

April 2, 1929.

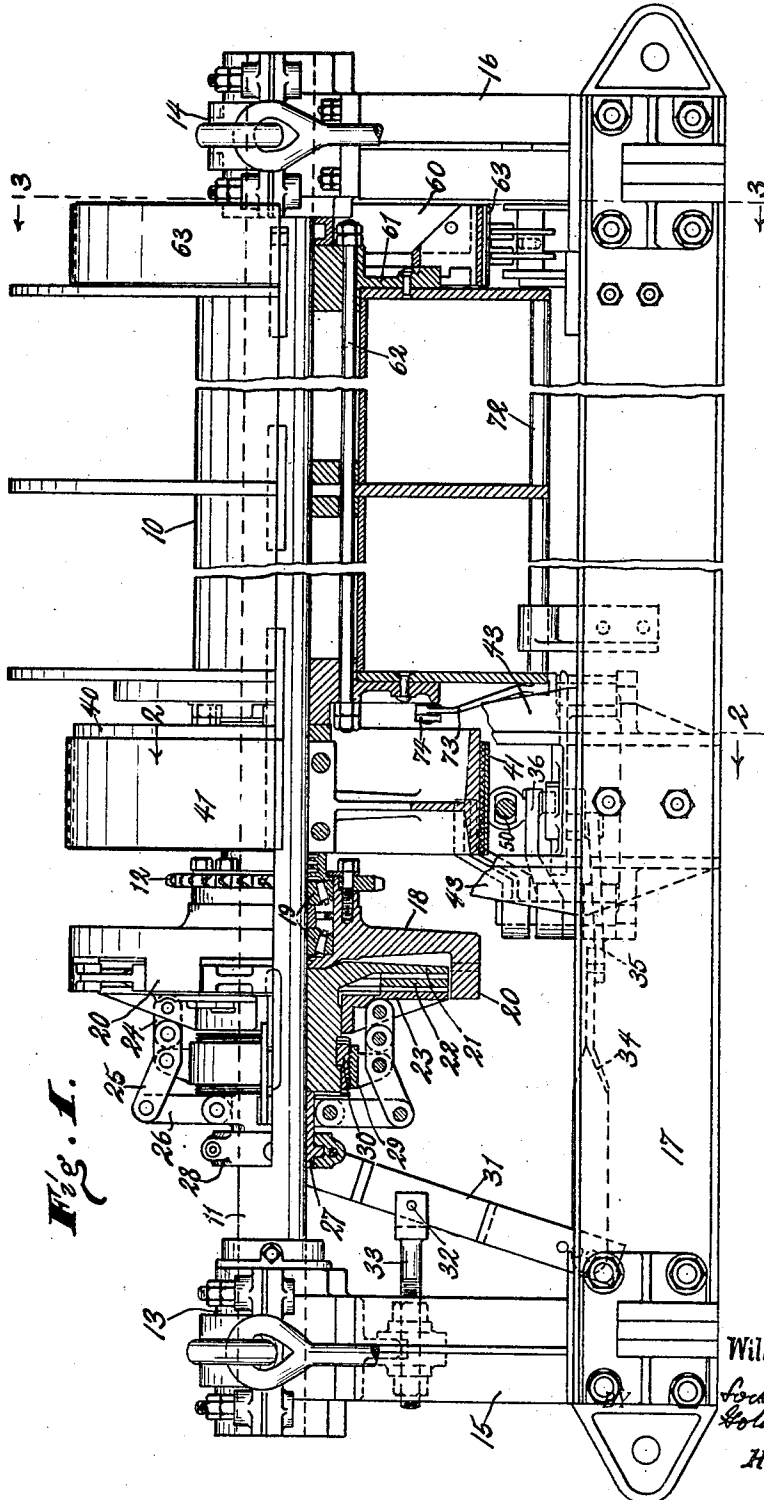
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1,707,219

SAND REEL

Filed Dec. 27, 1927

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2.

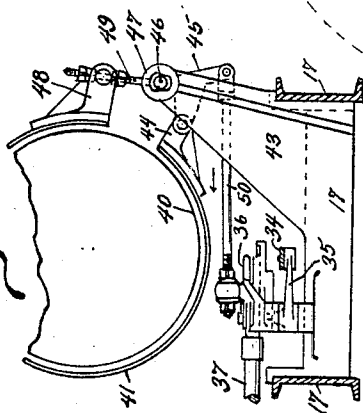


Fig. 4.

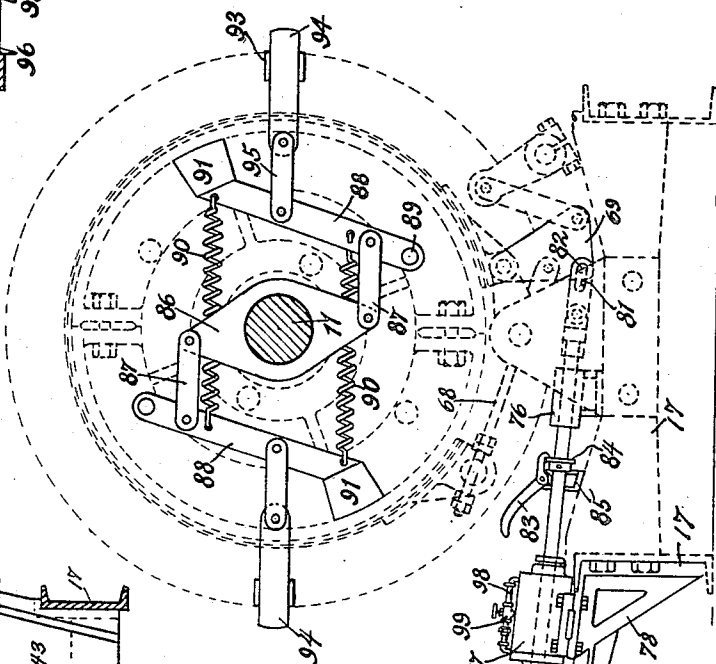


Fig. 3.

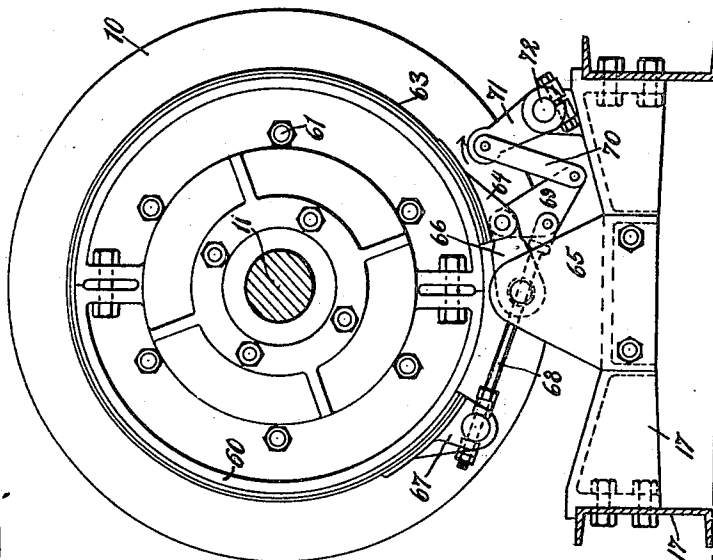
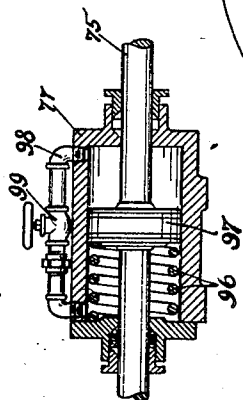


Fig. 5.



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SAND REEL.

Application filed December 27, 1927. Serial No. 242,940.

The object of this invention is to improve the control of clutch and brake mechanisms for power transmission apparatus, and particularly of sand reel apparatus for oil wells and the like.

The invention is more particularly adapted for use in chain-driven sand reels of substantially the same character as that shown in my Patent No. 1,607,871, patented November 23, 1926.

In the particular form of sand reel apparatus for which this invention is particularly devised, there is a clutch for driving and releasing the drum on which is wound or unwound the cable running to the derrick of the oil well for carrying the bailer and the like in operating oil wells. There also has been provided what may be called a standard brake which is controlled by the same means as controls the clutch and usually from lever mechanism located near the derrick. This control has been such as to enable the sand reel to draw the bailer or other means out of the oil well, and during such time the clutch is engaged and when the bailer, or the like is returned or descends into the well, the clutch is released to permit such descent and the brake is brought into operation for controlling such descent. The control mechanism therefore releases the brake after the clutch has been operated and after the clutch has been released to let the bailer down the brake is put in operation, the clutch and brake thus being controlled by the same means and the brake operating more or less automatically in relation to the action of the clutch.

It is frequent for said brake to get too hot, especially in letting down the bailer in a very deep hole, say more than 3,000 feet, and it is also frequent for something to happen to said brake or brake surface whereby it fails to operate properly or the bailer to descend sufficiently slowly, and the bailer in deep wells is liable to get away and run at a dangerous speed and do damage to the well or the mechanism.

The chief feature of this invention consists in the means provided for preventing the bailer or other means from descending too rapidly or the sand reel from running away for lack of proper brake control.

This end is attained by an emergency brake combined and cooperating with said stand-

ard brake for the better and safer control of the sand reel and well mechanism it is operating. This emergency brake may be operated by hand from the derrick or by automatic means as herein disclosed, or both. If the standard brake of the sand reel fails to hold, or something is broken, or the connection between the derrick floor and the sand reel is broken, or the sand reel starts to run away at high speed, the emergency brake mechanism may be applied, either by hand or automatically, as herein set forth, and control the operation of the sand reel to keep it from running away and to render it safe and uniform in operation, as hereinafter will more fully appear.

In the drawings:

Fig. 1 is a view, partly in side elevation, and partly in central vertical section, of a sand reel provided with a standard brake and an emergency brake as contemplated in this invention. Fig. 2 is a view partly in cross section of parts of the sand reel on line 2—2 of Fig. 1. Fig. 3 is a view in vertical cross section of the sand reel on line 3—3 of Fig. 1, showing an emergency brake adapted to be operated by hand from the derrick floor. Fig. 4 shows a modified form of emergency brake, the older parts being indicated by dotted lines and corresponding with what is shown in Fig. 3, and the novel features being indicated by full lines. Fig. 5 is a central vertical section through a portion of what is shown in Fig. 4, parts being broken away.

The sand reel herein shown has for its object the operation of a cable, not shown, for operating drilling and other mechanism for use in connection with oil wells, the derrick and said connection not being shown; and it is driven by any suitable source of power mounted on what is called a rig-iron that is usually located near the said reel, and it is not here shown.

The sand reel has a drum 10 on which said cable is wound and unwound, and said drum is mounted on a drum shaft 11 that is operated by a sprocket wheel 12, which is driven by a chain, not shown, extending from the driving mechanism mounted in the rig iron not shown. The particular sand reel shown is called a chain-driven sand reel. The shaft 11 is mounted at each end in suitable bearings 13 and 14 mounted on stands 15 and 16

extending up from a base frame 17, as shown in Fig. 1.

The sprocket wheel 12 is controlled by a clutch mechanism which may be of any desired form, but that shown herein consists of a hub member 18 which is bolted to the sprocket wheel 12 and it is rotatably mounted on the shaft 11 by taper roller bearings 19, and said clutch member 18 has laterally extending jaws 20. The remainder of the clutch is of a disk construction, there being a friction disk 21 having a hub keyed on the shaft 11 so that when the clutch is in operation it will rotate the shaft. This friction disk construction includes an intermediate floating disk 22 and a friction disk faced pressure plate 23. The latter is connected to toggle levers 24, 25 and 26, and the latter toggle levers are pivoted to the sleeve 27 on shaft 11, having a collar 28 thereon that is operated by the shifting lever 31. The toggle lever 25 is fulcrumed on a nut 29 that screws and is adjustable on the threaded sleeve 30, located on the hub of the friction disk 21.

The clutch is operated and controlled by the lever 31 which is fulcrumed between its ends by a pin 32 on a post 33 and is actuated by a connecting bar or link 34 which is operated by a cam 35 that is driven by a cam 36 through an intermediate connection, and cam 36 is driven by a rod 37 leading to the derrick where it is operated by means not shown herein.

There is what may be termed a standard brake which is controlled by the same means, rod 37, which controls the clutch. It consists of a drum 40, keyed to the shaft and has on it a brake band 41. One end of the brake band is supported on the brake support 43, extending up from the base 17 of the machine, as seen in Fig. 2, by means of a bracket 44 secured to the brake band and pivotally connected with one arm of a bell crank lever 45 that is fulcrumed to the pin 46 carried in the bearing 47 at the upper end of the support 43. The other end of the brake band has a bracket 48 that is adjustably mounted on the screw rod 49 connected with said bearing 47 so as to be adjustable thereon. The brake band is tightened by movement of the rod 50 in the direction of the arrow shown in Fig. 2 by the cam 36 and the lever operated rod 37.

The particular construction of the foregoing mechanism is not essential to this invention as the connection may be made in any manner such that the movement of the hand operated rod 37, by a hand lever near the derrick, not shown, in one direction will draw the clutch above described into operation and immediately afterwards release the brake, and when in the opposite direction will release the clutch and thereafter set the brake. Therefore the operation of the brake

is automatic in its relation to the clutch as it is operated by the clutch operating means.

In operation, the driving means including the sprocket wheel 12 and clutch member 18 may be in continuous operation and when it is desired to wind up the cable, as when lifting a bailer from the bottom of the well, the hand operated rod 37 is moved so as to cause the lever 34 in Fig. 1 to be moved to the right, and thus operate the friction clutch and transmit power to the shaft 11 and drum 10. While the drum is operating and the bailer is being elevated from the bottom of the well, the brake is loose and running idle. When it is desired for the bailer to descend into the well the clutch is released by an opposite movement of rod 37 and the brake is tightened so as to control and limit the speed of the bailer as it goes down into the well.

At the opposite end of the drum 10 from the end adjacent to which the standard brake is mounted, which is automatically operated by the means for operating the clutch, an emergency brake is mounted, which consists of a drum 60 secured by the flange 61 bolted to the end of the drum and held thereon by tie rods 62 in the same manner that the other brake drum is mounted at the other end of the drum.

In the form shown in Fig. 1 this emergency brake drum has a brake band 63 surrounding the same, as seen in Fig. 3, and at one end it is held by a bracket 64 that is connected to the brake support 65 by the links 66. The other end of the brake band has a bracket 67 secured to it and it is adjustably mounted on the rod 68 and is connected with a bell crank lever 69, one end of which is pivoted to the links 66 and the other end is connected by a link 70 which extends to an arm 71 secured on a brake shaft 72, see Fig. 1, which has at its other end an arm 73 which is connected to a rod 74 that extends to the control mechanism located usually near the derrick and which is not shown.

When the shaft 72 is operated so as to move the arm 71 in the direction of the arrow shown in Fig. 3, the brake will be tightened and when moved in the opposite direction the brake will be idle. This is a simple form of emergency brake and is particularly useful in operating deep wells, as for instance in letting down the bailer. In deep wells the bailer acquires by and by a great speed and in fact a dangerous speed, even with the resistance of the standard brake 40. If this speed of the bailer becomes excessive or the standard brake gets too hot, or if something should happen to the standard brake so that it could not be applied, the emergency brake is employed.

Since the problem of the satisfactory operation of sand reels is one having many difficulties and complications, and oil wells are being made deeper and deeper until now they

have obtained a relatively great depth, the combination in the sand reel of the emergency brake has proven to be one of great value. If the standard brake on the sand reel fails to hold, or something is broken about it, or the connecting lever between the derrick floor and sand reel is broken, and the sand reel starts to run away at high speed, the emergency brake will save the situation and it has been desirable frequently to operate it simultaneously with the standard brake, especially in deep wells.

A modified and improved form of emergency brake for sand reels is shown in Figs. 4 and 5. In Fig. 4 the parts indicated in Fig. 3 are reproduced by dotted lines and the added parts by full lines, excepting that shaft 11 is in full lines in Fig. 4.

A piston rod 75 is slidably mounted in a bearing 76 and a cylinder 77. The cylinder 77 is mounted on a bracket 78 secured to the end of the base frame 17 and having an arm 79 to which the lower end of a hand lever 80 is pivoted. The hand lever between its ends is pivoted to the outer end of the piston rod 75. The inner end of said piston rod is longitudinally slotted at 81, and has extending through it a pin 82 which is fastened in the lever plate 69. When the handle 80 is moved to the left the lever 69 is similarly moved and through the rod 68 the brake is released. In that released condition of the brake it may be held by the latch 83 catching on the collar 84 and holding it in the position shown in Fig. 4. The latch 83 is mounted on a bracket 85 which is fastened to the base of the machine. This brake thus held in released or idle condition is thrown into operation automatically by the following speed control means.

On the shaft 11 there is secured a plate 86 having thereon oppositely extending arms to which links 87 are pivoted and they in turn are pivoted to the weight levers 88 that are in the form of bars pivoted at their extreme ends at 89 to the side of the brake drum or construction which revolves with the shaft 11. The outer end of each weight bar 88 is yieldingly held inward by spring 90 which is connected therewith and extends to and is connected with the opposite bar 88 near its pivot point. On the free end of each bar 88 there is a weight 91.

The brake drum has at two opposite points fingers or guide plates 93 which hold and guide a radially extending cam 94 which is connected by a link 95 with the weight arm 88.

The cams 94 are held normally in a position which will enable them as they revolve to miss the latch or trip 83, but when the speed becomes relatively great, or too great, the weights 91 will swing the bars 88 outward somewhat and thus push the cams 94 outward far enough to cause them to engage the latch 83 and release the collar 84 and piston rod 75, and when that rod is released it is pushed to

the right from the position shown in Fig. 4 by a spring 96 in the cylinders 77, as seen in Fig. 5, until the brake is tightened and acts as a resistance to the speed of the drum and the shaft so as to reduce the speed thereof and possibly stop it.

The cylinder 77 is provided in order to control and slow up the action of the piston rod 75 in operating the brake. It is not desirable that the brake should be set suddenly for that would endanger the machinery, but this mechanism enables the brake to slowly get into action. To that end rod 75 has a piston 97 on it in the cylinder and on one side of that cylinder there is a spring 96 and there is a by-pass 98 connecting the two ends of the cylinder and having between its ends a control valve 99. The cylinder is filled with oil.

When the piston rod 75 is pulled back by lever 80 until latch 83 hooks over collar 84, the brake is in released condition. This movement of the piston rod 75 compresses the spring 96 in the left hand end of the cylinder and the oil in the cylinder to the left of the piston is forced through the by-pass into the end of the cylinder nearest the sand reel. The by-pass valve 99 is regulated to let through a given amount of oil in a given time and this controls the speed of action of the piston rod 75.

The speed of the sand reel is set or controlled largely by the governor springs 90. When the speed overcomes the resistance of those springs and the cams 94 are moved outward the latch 83 will be released and then the spring 96 will force the piston 97 in the cylinder 77 from the left hand end of the extreme right hand end of the cylinder and that will gradually and increasingly tighten the brake. The speed of applying this brake will be controlled by the oil passing through the by-pass 98 of the cylinder 77. This will let the brake gradually be applied for reducing the speed of the drum and movement of the bailer until they may be brought to a standstill.

I claim as my invention:

1. In a sand reel, the combination of the drum, a clutch for driving said drum, means for operating the clutch, a clutch controlled brake for the drum operated by the means for operating the clutch, and an emergency brake for the drum operative independently of the clutch and clutch controlled brake.

2. In a sand reel, the combination of the drum shaft, a clutch for driving the said shaft, a brake for said shaft, a single means for controlling both the clutch and said brake arranged to release said brake when the clutch is operated, and to operate the brake when the clutch is released, and an emergency brake for the drum shaft operative independently of the clutch and said other brake.

3. In a sand reel, the combination of the

drum, a clutch for driving said drum, a clutch controlled brake for said drum, an emergency brake for the drum, and means controlled by the speed of the drum for causing the operation of the emergency brake.

4. In a sand reel, the combination of a drum shaft, a clutch for driving said shaft, a clutch controlled brake for said shaft, an emergency brake for the shaft, centrifugally acting means secured on the drum shaft, and means controlled by said centrifugally acting means for causing the operation of said emergency brake.

5. A sand reel mechanism substantially as set forth in claim 4, and means for controlling the speed of the action of said emergency brake operating means.

6. In a sand reel, the combination of a drum shaft, a clutch for driving said shaft, a clutch controlled brake for said shaft, an emergency brake for the shaft, means for yieldingly causing the operation of said emergency brake, releasable means for holding said brake operating means from operation, and centrifugally acting means mounted on the drum shaft adapted to engage and

release said holding means when the speed of the drum shaft becomes excessive.

7. In a sand reel, the combination of a drum shaft, a clutch for driving said shaft, a clutch controlled brake for said shaft, an emergency brake for the shaft, a spring actuated rod for operating said emergency brake, releasable means for holding said rod in position to render the emergency brake inoperative, and centrifugally acting means mounted on the drum shaft for releasing said holding means and thus permitting the operation of the emergency brake.

8. A sand reel mechanism substantially as set forth in claim 7, an oil containing cylinder through which said rod operates, a piston in said cylinder secured on said rod, a spring in said cylinder acting between one end thereof and said piston for moving the rod so as to cause operation of the emergency brake, and a by-pass connecting the ends of the cylinder.

In witness whereof, I have hereunto affixed my signature.

WILLIAM A. COOK.