Jan. 22, 1935. L. DILLON 1,988,785

APPARATUS FOR COUNTING CASING OR TUBING COLLARS

Filed June 10, 1930

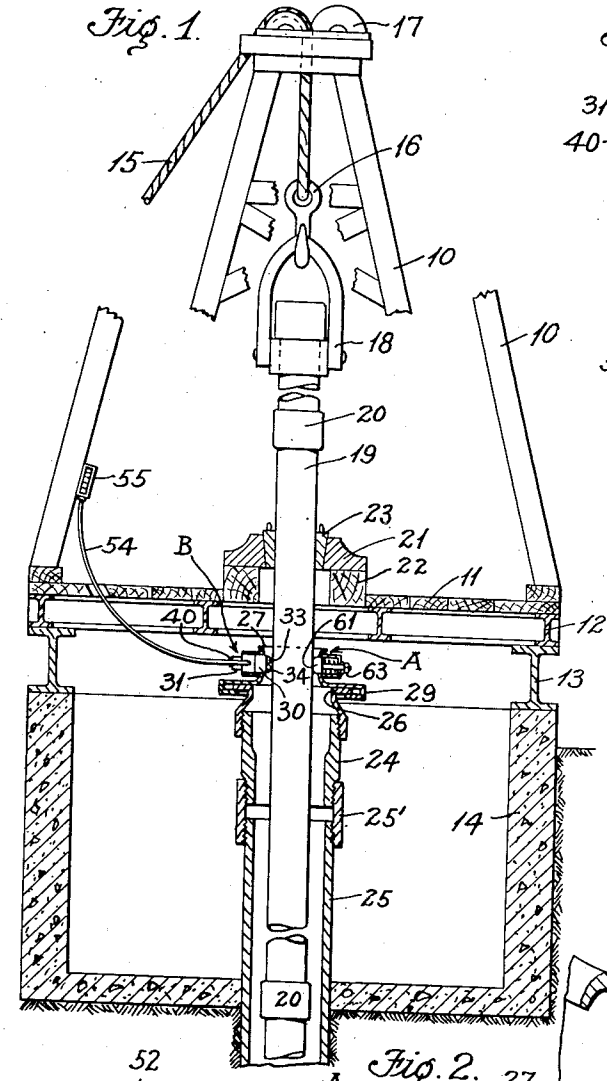


Fig. 1.

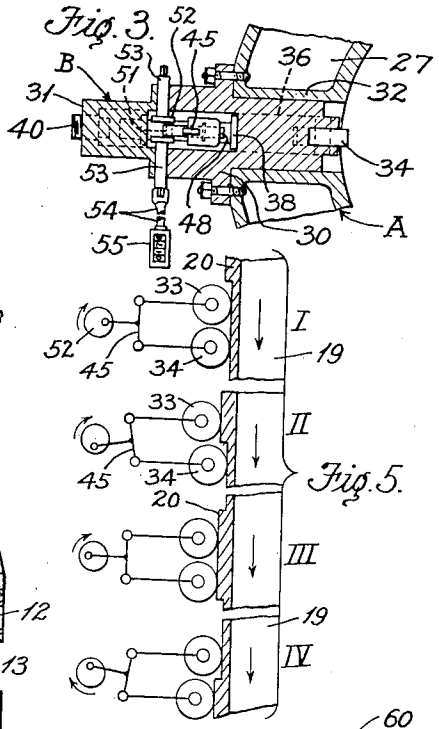


Fig. 3.

Fig. 5.

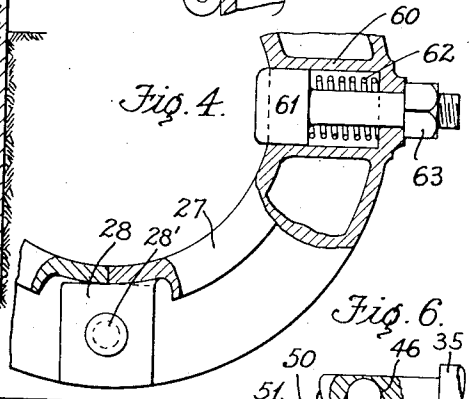


Fig. 4.

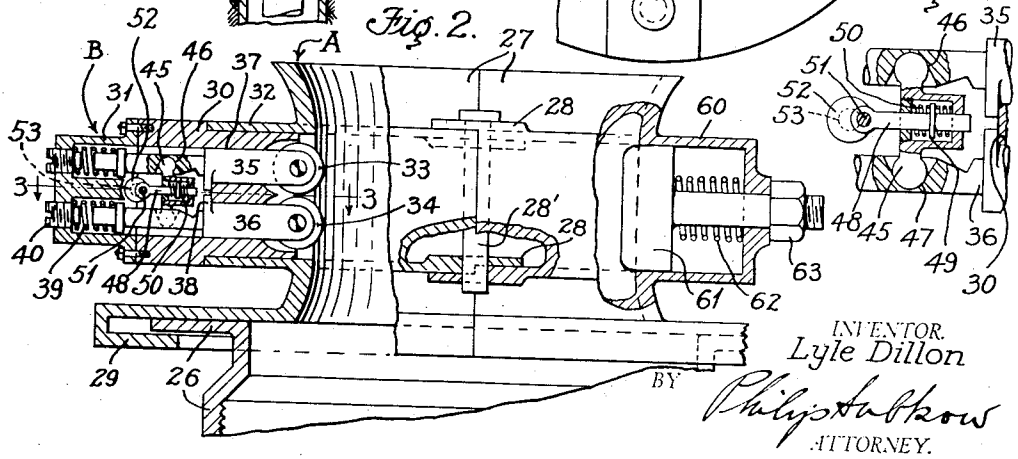


Fig. 2.

Fig. 6.

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APPARATUS FOR COUNTING CASING OR TUBING COLLARS

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15 Claims. (Cl. 235—91)

This invention relates generally to a device for automatically registering the number of pipe couplings or casing joints which have been lowered into or pulled out of a well, such as an oil well.

In many instances during oil production in oil fields, it is frequently desirable to know how much casing or tubing has been lowered into a well. Some operators arrive at this by counting the number of sections of casing or tubing as they are lowered into the well and determine the total length of tubing by multiplying the number of tubing sections by the average length thereof. However, during the lowering, it is often necessary to back up the string of tubing for several lengths, this being due, for example, to the jamming or sticking of the tubing in the well, and possibly to various other reasons. Therefore, the operator must necessarily subtract the number of tubing sections backed up. The counting of these sections, as may be observed, requires the continuous attention of one operator and very often results in miscalculation.

It is, therefore, an object of the present invention to eliminate the necessity for employing an operator to perform the counting operation. Another object is to automatically register or indicate the number of casing or tubing joints lowered into or pulled out of a well.

I have found that the number of tubing sections lowered into or pulled out of a well may be accurately registered in the device forming the present invention, thereby entirely eliminating the necessity for an operator to count them and thus preventing any miscalculations to enter in the determination of the amount of casing or tubing in the well.

Briefly stated, the invention resides in means for registering the number of casing or tubing collars or other couplings as they are lowered or raised in a well. The invention also includes a registering device and means to actuate the device, in combination with a string of tubing having means connected therewith to operate the actuating means. The invention further resides in combination with a well, of a counting mechanism having means to actuate said counting mechanism, said means being adapted to actuate said counting mechanism and to be actuated by the collars on a string of tubing when the tubing is lowered into or pulled out of a well. In one embodiment of the invention, the actuating means may comprise a plurality of rollers mounted on reciprocable rods actuable by the tubing collars and adapted to actuate the counting mechanism. The rods may be attached to a crank on a crank shaft which drives the counting mechanism. More specifically, the invention comprises a pair of rods having at one of their ends a plurality of rollers, the other ends of said rods carrying and pivoting a yoke, said yoke carrying a connecting rod operatively engaged with a crank shaft connected to actuate a counting mechanism.

The invention further includes a specific type of a guide for casing and casing collars and in which the counting mechanism actuator is attached in operative position and to permit a limited amount of lateral motion ordinarily necessary to accommodate the weaving of the tubing as it is lowered. Other features of the invention will be understood from the following description of the drawing.

In the drawing I have shown one embodiment of the invention for purposes of illustration only.

Fig. 1 is chiefly a vertical section showing the present device in operative position to count the number of collars of a string of casing or tubing being lowered into or pulled out of a well;

Fig. 2 is a vertical section through the counting mechanism actuator;

Fig. 3 is a horizontal detail section taken along lines 3—3 of Fig. 2;

Fig. 4 is a fragmentary plan partly in section showing a portion of the collar guide;

Fig. 5 is a diagrammatic view showing the relative position of the crank pin and other parts at different stages as the string of tubing is lowered; and

Fig. 6 is an enlarged elevational view of the yoke, crank pin, crank and rod.

Referring to Fig. 1, the derrick 10 is suitably supported on the derrick floor 11 which rests on cross I-beams 12 supported by I-beams 13 positioned on top of the concrete foundation 14 forming the cellar of the well. A cable 15 provided with a hook 16 is carried by the crown block 17 and supports a casing elevator 18 suspending a string of tubing or casing 19 suitably coupled with collars 20. A spider 21 positioned on beams 22 is employed and is provided with the usual clamping slips 23 for supporting the string of casing or tubing 19 in a fixed position when adding tubing sections 19 to the string.

A casinghead 24 is connected to an outer well casing 25 by a suitable collar 25'. Threaded on the upper end of the casinghead is a special casinghead flange 26 carrying the device forming the subject of the present invention which comprises a casing or tubing guiding unit indicated generally by the letter A and a counting mechanism actuator generally designated by B, Fig. 2.

The casing or tubing guiding unit A consists of a circular guide comprising a pair of semicircular rings 27 provided with lugs 28 and held together by pins 28' passing through the holes provided in the lug. The lower portion of each of the members 27 is provided with a transversely disposed U-shaped or channeled receiving flange 29, the upper portion of which rests on the casinghead flange 26 to slide laterally thereon

and the lower portion of which acts as a retaining ring to prevent upward motion by abutting against the flange 26.

The counting mechanism actuator B as shown more specifically in Figs. 2, 3, 4 and 6 comprises a pair of housings 30, 31 joined by a plurality of screws, the counter housing 30 being snugly received in a suitable supporting housing 32 carried by one of the guides 27. A pair of rollers 33, 34 are suitably mounted one above the other on rods 35, 36, respectively, which are free to move longitudinally in guides 37 of the housing 30 but when not in operation are held out against the stops 38 by springs 39. When in operation their inward motion is limited by adjustable stops 40. Intermediate rods 35, 36 is a yoke 45, the ends of which are pivoted in slots 46, 47 in the rods 35, 36, respectively. A connecting rod 48 passes through the yoke and is held therein by means of a pin 49 and springs 50 disposed on each side thereof and within the yoke. The other end of the connecting rod is attached to a crank pin 51 carried on crank 52 which in turn is connected to the crank shaft 53. The crank shaft 53 is journaled between housings 30 and 31 and may be connected by a flexible shaft 54 to a suitable counting mechanism or a revolution counter 55 mounted on a derrick as shown in Fig. 1.

The other half of the guide 27 is provided with a housing 60 in which a plunger 61 slides longitudinally and is urged forward by a spring 62, the inward movement of the plunger being limited by a nut 63 screwed to one end of the plunger. The plunger is adjusted to extend into the casing passageway for a limited distance. The purpose of this plunger is to force a tubing collar against the rollers 33, 34 at all times during its downward or upward movement in the well and to prevent jamming of the collars in the guide when an oversized collar is passed therethrough. In other words, should an oversized collar be lowered through the ring, the plunger will retract to allow the collar to pass through. Of course, the tension of the spring 62 should be greater than that of the springs 39 in order that these latter springs are retracted first as the collar contacts the rollers.

The counter actuating device B is so mounted in the support 32 of the guide ring 27 that the rollers 33, 34 project into the passageway such a distance as to allow clearance for the tubing 19 to pass without retracting the rods and rollers but is sufficient to insure forcing of the rollers 33, 34 and rods 35, 36, respectively, into the unit when the collars 20 pass. Various sizes of guides are constructed for various sizes of casing or tubing so that the extent of movements of the rollers and rods will be the same in all cases. The device B is transferable and is always applied to the proper size guide for the individual tubing being run.

In the operation of the present device a guide 27 of suitable diameter is placed in line with the casing 25 in any convenient position where the casing or tubing can pass through it. We have shown it as being positioned on a special flange 26 screwed to the top of the casinghead 24. The guide 27 may be fixed so that it restricts the lateral motion of the tubing in the hole or preferably it may be freed to follow such lateral motion as shown.

When a plain section of tubing is lowered into the well through the guide and no collar is present to contact the rollers, the parts take the position I of Fig. 5. As the tubing is lowered farther, the collar 20 makes contact with the roller 33 and forces the rod 35 inwardly, thus causing the parts to take the position II. The inward motion of the yoke 45 forces the crank pin 51 to rotate clockwise 90°, thus rotating the crank shaft 53 a similar amount. The non-congruity of the line of motion of the crank pin with that which the connecting rod bearing would make if the connecting rod were rigidly connected to the yoke, is taken care of by motion of the springs 50 within said yoke. As the collar 20 continues to pass through the ring it makes contact with the roller 34, forcing the rod 36 inwardly so that the ends of the yoke are in a vertical plane. The crank pin and the crank shaft are thus forced to rotate clockwise another 90° as shown at position III. As the collar leaves the roller 33, the rod 35 returns to its normal outward position, moving the crank pin and crank shaft an additional 90° as shown at position IV, and as the collar leaves the roller 34, the rod 36 also returns to its normal position, revolving the crank pin and crank shaft clockwise a final 90°, thus returning the parts to their original position. Thus, a complete revolution will be made in a clockwise direction by the crank shaft which in turn registers the same in the counter 55.

By repetition of the above operations occasioned by the passage of successive collars as the string of tubing is being lowered into the well, the number of units of pipe will be automatically registered in the counter. If, for any reason, the running in of tubing must be stopped and it becomes necessary to pull out or back up a number of lengths of tubing, the passage of collars up through the guide will actuate the crank in a counter clockwise direction a number of times corresponding to the number of collars backed up, thus subtracting from the counter the number of collars and thereby indicating at all times the exact number of joints remaining in the well.

The counter or registering device 55 illustrated herein may be any type of device capable of both additive or subtractive operation depending upon the direction of rotation of the actuating shaft thereof. For example, a "Veeder-Root" revolution counter described on page 29052 of Catalog No. 29 B of the Veeder-Root Manufacturing Co., Inc. of Hartford, Connecticut, has been successfully used.

While I have disclosed the operation in connection with running in of casing, the device is also applicable to pulling out of casings from a well. Thus, if the number of tubing or casing joints in the well has already been determined or is known, that number is primarily registered in the counter before the pulling out operation, and as the tubing is pulled out the number of collars passing over the rollers will be automatically subtracted from the total. If the pulling out of tubing is stopped for any reason, then the number of joints remaining in the well will be correctly registered in the counter.

However, in some cases the actual number of joints in the well is unknown. Then in order to determine the number of joints pulled out of the well, it will be first necessary to place in the counted any arbitrary number, such as a thousand, and as the collars pass over the rollers, the total number of joints pulled out of the well will be subtracted from the arbitrary number and thus by subtracting the number remaining in the counter from the arbitrary number, the actual number of joints pulled out will be determined.

However, it is not necessary to resort to this procedure, since it will be noted that by connecting the cable 54 to the opposite end of the counter 55 from that shown in Fig. 3, a reverse direction of the crank shaft 53 will cause a positive rotation of the dials in the counter and thus the actual number of joints pulled out of the well will be positively registered in the counter without necessitating any subtraction from an arbitrary number.

While the device has been disclosed as specifically applicable to the counting of the number of casing or tubing joints being lowered into or pulled out of a well, the device may also be used in connection with other types of pipes, such as drill pipe, pump rod tubing, sucker rods or any lengths of material provided with couplings or shoulders of larger external diameter than the pipe or rods coupled. The only change necessary is to provide a guide of proper diameter. In drilling wells, the actual depth drilled will be accurately determined by multiplying the average length of the drill pipe by the number of joints registered in the counter and adding the length of the last section. Other uses for the device will be readily understood by those skilled in the art.

The above description and operation of the device is, of course, merely illustrative of the generic invention. Other refinements and improvements may be made as any one skilled in the art will readily understand. The above description is not to be considered as limiting but is to be taken as merely illustrative of the best mode of utilizing the invention. It is to be understood that where the expression "lowering into a well" is used in the claims, it is intended that raising out of a well be also included.

I claim:

1. In a device for counting casing couplings, a vertical guide for said couplings, a counter, a device for actuating said counter and actuable on contact with said couplings, said guide being adapted to direct said casing and couplings to said device.

2. In a device for counting the number of joints of pipe lowered into a well, said joints being connected by couplings, the combination of a counter, a guide movably supporting a counter actuating means, and means attached to said guide to urge the said counter actuating means into operative engagement with passing couplings.

3. In a device for counting the number of joints of pipe lowered into a well, said joints being connected by couplings, the combination of a fixed casing, a counter, and a guide movably supporting said counter actuating means upon said casing in operative engagement with said pipe.

4. A device according to claim 2 wherein the counter actuating means comprises means adapted to actuate the said counter to add couplings moving into the well, and to subtract couplings moving out of the well.

5. In a device for counting the number of coupled tubing joints lowered into or removed from a well, a well casing having a flange, a tubing guide laterally movably supported by said flange and register actuating means supported by said guide and adapted to be operated by tubing couplings passing through said guide.

6. A construction according to claim 1 and a plunger adapted to urge said couplings against said actuating device.

7. In a device for registering the number of joints of pipe lowered into a well, the combination of a counter, a plurality of rollers successively engageable by the pipe joints and means attached to and actuable by said rollers to actuate said counter.

8. A casing collar counter comprising in combination with a registering device, a pair of actuating rods, a yoke pivotally attached to said rods, and a crankshaft in operative engagement with said yoke and said registering device to register the passage of casing collars past said rods.

9. In a device for registering the number of joints of pipe lowered into a well, the combination of a counter, a plurality of rollers, a plurality of rods each in operative engagement with one of said rollers, a yoke attached to said rods and means in operative engagement with the yoke to actuate said counter.

10. A device according to claim 9 wherein said means to actuate said counter comprises a crank.

11. In a device for registering the number of joints of pipe lowered into a well, said joints being connected by collars, the combination of a counter, a plurality of rollers, and means attached to and cooperating with said rollers to actuate said counter when contacted by said collars said rollers being successively actuable by the pipe joints to operate the counter to add the number of collars run into the well and subtract those withdrawn from the well.

12. In a device for registering the number of joints of pipe lowered into a well, said joints having enlarged connections, the combination of a counter, a plurality of rollers actuable by the pipe connections, and a plurality of rods each in cooperative engagement with one of said rollers to actuate said counter, said rollers being successively actuable by the pipe connections to operate the counter to add the number of joints introduced and to subtract the number of joints withdrawn.

13. In combination a fixed well casing adapted to receive tubing connected by couplings, means attached to said casing to guide said couplings, a counter, means attached to said guiding means to register on said counter the passage of couplings through said guiding means and means on said guiding means to urge said couplings laterally against said counter registering means.

14. In a device for counting the number of coupled tubing joints lowered into or removed from a well, a counter, a rigidly supported outer casing having a casinghead thereon, a guide attached to said casinghead, retractable rods in said guide operatively connected with said counter and actuable by the passage of said tubing couplings in said guide, and a plunger adapted to urge said couplings against said rods.

15. In combination, a well casing having a flange, said casing being adapted to receive a tubing having collars to be lowered into the casing, a guide for said tubing mounted upon said casing, counter means carried by said guide adapted to be actuated by said collars on passage through the guide, and a channeled flange on said guide adapted to loosely receive the casing flange and to shift laterally thereon.

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CERTIFICATE OF CORRECTION.

Patent No. 1,988,785. January 22, 1935.

LYLE DILLON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 69, for "counted" read counter; page 3, first column, line 56, claim 3, after "counter" insert the words actuating means; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of April, A. D. 1935.

Leslie Frazer

(Seal) Acting Commissioner of Patents.

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