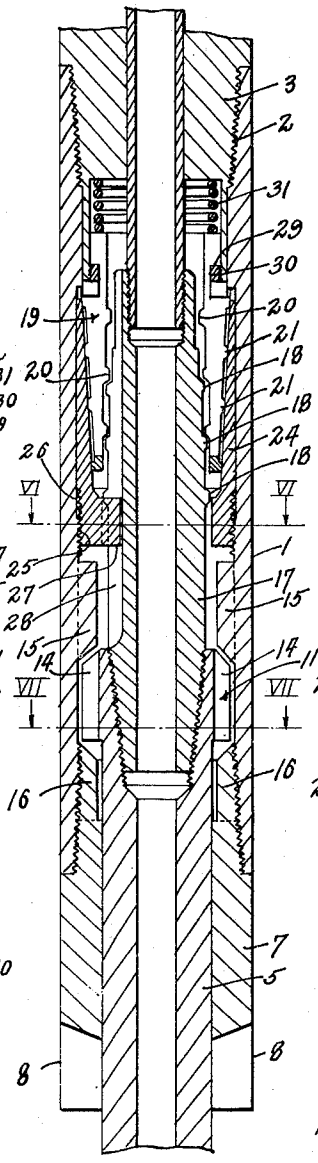


Fig. 4.

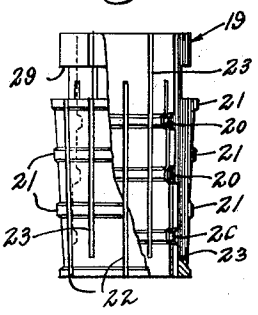
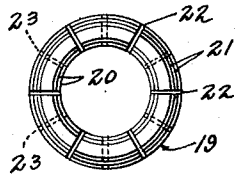


Fig. 5.



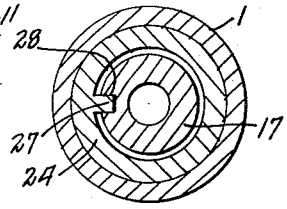
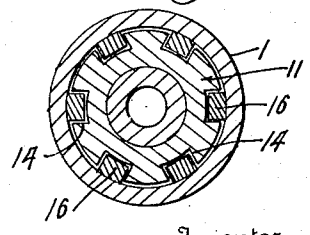


Fig. 6.

Fig. 7.



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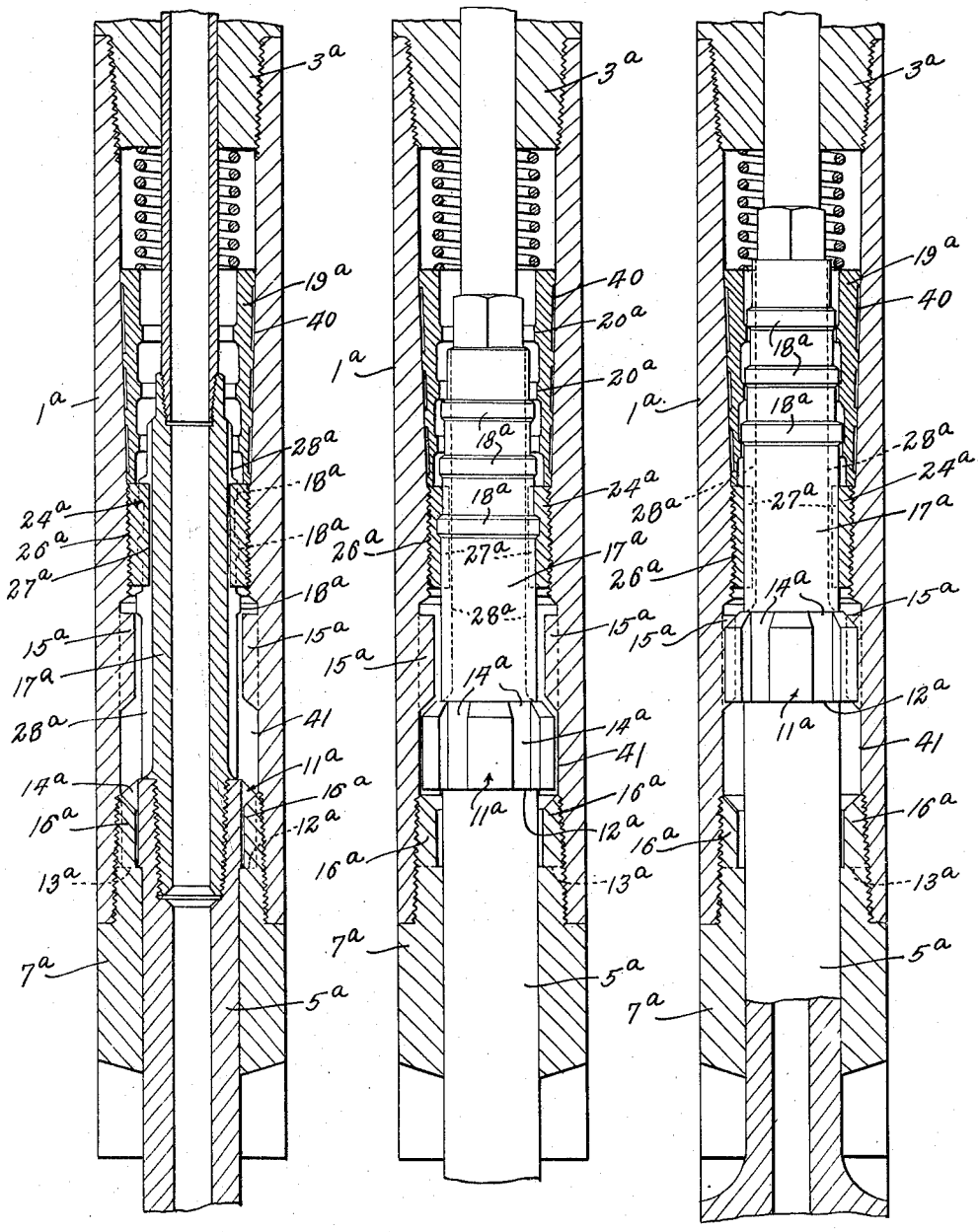


Fig. 8. Fig. 9. Fig. 10.

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ADJUSTABLE ROTARY JAR

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Application September 15, 1934, Serial No. 744,167

11 Claims. (Cl. 255—27)

My invention relates to jars for use in drilling and operating oil wells and the like, and has particular reference to a jarring tool which is readily adjustable to exert jarring blows of predetermined intensity.

In the oil well industry the various earth boring tools employed in drilling an oil well frequently become stuck in the hole and it is necessary to jar or otherwise produce one or more shocks in the drilling string to dislodge the tool which is stuck, permitting such tool to be either withdrawn from the hole or to permit the tool to proceed with its normal drilling functions. A number of different jarring devices have been developed for this purpose, the most successful being a jar which is employed in rotary drilling consisting essentially of a bowl or shell attached to a drilling string, with a mandrel located within the bowl and attached to the drilling tools with suitable separable connecting devices normally holding the mandrel against longitudinal movement with respect to the bowl until a predetermined longitudinal strain is exerted between the drill string and a tool which may be stuck in the hole.

Some of such prior devices have been provided with adjustments or mechanism by which the amount of strain required to release the mandrel and bowl connecting means can be varied; but all of such devices require that the entire drill string and the jar be removed from the hole before the adjusting devices can be actuated to vary the required strain.

It is, therefore, an object of my invention to provide a rotary jar in which the mandrel and bowl may be connected against longitudinal movement by a separable connecting mechanism and in which such connecting mechanism can be adjusted to vary the required strain and to vary the tonnage of the jarring blow without the necessity of removing the drill string or the jar from the well.

Another object of my invention is to provide a tool, as set forth in the preceding paragraph, in which the connecting means may be adjusted to vary the tonnage of the blow from the top of the well.

Another object of my invention is to provide a jar, of the character set forth, in which the connecting mechanism between the mandrel and bowl comprises a spring sleeve surrounding a portion of the mandrel and in which an adjusting device is employed to radially move the sleeve toward and away from the mandrel to vary the gripping relation therebetween.

Another object of my invention is to provide a tool, of the character set forth in the preceding paragraph, in which the adjustment mechanism may be operated by rotation of the drill string without the necessity of removing the drill string and tool from the hole.

Other objects of my invention will be apparent from a study of the following specification read in connection with the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view of a jarring tool constructed in accordance with my invention, showing the tool in contracted or drilling position.

Fig. 2 is a vertical sectional view similar to Figure 1, showing the tool in jarring position.

Fig. 3 is an enlarged sectional view similar to Figures 1 and 2, showing the tool in adjusting position.

Fig. 4 is a detail elevational view, partly in section, of the spring sleeve employed as the mandrel and bowl connecting means in practicing my invention.

Fig. 5 is a plan view of the spring sleeve, shown in Figure 4.

Fig. 6 is a horizontal sectional view, taken along the line VI—VI of Figure 3.

Fig. 7 is a detail horizontal sectional view, taken along line VII—VII of Figure 3.

Fig. 8 is a vertical sectional view of a modified form of jar, constructed in accordance with my invention, illustrating the jar in its fully extended or jarring position.

Fig. 9 is a view similar to Figure 8, illustrating the jar in the adjusting position, while—

Fig. 10 is a view similar to Figures 8 and 9, illustrating the jar in its fully contracted position ready for drilling.

Referring to the drawings, I have illustrated my jar as comprising a pair of telescopically assembled members, one being a bowl or shell 1 threadedly connected, as at 2, to an upper sub 3, which is provided with a threaded box 4 to receive the threaded pin on the lower end of a string of drill pipe (not shown), such as is ordinarily employed in rotary drilling of oil wells and the like, and the other being a mandrel 5.

The shell or bowl 1 is illustrated as being hollow to receive therein the mandrel 5, the lower end of which is formed as a threaded pin 6 to be received in the threaded box of either additional sections of drill pipe or the upper end of drill bits, reamers, other drilling tools employed in drilling the well, or fishing tools of all types.

In order to permit rotary forces exerted upon the drill string to rotate the drilling tools, I provide the lower end of the shell or bowl 1 with a lower sub 7, the extreme lower end of which is provided with a plurality of extending fingers 8 to be received in a plurality of slots 9 formed upon an enlarged section 10 of the mandrel 5 so that when the mandrel and bowl are in contracted position, as shown in Figure 1, the fingers 8 and slots 9 constitute a clutch transmitting rotary forces from the bowl 1 to the mandrel 9. But when the bowl 1 is lifted relative to the mandrel, as shown in Figure 2, the fingers 8 will separate from the slots 9 and permit the bowl to be rotated relative to the mandrel.

The mandrel 5 is provided with an enlarged head 11 located within the body of the bowl 1 having a shoulder 12 formed upon the lower end thereto to constitute a hammer to engage shoulders 13 formed upon the lower sub 7, the shoulders 12 and 13 constituting hammer and anvil abutting members respectively to transmit jarring impacts from the bowl 1 to the mandrel 5 when the bowl 1 is rapidly lifted relative to the mandrel 5.

From an inspection of Figures 1, 2 and 7, it will be observed that the exterior surface of the mandrel head 11 is provided with a plurality of longitudinally extending slots 14 to engage a plurality of longitudinally extending splines 15 formed upon and projecting inwardly from the interior surface of the bowl 1. As shown in Figure 1, whenever the mandrel and bowl are in contracted position, the splines 15 will engage the slots 14 and assist in the transmission of rotary forces between the bowl and mandrel.

Likewise a similar series of splines 16 formed upon the upper end of the lower sub 7 extending above the anvil shoulders 13 will engage the slots 14 when the mandrel and bowl are moved to extended or jarring position, as shown in Figure 2, so that when the bowl and the mandrel are in either fully contracted position, as shown in Figure 1, or in fully extended position, as shown in Figure 2, the mandrel and bowl are connected against relative rotary movement so that in either of these positions rotary forces exerted upon the drill string will tend to cause rotary movement of the drilling tools.

The extreme upper end of the mandrel 5 is illustrated as being provided with a friction head 17 having a plurality of radially extending flanges 18 formed thereon and extending around the friction head 17. The friction head 17 is adapted to be received within a spring friction sleeve 19 which has radially extending flanges 20 formed upon the interior thereof to engage below the flanges 18 on the friction head 17. It will be understood by those skilled in the art that these flanges will extend radially but a relatively small distance, a matter of a few hundredths of an inch, so that they will constitute gripping members positively holding the spring friction sleeve 19 against longitudinal movement on the friction head 17 until longitudinal forces are exerted between the sleeve 19 and the head 17 sufficient to force the walls of the spring sleeve outwardly a sufficient distance to allow the flanges 18 and 20 to pass each other.

It will also be observed that the exterior of the spring sleeve 19 is provided with a plurality of radially extending flanges 21, which flanges, however, are disposed longitudinally along the spring sleeve 19 in spaced relation relative to the flanges 20 on the sleeve 19 so that the section of the spring sleeve 19 lying between any two of the flanges 21 constitutes a spring bridge permitting that portion of the spring sleeve to be flexed outwardly when a sufficient longitudinal strain is exerted between the flanges 20 and the hanges 18 on the mandrel head 17.

By referring particularly to Figure 4, it will be observed that the spring sleeve 19, while made of suitable resilient material, such as hardened steel, and would, therefore, have considerable resiliency, the resiliency of this sleeve may be further increased by providing a plurality of longitudinally extending slots 22 and 23 therein. In the form illustrated herein, slots 22 extend from the lower end of the sleeve 19 to a point spaced from the upper end of the sleeve, while slots 23 extend from the upper end of the sleeve to a point spaced from the lower end thereof, thus dividing the sleeve into a plurality of spring strips which, however, are joined at the upper end and the lower end of the sleeve so that the entire sleeve remains as a sleeve unit.

By referring particularly to Figures 1, 2 and 3, it will be observed that the outer flanges 21 on the sleeve 19 bear against the tapered interior surface of an adjusting sleeve 24, the exterior surface of which is substantially parallel to the exterior cylindrical surface of the bowl 1. The lower end of the adjusting sleeve 24 is provided with threads 25 engaged with interior threads 26 formed upon the interior of the bowl 1 so that by rotating the bowl 1 relative to the sleeve 24, the sleeve will be moved longitudinally in the bowl upon its threads 25 and 26 and thus, by reason of the tapered interior surface of the adjusting sleeve 24, will exert a radial pressure upon the spring sleeve 19, the value of which will depend upon the longitudinal position of the sleeve 24 relative to the bowl.

It will thus be apparent to those skilled in the art that with the mandrel in the contracted position shown in Figure 1 and with the adjusting sleeve 24 in a predetermined position longitudinally of the bowl 1, it will require a predetermined longitudinal strain between the bowl 1 and the mandrel 5 to pull the flanges 18 of the friction head 17 past the flanges 20 of the spring sleeve 19. But, if the adjusting sleeve 24 is raised relative to the bowl 1, it will require a greater strain to pull the flanges 18 past the flanges 20.

By referring particularly to Figure 3, it will be observed that the lower end of the adjusting sleeve is provided with an inwardly extending spline 27 engageable in an elongated key-way 28 cut into and extending longitudinally of the friction head 17 so that in all positions of the mandrel relative to the bowl 1 the mandrel is positively keyed to the adjusting sleeve 24.

It will also be observed that the splines 15 are in spaced relation to the beginnings of the splines 16, this space being sufficient to accommodate the entire length of the hammer head 11 of the mandrel 5 so that when the mandrel is in the position shown in Figure 3, that is half-way between the contracted position shown in Figure 1 and the fully extended or jarring position shown in Figure 2, the head 11 of the mandrel is free to rotate relative to the bowl and thus, with the mandrel and bowl in this position, rotary movement of the drill string will cause rotary movement of the bowl 1 relative to the adjusting sleeve 24 without causing rotary movement of the lower sub 10 and its attached drilling tools. Thus the adjusting sleeve 24 may be initially assembled in the bowl 1 to exert a minimum desired pres-

sure upon the friction sleeve 19 so that a minimum amount of longitudinal strain on the drill string will be sufficient to separate the spring sleeve 19 and the friction head 17 and thus jar the hammer head 11 against the anvil 13. If such minimum amount of strain and minimum impact is not sufficient to dislodge a stuck tool, the drill string may be lowered slightly relative to the mandrel while the drill string is given a slight rotary torque. This will cause the adjusting sleeve 24 to be screwed upwardly in the bowl 1 as soon as the slots 14 of the mandrel head 11 disengage splines 16 and before engaging splines 15. By regulating the amount of torque placed in the drill string, a selected upward movement of the adjusting sleeve 24 may be accomplished to increase the strain required to again jar the tool to any predetermined increased value. This entire adjusting operation can be accomplished without disconnecting the drill string, without withdrawing the drill string from the hole, and without withdrawing the jar from the hole.

This advantage will be appreciated by those skilled in the art when it is considered that during the drilling operations the most frequent opportunities for sticking or locking of the tools in the hole occurs when the hole has penetrated to a considerable distance below the surface of the ground and that it is a long and arduous operation to withdraw the long drill string and to withdraw the jar from the hole in order to make adjustments for increased tonnage of blow when the initial setting of the jar is found insufficient to dislodge the tool. Moreover, in order to withdraw the jar and drill string from the hole, it is necessary to disconnect the jar from the drilling tools and after the adjustment is made, the drill string is again lowered into the hole in the hope that it will reengage the stuck drilling tools and reconnect with these tools at a distance which may be several thousand feet from the surface of the ground.

After the jar has been moved to extended or jarred position, as shown in Figure 2, and it is desired to again contract the tool ready for a new jarring operation, it is desirable that relatively little downward pressure on the bowl 1 should reconnect the spring sleeve 19 and the friction head 17. To accomplish this relatively easy reconnection, I have provided a radially extending shoulder 29 on the upper end of the spring sleeve 19 to engage a fixed ring 30 secured to the bowl 1, the spring sleeve 19 being undercut for a distance longitudinally thereof sufficient to permit the sleeve to raise slightly in the bowl and thus separate the spring sleeve from the adjusting sleeve 25. With the spring sleeve so elevated, comparatively little force need be exerted to move the flanges 18 of the friction head 17 past the flanges 20 of the spring sleeve 19 and, as soon as the flanges have passed each other, a spring 31 secured above the spring sleeve 19 forces the spring sleeve down in the bowl until the shoulder 29 engages the ring 30 and the spring sleeve is again in the contracted or locked position ready for a second jarring operation.

Referring particularly to Figs. 8, 9 and 10, I have illustrated a modified form of the jarring tool, which comprises essentially an upper sub 3a, the lower end of which is connected to an outer bowl or shell 1a, at the extreme lower end of which is secured a lower sub 7a, the parts 1a, 3a, and 7a being identical in construction with the parts 1, 3 and 7, illustrated in the form of the device shown in Figs. 1 to 7.

Assembled within the shell or bowl 1a for telescopic movement longitudinally thereof is a mandrel 5a, the upper end of which is formed at 11a as an enlarged head similar in all respects to the striking head 11, shown in Figs. 1 to 7, the head 11a having formed thereon suitable shoulders 12a constituting hammers which will engage similar shoulders 13a formed upon the lower sub 7a, so that when the mandrel and shell are in the extended positions, as shown in Fig. 8, the shoulders 12a and 13a will be brought into engagement with each other to produce the jarring blow.

Like the mandrel head 11, the head 11a is formed with a plurality of longitudinally extending slots 14a adapted to engage a plurality of longitudinally extending splines 15a formed upon and projecting inwardly of the interior of the shell 1a when the mandrel and shell are in contracted position, as shown in Fig. 10. Similarly, the lower sub 7a is provided with longitudinally extending splines 16a to engage the slots 14a of the mandrel head when the hole and mandrel are in fully extended position, as shown in Fig. 8.

Secured to the mandrel immediately above the head 11a is a friction head 17a having on its exterior surface a plurality of friction flanges 18a adapted to engage similar friction flanges 20a formed upon the interior of a spring friction sleeve 19a assembled within the shell or bowl 1a.

In this form of the invention the friction sleeve 19 is illustrated as resting directly upon a collar 24a comprising a simple cylindrical collar, the exterior of which is provided with threads 26a engaging suitable threads formed upon the interior of the bowl or shell 1a. The collar 24a, like the adjusting sleeve 24, shown in Figs. 1, 2 and 6, is provided with one or more radially extending splines 27a engageable in suitable longitudinal slots 28a formed in the exterior surface of the friction head 17a.

In this form of the invention, the interior wall of the shell or bowl 1a is provided with a tapering surface 40 formed directly thereon and conforming with the tapering exterior surface of the friction sleeve 19a. Thus, by moving the collar 24a upwardly and downwardly relative to the shell or bowl 1a, the spring sleeve 19a may be lifted or lowered relative to the tapering surface 40 to permit greater or lesser radial movement of the portions of the sleeve 19a, and thus decreasing or increasing, respectively, the amount of longitudinal strain which must be exerted between the shell 1a and the mandrel 5a in order to disengage the flanges of the friction head 17a from the flanges of the spring friction sleeve 19a.

Similarly to the construction illustrated in Figs. 1 to 7, the mid portion of the splines 15a—16a are cut away, as indicated at 41, so that when the mandrel and shell are in a partially contracted position, as shown in Fig. 9, the enlarged head 11a of the mandrel will disengage the splines 15a and 16a, permitting the shell 1a and the mandrel 5a to be rotated relative to each other, while at the same time the engagement of the splines 27a with the slots of the friction head will permit such relative rotation to adjust the level of the collar 24a.

The operation of the form of device, illustrated in Figs. 8, 9 and 10, is similar to that shown in Figs. 1 to 7 in that with the jar in the fully contracted position, shown in Fig. 10, rotary movement transmitted through the drill

pipe will be transmitted as rotary movement direct from the shell 1a to the mandrel 5a to produce the desired rotary movement for the drilling operations. If the drill or other tool should become fast in the hole, longitudinal strain placed upon the drill string will tend to pull the shell 1a upwardly relative to the mandrel 5a against the resistance exerted between the friction sleeve 19a and the friction head 17a. Then as soon as sufficient strain has been taken to cause the flanges 20a and 18a to pass each other, the bowl 1a will move upwardly with great rapidity, bringing the hammer and anvil shoulders 12a and 13a into violent impact, producing the jarring blow necessary to release the stuck tool.

If, as a result of the first jarring blow so produced, the tool does not become loosened, the drill string may be lowered until the enlarged head 11a arrives at that point at which the splines 15a and 16a are cut out, and rotary movement may be given the drill string and shell 1a in such direction as to move the collar 24a downwardly relative to the shell. Then the entire drill string may be lowered to move the shell and the mandrel into fully contracted position, as shown in Fig. 10, reengaging the flanges 20a and 18a, and a second jarring blow is produced which, in this instance, will be a greater blow due to the fact that the friction sleeve 19a has been permitted to move downwardly against the tapered wall 40 to a position in which the sleeve 19a is permitted less radial movement than at the time of the first blow. Further tightening of the sleeve 10a may be accomplished in a similar manner if it is found necessary or desirable.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details set forth herein except as defined in the appended claims.

What I claim is:

1. A jar for use in rotary drilling comprising two members telescopically assembled one within the other for relative longitudinal movement from a contracted position to an extended position, striking abutments formed on said members engageable when said members are in extended position, disengageable means for coupling said members together against rotation relative to each other, friction means normally holding said members in contracted position but releasable by the exertion of a predetermined longitudinal strain between said members, means for adjusting said friction means to vary the strain required to release it, and means operable by rotation of one of said members relative to the other of said members when said coupling means is disengaged for changing the adjustment of said adjusting means.

2. A jar for use in rotary drilling comprising a bowl and a mandrel telescopically assembled one within the other for relative longitudinal movement from a contracted position to an extended position, striking abutments formed on said members engageable when said members are in extended position, disengageable means for coupling said members together against rotation relative to each other, friction means on said mandrel, friction means secured within said bowl for engaging said mandrel friction means to normally hold said mandrel and bowl in contracted position but releasable by the exertion of a predetermined longitudinal strain between said bowl and said mandrel, means for adjusting the frictional relation between said mandrel friction means and said bowl friction means, and means operable by rotation of one of said members relative to the other of said members when said coupling means is disengaged for changing said adjusting means to vary the strain required to release it.

3. A jar for use in rotary drilling comprising a bowl and a mandrel telescopically assembled one within the other for movement from a contracted position to an extended position, cooperating striking abutments formed on said bowl and upon said mandrel respectively engageable when said members are in extended position, disengageable means for coupling said bowl and said mandrel together against rotation relative to each other, a sleeve secured in said bowl and surrounding said mandrel for frictionally engaging said mandrel to hold said mandrel and bowl in contracted position, means for exerting a radial pressure upon said sleeve, means mounting said pressure adjusting means for movement in said bowl to vary said radial pressure, and means operable responsive to relative rotation between said bowl and said mandrel when said coupling means is disengaged for varying the position of said adjusting means to vary the strain required to release said sleeve.

4. In a jar for use in rotary drilling comprising a bowl and a mandrel telescopically assembled one within the other for movement from a contracted position to an extended position, a friction sleeve secured in said bowl and surrounding said mandrel to frictionally hold said mandrel and said bowl in contracted position, a tapered adjusting sleeve surrounding said friction sleeve and movable longitudinally relative to said friction sleeve to vary the strain required to release said sleeve from said mandrel, means connecting said mandrel and said adjustment sleeve to move said adjusting sleeve relative to said friction sleeve upon rotation of said mandrel relative to said bowl whereby the strain required to release said friction sleeve may be varied from a point remote from said jar.

5. In a jar for use in rotary drilling comprising a bowl and a mandrel telescopically assembled one within the other for movement from a contracted position to an extended position, a friction sleeve secured in said bowl and surrounding said mandrel to frictionally hold said mandrel and said bowl in contracted position, a tapered adjusting sleeve surrounding said friction sleeve and movable longitudinally relative to said friction sleeve to vary the strain required to release said sleeve from said mandrel, means connecting said mandrel and said adjustment sleeve to move said adjusting sleeve relative to said friction sleeve upon rotation of said mandrel relative to said bowl whereby the strain required to release said friction sleeve may be varied from a point remote from said jar, interengaging means on said mandrel and said bowl for preventing relative rotation of said mandrel and bowl when said mandrel and bowl are in contracted position.

6. In a jar for use in rotary drilling comprising a bowl and a mandrel telescopically assembled one within the other for movement from a contracted position to an extended position, a friction sleeve secured in said bowl and surrounding said mandrel to frictionally hold said mandrel and said bowl in contracted position, a tapered adjusting sleeve surrounding said friction

sleeve and movable longitudinally relative to said friction sleeve to vary the strain required to release said sleeve from said mandrel, means connecting said mandrel and said adjustment sleeve to move said adjusting sleeve relative to said friction sleeve upon rotation of said mandrel relative to said bowl whereby the strain required to release said friction sleeve may be varied from a point remote from said jar, splines on said bowl engageable with slots on said mandrel when said bowl and mandrel are in either extended position or contracted position, said splines being free from said mandrel when said mandrel and bowl are in intermediate positions.

7. A jar for use in rotary drilling, comprising two members telescopically assembled one within the other for relative longitudinal movement from a contracted position to an extended position, striking abutments formed upon said members engageable when said members are in extended position, disengageable means for coupling said members together against rotation relative to each other, friction means normally holding said members in contracted position but releasable by the exertion of a predetermined longitudinal strain between said members, said friction means including a sleeve on one of said members having a shoulder thereon movable radially with respect to the other of said members, and a shoulder formed upon the other of said members engageable with said first-named shoulder, means variably limiting the radial movement of said first-named shoulder, and means operably responsive to rotation of one of said members relative to the other of said members when said coupling means is disengaged for variably adjusting said limiting means.

8. In a jar for use in rotary drilling, comprising a bowl and a mandrel telescopically assembled one within the other for relative longitudinal movement from a contracted position to an extended position, striking abutments formed upon said bowl and said mandrel engageable when said members are in extended position, disengageable means for coupling said members together against rotation relative to each other, a friction sleeve in said bowl surrounding said mandrel to frictionally hold said mandrel and said bowl in contracted position, a tapered surface formed in said bowl surrounding and engaging said friction sleeve, means for limiting the movement of said sleeve longitudinally of said bowl, means mounting said limiting means for movement longitudinally of said bowl by relative rotation between said mandrel and said bowl, and means operable from a point remote from said jar for disengaging said coupling means and for rotating said mandrel and bowl relative to each other.

9. In a jar for use in rotary drilling, comprising a bowl and a mandrel telescopically assembled one within the other for relative longitudinal movement from a contracted position to an extended position, striking abutments formed upon said bowl and said mandrel engageable when said members are in extended position, disengageable means for coupling said members together against rotation relative to each other, a friction sleeve in said bowl surrounding said mandrel to frictionally hold said mandrel and said bowl in contracted position, a tapered surface formed in said bowl surrounding and engaging said friction sleeve, means for limiting the movement of said sleeve longitudinally of said bowl, means mounting said limiting means for movement longitudinally of said bowl by relative rotation between said limiting means and said bowl, means connecting said limiting means to said mandrel for rotation therewith, whereby relative rotary movement between said mandrel and said bowl when said coupling means is disengaged will move said limiting means in said bowl.

10. In a jar for use in rotary drilling, comprising a bowl and a mandrel telescopically assembled one within the other for relative longitudinal movement from a contracted position to an extended position, striking abutments formed upon said bowl and said mandrel engageable when said members are in extended position, a friction sleeve in said bowl surrounding said mandrel to frictionally hold said mandrel and said bowl in contracted position, a tapered surface formed in said bowl surrounding and engaging said friction sleeve, means for limiting the movement of said sleeve longitudinally of said bowl, means mounting said limiting means for movement longitudinally of said bowl by relative rotation between said limiting means and said bowl, means connecting said limiting means to said mandrel for rotation therewith, whereby relative rotary movement between said mandrel and said bowl will move said limiting means in said bowl, and interengaging means on said bowl and said mandrel for preventing relative rotation of said mandrel and said bowl when said mandrel and said bowl are in contracted position and disengageable to permit said relative rotation when said mandrel and said bowl are moved from contracted position.

11. A jar for use in rotary drilling, comprising two members telescopically assembled one within the other for relative longitudinal movement from a contracted position to an extended position, means connecting one of said members to a drill string, means connecting the other of said members to drilling tools, striking abutments formed on said members engageable when said members are in extended position, interengaging means on said members for coupling said members together when in contracted position to transmit rotary force from one of said members to the other thereof and disengageable when said members are moved from contracted position to permit relative rotation between said members, friction means normally holding said members in contracted position but releasable by the exertion of a predetermined longitudinal strain between said members, and means operably responsive to relative rotation between said members for adjusting said friction means to vary the strain required to release it.

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