Fig. V

Fig. VI

Fig. VII

Fig. VIII

Inventors: Clarence R. Dale
Helmut Hügel

By their Attorneys
The present invention relates to oil well tools and pertains more particularly to a device for feeding cable into a well casing or tubing under pressure.

It is often desirable during the operation of a flowing well under pressure to introduce thereinto on a cable various tools or devices such as pressure or temperature recorders, level indicators, etc. This is generally accomplished by first installing a "lubricator," which consists of a pipe nipple placed above the gate valve on the "Christmas tree" or on the well head and packer on top of the nipple. The desired tool is then introduced into the nipple, the packer closed about the cable, the gate valve opened, and the tool lowered into the well.

In order to overcome the well pressure, which reaches sometimes very high values and tends to force the cable out of the well, it is generally necessary to attach weights or "sinkers" to the lower end of the cable either below or above the tool. When a wire line or a small diameter cable is used, tools can be successfully introduced into a well by this means. However, when it is necessary or desirable to use a relatively large diameter cable, it is not practical in most cases to use a sufficient amount of "sinkers" to overcome the well pressure and the friction of the packer on the cable. For example, in a well with a pressure of 1000 pounds a one-half inch cable having a cross sectional area of about one-fifth of a square inch would have a pressure against it of 200 pounds. Added to this would be the friction of the packer against the cable which is usually greater than 200 pounds for a 1000 pound pressure in a well. Thus, to insert a tool or apparatus on a one-half inch cable into a well with a 1000 pound pressure, enough "sinkers" would have to be attached to the cable to make the total weight of the tool and sinkers more than 400 pounds.

It is, therefore, the purpose of the present invention to provide a cable feeding mechanism which eliminates the necessity of using weights or "sinkers."

It is a further object to provide a device in which power derived from the well pressure is utilized to feed the cable into the well.

Other objects and advantages will be apparent from the following description taken in reference to the drawings, wherein:

Figure 1 is a side elevation showing a preferred embodiment of the cable feeding mechanism and a packer above it.

Figure 2 is a vertical sectional view along the line II—II of Figure 1.

Figure 3 is a cross sectional view along the line III—III of Figure 2.

Figure 4 is a vertical sectional view along the line IV—IV of Figure 3.

Figure 5 is a vertical sectional view along the line V—V of Figure 3.

Figure 6 is a vertical sectional view similar to Figure 2 and showing a modification of the present device.

Figure 7 is a vertical sectional view of another modification.

Figure 8 is a vertical sectional view of still another modification.

Briefly, the present invention comprises two parallel sets of vertically arranged wheels within a housing, means for moving the sets of wheels horizontally toward each other and thus for clamping about the cable, and means for positively rotating at least one of said wheels, whereby the cable is forced into the well without the aid of "sinkers."

Referring to Figure 1 a preferred embodiment comprises a housing 1 fitted between the packer 2 and pipe nipple 3 of a conventional "lubricator," the pipe 3 being provided with a gate valve (not shown in the drawings) below the housing 1. The housing generally designated as 1 may as shown comprise an intermediate tubular portion 14 threadably or suitably attached between two bell reducers 15. A hydraulic motor 4 supplied with pressure fluid from the well through a conduit 5 is preferably used as a source of motive power through a shaft 6 to the driving mechanism within the housing 1, although any other suitable means, such as an electric motor or hand power, may be used to rotate the shaft 6.

Referring to Figures 2 to 5 which show a preferred arrangement of the cable feeding mechanism within the housing 1, a set of driving wheels 11 and a set of pressure wheels 12 and 13 are parallel to each other and disposed on either side of the cable 16.

The pressure or idle wheels 12 and 13 are carried on a movable yoke 18, which is adapted to move horizontally along the guides 19 by means of a hand screw 17. The hand screw 17 passes through a threaded opening 18 in the housing 1 and packing gland 19 and nut 20 and terminates in a hand wheel 21. In a preferred arrangement there are four pressure wheels, of which the upper and lower ones are guiding rollers 12 and the intermediate ones are sheaves 13.
rotation and/or the diameters of the sheaves 13 and the roller wheels 12 are so spaced and/or selected so that said sheaves 13 come in contact with the cable 14 slightly ahead of the roller wheels 12, for a subsequently described purpose. The driving wheels may be pivoted in a fixed position within the housing, as shown, or, if desired, may be carried by a horizontally movable yoke fitted with a hand screw and similar to yoke 15. The driving wheels 11 are preferably sheaves and may be provided with fine teeth, for example, all the order of 1/32 of inch apart, in order to grip the cable more firmly, although in ordinary cases a satisfactory gripping or frictional engagement may be obtained with flat faced wheels or sheaves. The terms “gripping engagement” or “frictional engagement” are, therefore, used in this specification to describe the action of either the toothed or the flat-faced wheels or sheaves on the cable. In a preferred arrangement, two driving wheels 11 are spaced so that the horizontal plane of the axis of the upper driving wheel 11 is between the horizontal planes of the axes of the upper two pressure wheels 12 and 13, while the plane of the axis of the lower wheel 11 is between that of the axes of the two lower pressure wheels 12 and 13. By this arrangement, and due to the staggered points of contact of the elements 12 and 13 with the cable, the latter is deflected slightly about the driving wheels 11, thus increasing the length of contact of the cable 14 with the driving wheels 11, and improving the grip of said wheels on the cable.

The wheels 11 are driven by the spur wheels 26 mounted on the shafts 27 of the driving wheels 11 and actuated by the driving spur wheel 25 mounted on the shaft 6 of the hydraulic motor 4 as shown in Figure 5. The conduit 5 provided with a regulating valve 28 communicates between the motor 4 and the lower portion of the housing 1, whereby the motive power for rotating the motor 4 is supplied by the well pressure. The motor 4 may be of any suitable type of hydraulic motor operated by fluid pressure.

It is, however, obvious that the present invention is in no way limited to the above-described preferred embodiment, since excellent results may be obtained with an arrangement involving only one driving wheel and two pressure wheels, or two driving wheels and one pressure wheel, as shown in Figures 6 and 7, respectively. In some cases, the use of one driving wheel and one pressure wheel or sheave, as shown in Figure 8, gives satisfactory results.

In operation, the gate valve below the housing 1 is closed, the packer 2 is opened or removed, and the set of pressure wheels 12 and 13 carried by the yoke 15 is moved outward along its guides 16 by rotating the hand screw 17 by means of the hand wheel 21. The instrument or device which it is desired to introduce into the well is then lowered through the housing and between the sets of wheels and into the pipe nipple 3 below the housing 1 and above the gate valve at the well head. The packer 2 is then closed about the cable 14. The pressure wheels are moved inward against the cable to force it against the driving wheels 11. The gate valve may then be opened and the regulating valve 28 opened, allowing the well pressure through the pipe nipple 3 and the conduit 5, to cause the rotation of the motor 4 and its shaft 6. The revolution of the shaft 6 causes the rotation of the spur wheel 25 which engages and in turn rotates the spur 28 and the driving wheels 11 on the shaft 27. By clockwise rotation of the driving wheels 11 as shown in Figure 2, the cable with the desired device attached to the lower end thereof is forced into the well against the pressure therein. Thus, any desired instruments or devices on relative wheels being staked may be introduced into a well without the necessity of using impractical and cumbersome amounts of weights or sinkers attached to the cable.

We claim as our invention:

1. In a mechanism for drawing a cable into pressure well casings, a housing in communication with the well, packer means for passing a cable into the well through said housing while maintaining said housing at the well pressure, wheels rotatably supported within the housing, said wheels being in gripping engagement with said cable at diametrically opposite sides thereof, and means to rotate at least one of said wheels whereby the cable is drawn into the well against the pressure therein.

2. In a mechanism for drawing a cable into pressure well casings, a housing in communication with the well, packer means for passing a cable into the well through said housing while maintaining said housing at the well pressure, wheels rotatably supported within the housing, said wheels being in gripping engagement with said cable at diametrically opposite sides thereof, means for moving said wheels horizontally with regard to each other until said cable is frictionally engaged between said opposite wheels, and means to rotate at least one of said wheels whereby the cable is drawn into the well against the pressure therein.

3. In a mechanism for drawing a cable into pressure well casings, a housing in communication with the well, packer means for passing a cable into the well through said housing while maintaining said housing at the well pressure, at least one driver wheel rotatably supported within said housing at one side of said cable, a plurality of pressure wheels rotatably supported within said casing at the diametrically opposite side of said cable, the rotation axes of said driver and said pressure wheels being staggered with regard to each other in a vertical plane, means for moving said opposite wheels horizontally with regard to each other until said cable is frictionally engaged therewith, and means to rotate at least one driver wheel whereby the cable is drawn into the well against the pressure therein.

4. In a mechanism for drawing a cable into pressure well casings, a housing in communication with the well, packer means for passing a cable into the well through said housing while maintaining said housing at the well pressure, at least one driver wheel rotatably supported within said housing at one side of said cable, a plurality of pressure wheels of unequal diameter rotatably supported within said casing at the diametrically opposite side of said cable, the rotation axes of said driver and said pressure wheels being staggered with regard to each other in a vertical plane, means for moving said opposite wheels horizontally with regard to each other until said cable is pressed into a sinusoidal position by frictional engagement between said staggered driver and pressure wheels, and means to rotate at least one of said driver wheels whereby the cable is drawn into the well against the pressure therein.

5. In a mechanism for drawing a cable into pressure well casings, a housing in communication with the well, packer means for passing a
6. In a mechanism for drawing a cable into pressure wells, a housing in communication with the well, packer means for passing the cable into the well through said housing while maintaining said housing at the well pressure, a plurality of rotatable friction elements mounted within said housing, said elements being positioned to grip said cable therebetween, and means to rotate at least one of said elements whereby the cable is drawn into the well against the pressure therein.

HELMUT HÜGEL.

CLARENCE R. DALE.