This invention relates to an improved method and apparatus for dislodging a drill pipe string stuck or held against normal movement in a well bore.

A major problem encountered in oil well drilling or operating is that of having the pipe string become stuck or lodged in the well bore. Oftentimes in a drilling operation the side walls of the well bore will cave in to wedge the drilling tool or pipe string against the wall of the well bore and under normal manipulation it is then impossible to advance or retract the pipe string in the well bore. Also, under normal operations, it oftentimes occurs that in a packing off operation that the packing tool will not come free from the well bore walls when it is so desired, again preventing any longitudinal motion of the pipe string in the well.

To overcome such sticking in the above cases, or any other times in which the pipe string becomes lodged in the well bore, jar tools are used in the pipe string whereby sharp shocks may be transmitted to the stuck object to dislodge it from its tightly wedged position. However, if a jar tool had not been inserted in the drill pipe prior to sticking, it is necessary to remove the unstuck pipe and insert a jar and recouple the pipe string. The same operation would be necessary if the pipe string becomes stuck in the well bore above a jar inserted in the pipe string. The necessity for removing the unstuck pipe string from the well bore is costly and time consuming.

It is proposed to carry out a jarring operation from the top of the pipe string, where all of the elements are readily accessible to the operator. As is well known, the drill pipe is elastic to a degree and may be elongated by applying an upward tensioned force to the upper end of the pipe string. If, after elongation, the pipe string is abruptly released, the pipe string will contract and the full weight of the pipe string will be applied to the stuck portion as the pipe string rebounds from its stretched position. However, in such an operation, it is necessary that the pipe string be released from its tensioned position so that it is allowed to fall freely. If the usual hoisting line is attached to the pipe string and the tensioning is released the hoisting string will follow the contracted pipe string. The abrupt stop of the drill pipe upon full contraction will either put a severe strain upon the hoisting apparatus if it attempts to stop the paying out hoisting line immediately, or else the hoisting line will continue to pay out after the pipe has contracted and will flay around wildly, endangering life and equipment.

It is proposed to provide a method and apparatus whereby the extensible properties of the drill pipe may be utilized, by upwardly tensioning the pipe string to cause elongation thereof, and then clamping and holding the pipe string in its elongated position, whereby the hoisting apparatus may be removed from the pipe string, of the enough slack be put in the hoisting line so that nothing will impede the pipe string in its course of downward contraction. The pipe string is then released from its supported elongated position and allowed to freely contract to its unstressed position to deliver the jarring blow to the stuck portion of pipe. The danger of flying hoisting line and danger to life and equipment is thus overcome.

It is an object of this invention to provide a method and apparatus whereby a drill pipe lodged against normal movement in a well bore may be jarred loose by applying tensioning forces to the upper end of the drill pipe, the drill pipe being then clamped and supported against contraction, the tensioning forces removed from the drill pipe, and the drill pipe being then released for unimpeded contracting movement downwardly in the well bore.

Other objects and advantages of the invention will be apparent in the course of the following detailed description.

In the accompanying drawings forming a part of this application, and in which like numerals are used to designate like parts throughout the same,

Fig. 1 is an elevational view, partially broken away and partly in schematic of the invention.

Fig. 2 is a cross sectional view taken along lines 2—2 of Fig. 1.

Fig. 3 is an elevational cross sectional view taken along lines 3—3 of Fig. 2.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the derrick floor 10 supports a conventional rotary table 11 through which the drill pipe 12 extends from the swivel 13 down through the conventional pressure apparatus 14 mounted on the cellar floor 15 into the well bore 16. A drill bit 17 is shown as connected to the bottom of the drill pipe 12.

A hook 18 connects the upper end of swivel 13 to the traveling block 19 of the hoisting works (not shown). A hoisting line 21 passes around the traveling block for raising and lowering the block 19.

Shown as supported on the rotary table is a support means 22 adapted to support collar means 23 fastenable to the drill pipe 12 to enable this invention to be practiced. The support means 22 comprises a pair of arcuate jaws 24 and 26, the jaw 24 being fastened to base plate 27 by means such as bolts 28. The jaw 24 has formed therethrough a hole 29 through which bolt 31 passes, the bolt 31 also passing through hole 32 formed in jaw 26. A nut 33fastens on one end of bolt 31. A piston head 34 is carried on the other end of bolt 31, with the bolt 31 extending through a hole 36 formed in the piston head 34 and held in place by nut 37. A compression spring 38 mounted around and coaxially with the bolt 31, between the jaws 24 and 26, bias the jaws in opposed directions. As is apparent from the drawings, a second bolt 39 connects the structure in the same manner as bolt 31, on the opposite side of jaws 24 and 26 and piston head 34, with compression spring 38a mounted between the jaws 24 and 26.

A cylindrical piston 40 is formed by providing a cylindrical piston wall member 41 mounted on the piston head 34, as by screw means 42; the piston 40 being adapted to move reciprocally in a circular bore 43 formed in jaw member 24. O-rings 44 mounted on the exterior of the piston 40 prevent fluid leakage between the piston 40 and the bore 43. The piston head 34 is apertured at 46 and screwed threaded to receive a fitting 47 on the end of the hydraulic conduit 48. The other end of hydraulic conduit 48 connects to a conventional three-way valve 49 having one conduit 51 connected through a check valve 52 to pump 53 and another conduit 54 leading to a sump tank 56. Conduit 57 connects the sump tank 56 to the pump 53. The valve 49 is operable to place either the conduit 51 or the conduit 54 in fluid communication with conduit 48, so that
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fluid may be pumped from pump 53 into the piston 40, or so that the fluid in piston 40 may be emptied into the

The collar means 23 has two semi-circular jaw members 61 and 62 adapted to be positioned on opposite sides
of a section 63 of the pipe string 12, each jaw member being provided with teeth members 64 and 65 to grip the
pipe section 63. Jaw member 61 is provided on its outer surface with an upper cam surface 66 and a lower
cam surface 67, the two cam surfaces inclining outwardly at the middle from the ends of the jaw member. Jaw
member 62 is similarly formed. An upper collar member 68 and a lower collar member 69 surrounds the jaw
members 61 and 62, the collar members having a screw

be inclined so that they will slide relatively to each other
when the fluid in piston 40 is released. The collar means
thus forces the support jaws to slide apart and the springs
38 and 38a force the jaws fully apart, allowing the drill
pipe and collar to contract uninterruptedly downwardly,
thus producing a shock wave upon final contraction there-
of which travels downwardly through the drill pipe to the

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supporting said collar means after said pipe string is
elongated to enable said tensioning forces to be removed
from said pipe string without a contraction thereof, and
means for removing said support from its collar-supporting
position to allow said pipe string to contract.

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when the fluid in piston 40 is released. The collar means
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thus producing a shock wave upon final contraction there-
of which travels downwardly through the drill pipe to the

It is to be understood that the form of the invention
herein shown and described, is to be taken as a pre-
ferred example of the same, and that various changes in
the shape, size and arrangement of parts may be resorted
to, without departing from the spirit of the invention or
the scope of the attached claims.

Having thus described my invention, I claim:
1. Apparatus for releasing a drill pipe string lodged against normal movement in a well bore comprising
means for applying tensioning forces to the upper end
of said pipe string to elongate the same, collar means
adapting the outer surface of said pipe string and
supporting said collar means after said pipe string is
elongated to enable said tensioning forces to be removed
from said pipe string without a contraction thereof, and
means for removing said support from its collar-supporting
position to allow said pipe string to contract.

2. Apparatus for delivering a jar to a drill pipe string
lodged against normal movement in a well bore com-
prising means for applying tensioning forces to the upper
end of said pipe string to elongate the same, collar means
having teeth adapted to grip said pipe string, said collar
means having a bottom surface, support means having
opposed jaws movable to and from each other and
adapted to be spaced around said pipe string, means to
move said jaws toward each other whereby the upper
surfaces of said jaws support the bottom surface of said
collar means, said collar means being supported on said
support means, means to move said pipe string to hold
said pipe string in elongated position, whereby said
tensioning forces may be removed from said pipe string,
and means to move said jaws apart to release said collar
means for downward movement to allow said pipe string
to contract.

3. Apparatus for delivering a jar to a drill pipe string
lodged against normal movement in a well bore com-
prising means for applying tensioning forces to the upper
end of said pipe string to elongate the same, collar means
having teeth adapted to grip said pipe string, said collar
means having an upwardly and outwardly inclined bot-
tom surface, support means having opposed jaws movable
towards and from each other and adapted to be
spaced around said pipe string, said opposed jaws having
upwardly and outwardly inclined upper supporting sur-
faces, means to move said jaws toward each other where-
by the upper surfaces of said jaws support the bottom
surface of said collar means, said collar means being
supported on said support means and gripping to said
pipe string to hold said pipe string in elongated position
whereby said tensioning forces may be removed from
said pipe string, and means to move said jaws apart to release
said collar means for downward movement to allow
said pipe string to contract.

4. Apparatus for delivering a jar to a drill pipe string
lodged against normal movement in a well bore com-
prising means for applying tensioning forces to the upper
end of said pipe string to elongate the same, collar means
having teeth adapted to grip said pipe string, said collar
means having an upwardly and outwardly inclined bot-
tom surface, support means having opposed jaws movable
towards and from each other and adapted to be
spaced around said pipe string, said opposed jaws having upwardly and outwardly inclined upper supporting surfaces, hydraulic piston means to move said jaws towards each other whereby the upper surfaces of said jaws support the bottom surface of said collar means, said collar means being supported on said support means and gripping to said pipe string to hold said pipe string in elongated position whereby said tensioning forces may be removed from said pipe string, and resilient means to move said jaws apart to release said collar means for downward movement to allow said pipe string to contract.

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