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SNUBBING DEVICE FOR OIL WELL TUBING

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Under certain conditions it is necessary to lower tubing into a well, for example, in wells which produce gas from which gasoline is extracted, the gas condenses into gasoline and gradually accumulates in the well to such an extent that it greatly reduces or finally shuts off natural gas pressure.

In order to withdraw this gasoline, and at the same time retain the gas pressure in the well, tubing is lowered through the control head to a point below the liquid level, the tubing in such cases being provided with a frangible closed end or tubing valve in order to prevent escape of gas therethrough, hence it is necessary to force the tubing downwardly against the confined gas pressure until weight of the tubing overcomes resistance of the gas pressure.

In order to force the tubing downwardly an apparatus commonly known as a "snubbing device" is employed. Such apparatus now in general use is more or less clumsy to handle requiring a considerable amount of time and labor to operate it, viz. downward movement of the tubing being effected intermittently by jaws engaging it which are pulled downwardly by cables on upward movement of the travelling block, it being necessary to manually lift the jaws after each downward movement of the tubing in order to obtain a new sight thereon, it being understood that the tubing is prevented from being forced upwardly by the gas pressure by slips in the control head.

The object of this invention is to provide a mechanism operated by fluid pressure for snubbing tubing into a well casing.

Another object of this invention is to provide a device for snubbing tubing and controlling the gas pressure in which the gas pressure from the well is utilized for effecting the snubbing operation and controlling the gas pressure during such operations.

A further object of this invention is to provide a device for forcing tubing downwardly through a control head by reciprocating movement.

Other objects and advantages will be apparent from the following description, reference being had to the accompanying drawings, in which:

Fig. 1 is a side elevation of the snubbing device in operative position on a control head mounted on a well casing with the tubing extending therethrough, the casing and well hole being shown in section;

Fig. 2 is a view analogous to Fig. 1 showing the moving parts in elevated position;

Fig. 3 is a vertical sectional view taken through the snubbing device and control head;

Fig. 4 is a horizontal section taken on line 4--4 of Fig. 3;

Fig. 5 is a sectional view taken on line 5--5 of Fig. 1.

Referring more specifically to the drawings, a pair of cylinders are designated at 10 in which are positioned pistons 12 connected to rods 14 extending upwardly through stuffing boxes 15 on heads 16. The upper ends of cylinders are preferably screw threaded into the heads 16 as indicated at 18 which are in turn threadedly connected to a plate 20, the lower ends of the cylinders being threaded into heads 22 which extend through openings in a plate 24. The plate 20 serves to hold the cylinders in fixed position and is secured to the top flange 25 of a member 26 by bolts 27.

Packing or sealing members designated at 30 and 31 respectively are connected to the member 26 and plate 24 between which is interposed the stationary member 34 of the snubbing device, the aforesaid member being connected by bolts 35 and nuts 36, the bolts passing through openings in companion flanges 37. The plate 24 is connected by bolts 38 to an emergency sealing member 40 which in turn is secured by bolts 41 to a control head fitting 42 screw threaded to the upper end of the casing C.

From the foregoing it will be seen that the cylinders 10 are mounted parallel in spaced relation and supported on the casing through the assembly of the sealing members and the stationary member of the snubbing device. The stationary member of the snubbing device serves to prevent upward movement of the tubing designated at T, and consists of a plurality of slips 50 mounted therein, the
slips having teeth urged into engagement with the tubing by expansion coil springs encircling rods, the upper end of the rods projecting into openings in the slips, the lower ends of which are pivotally mounted on pins extending through lugs formed on the lower ends of guide blocks having inclined faces engaged by the slips as shown in Fig. 5.

Downward movement of the tubing is effected by a movable member which is actuated by admitting fluid pressure into the upper and lower ends of the cylinders. The movable member consists of a housing having arms secured to the reduced upper ends of the rods by nuts. A plurality of slips having teeth adapted to engage the tubing are slidable mounted on guide blocks having inclined faces and rods, the lower ends of which extend into openings in the slips, the teeth of the slips being urged into engagement with the tubing by expansion coil springs encircling the rods.

Fluid pressure from within the casing is utilized to operate the snubbing device, the combined area of the pistons being greater than that of the tubing in order to overcome the resistance of the gas pressure acting thereon, it being understood that the lower end of the tubing is closed either by a frangible plug or a valve designated at V. Fluid pressure from the casing is conducted to the upper and lower ends of the cylinders through pipe lines as follows:

Pipes 70 are threaded into openings 71 in the head which communicate with the interior of the cylinders, in a like manner pipes 72 are threaded into openings 73 in the head, the pipes 70 and 71 lead to a four-way valve 74 through pipes 75 and 76. Fluid or gas pressure from the casing is conveyed to the four-way valve through a pipe extending from the control head fitting 42.

The four-way valve is provided with ports 80 and 81 adapted to register with the pipe and exhaust pipe. When in the position shown in Fig. 1, gas under pressure in the casing will pass through pipe and port in the valve thence through pipes 75 and 76 into the upper ends of the cylinders, and the same time any gas in the opposite ends of the cylinders may pass through pipes 72, 76 and port 82 in the valve thence through exhaust pipe. By rotating the valve one quarter turn by the handle the flow of gas will be reversed, thereby raising the pistons, rods, and movable member.

From the construction it will be seen that by alternately admitting pressure to each end of cylinders reciprocation of the movable member is effected, on its downward movement the slips will grip and move the tubing with it, the slips in the stationary member allowing the tubing to pass through, but preventing any upward movement thereof. The slips in the stationary member will move downwardly on the rods and blocks when engaged by a coupling designated at 86, thereby allowing it to pass, the springs returning the slips into engagement with the tubing, the slips of the movable member will also move downwardly on the rods and blocks when engaged by a coupling during its upward movement.

The packing or sealing members 30, 31, and 40 are provided with annular packing rings 86 formed of resilient material to serve to prevent escape of gas around the tubing and are normally expanded into engagement therewith by fluid pressure preferably from the well, the packing rings being successively deflated and expanded (by manipulating suitable control valves not shown) to permit passage of a coupling during downward movement of the tubing. It being noted that upon return movement of the slips after a coupling has passed therebetween a clicking sound will be given, such sound indicating to the operator the position of coupling so that the packers in the seal members may be deflated to permit passage therethrough.

In actual practice the snubbing device is operated as above described until the weight of the tubing overcomes the gas pressure at which time it will slide downwardly due to its own weight. After reaching a predetermined point below the fluid level the valve V is opened by rotating the tubing one quarter turn, the gas pressure will then force the liquid upwardly through the tubing. A frangible plug closing the lower end of the tubing may be substituted for the valve, and this seal being broken when the tubing has been lowered to required depth as above stated.

I claim:

1. A snubbing device for forcing tubing into a well against confined gas pressure, comprising a plate, a cylinder secured to said plate, and disposed at side thereof, a relatively stationary member secured to said plate and extending downwardly therefrom, packing and sealing members carried by said stationary member, a relatively movable member disposed above said plate, valve, and tubing gripping device carried by said movable member, there being aligned openings in said stationary and movable members and said plate to permit the passage of tubing therethrough, means for admitting gas pressure from said well into said cylinder to operate said movable member, and means whereby the snubbing device may be secured to the control head of a well.

2. A snubbing device for forcing tubing into a well against confined gas pressure, com-
prising a plate, a cylinder secured to said plate and disposed at one side thereof, a relatively stationary member secured to said plate and extending downwardly therefrom, a relatively movable member disposed above said plate and connected to the piston rod of said cylinder, a tubing gripping member in said movable member, there being aligned openings in said stationary and said movable members and said plate to permit the passage of tubing therethrough, means in said stationary member for preventing the upward movement of tubing, packing and sealing members above and below said means, means for admitting gas pressure from said well into said cylinder to operate said movable member, and means whereby said snubbing device may be secured to the control head of a well.

3. In a snubbing device for forcing tubing into a well against confined gas pressure, upper and lower plates, a plurality of cylinders secured at their upper and lower ends to the upper and lower plates respectively, a piston and piston rod in each of said cylinders, a relatively movable member secured to the upper ends of said piston rods, a tubing gripping member carried by said movable member, a relatively stationary member disposed between said upper and lower plates, packing and sealing members carried by said stationary member and secured to said upper and lower plates, means whereby the lower plate may be secured to the control head of a well, and means for leading gas pressure to the lower and upper ends of said cylinders for actuating said pistons and operating said movable member.

4. A snubbing device for forcing tubing into a well against confined gas pressure, upper and lower plates, a plurality of cylinders secured to said cylinders and therebetween, a piston and piston rod in each of said cylinders, a relatively movable member secured to said piston rods, a tubing gripping member carried by said movable member, a relatively stationary member disposed between said plates, packing and sealing members carried by said stationary member and secured to said upper and lower plates, means whereby the lower plate may be secured to the control head of a well, an emergency sealing member disposed between the lower plate and the control head, and means for leading gas pressure from the well into the cylinders to actuate the pistons and operate the movable member.

In testimony whereof I affix my signature.

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