Aug. 18, 1936. B. BOYKIN, JR 2,051,286

WATER COOLED BRAKE FOR DRAW WORKS

Filed June 23, 1933 4 Sheets-Sheet 1

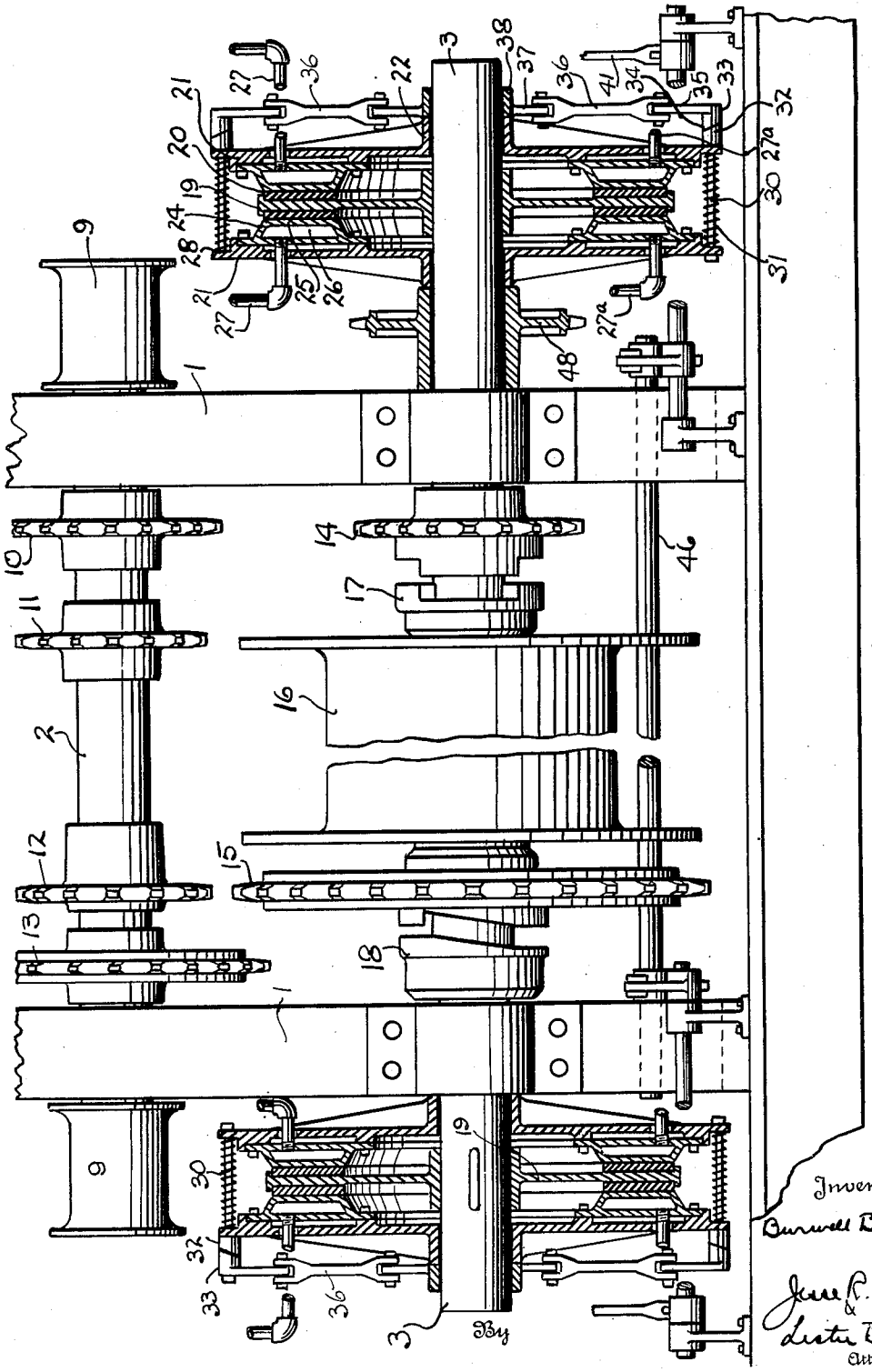


Fig. 1.

Aug. 18, 1936. B. BOYKIN, JR 2,051,286

WATER COOLED BRAKE FOR DRAW WORKS

Filed June 23, 1933 4 Sheets-Sheet 2

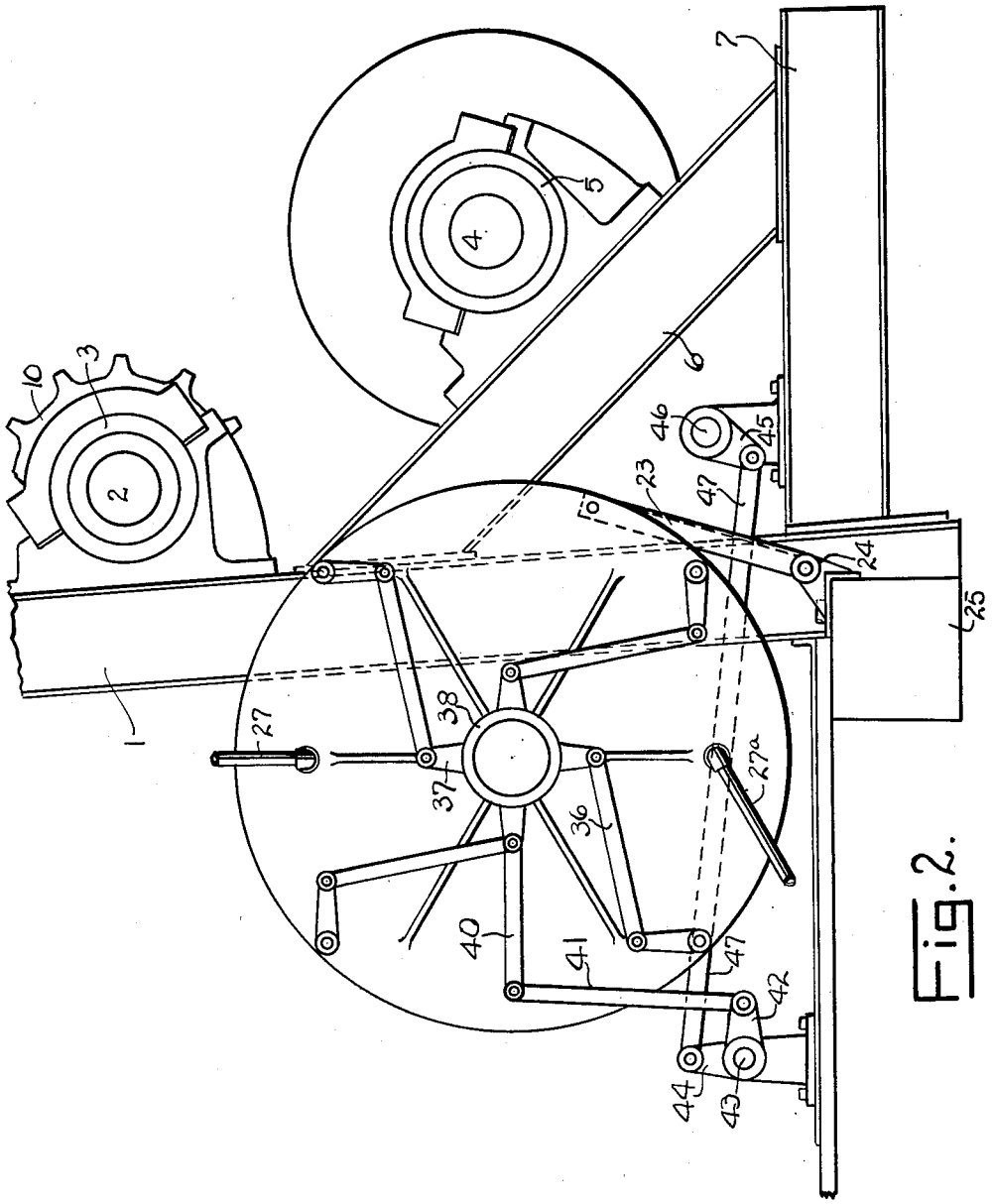


Fig. 2.

Burwell Boykin Jr. Inventor

Jesse P. Stone
&
Lester B. Clark

By

Attorneys

Aug. 18, 1936. B. BOYKIN, JR 2,051,286

WATER COOLED BRAKE FOR DRAW WORKS

Filed June 23, 1933 4 Sheets-Sheet 3

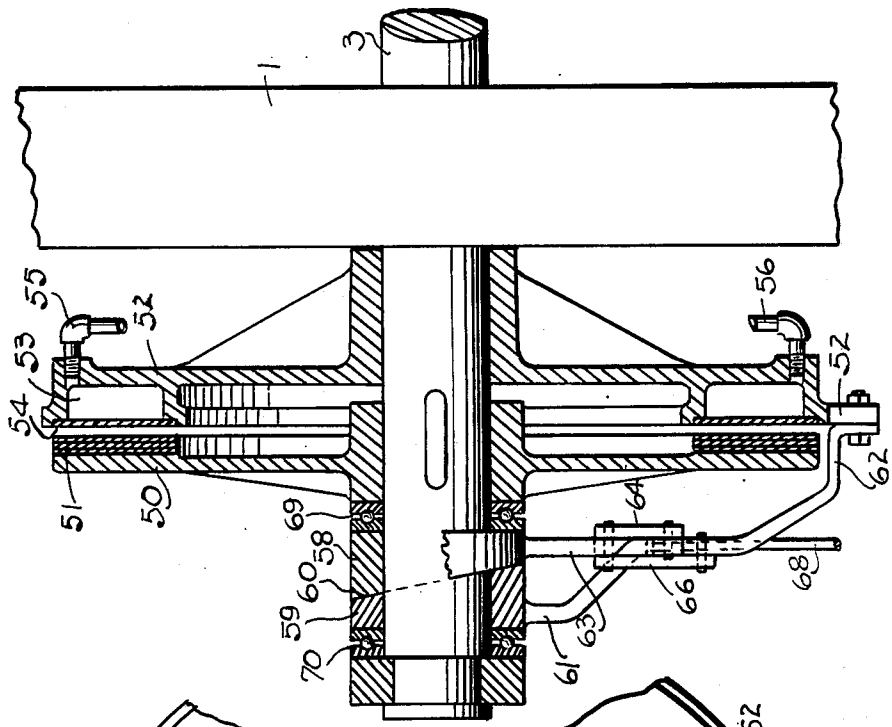


Fig. 4.

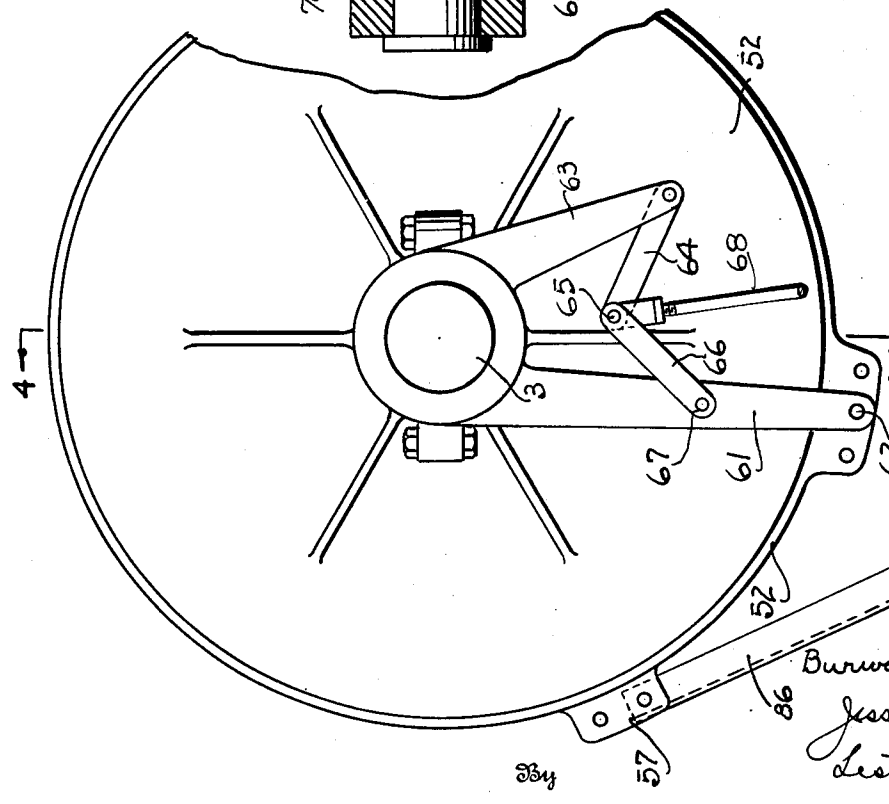


Fig. 3.

Inventor
Burwell Boykin Jr
Jesse P. Stone
& Lester B. Clark
Attorneys

By

Aug. 18, 1936. B. BOYKIN, JR 2,051,286

WATER COOLED BRAKE FOR DRAW WORKS

Filed June 23, 1933 4 Sheets-Sheet 4

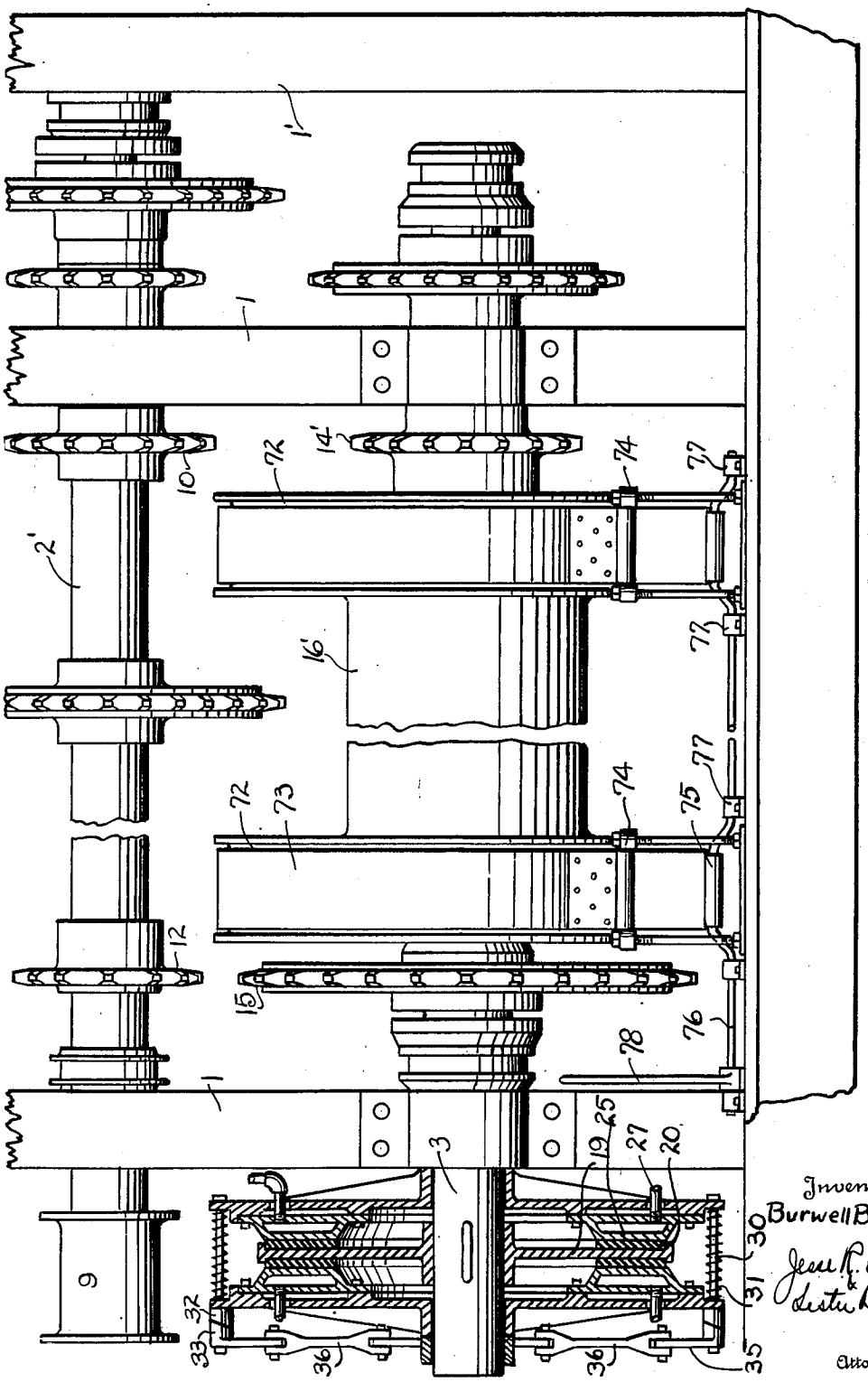


Fig. 5.

Inventor
Burwell Boykin, Jr
Jesse R. Stone
& Lester B. Clark
Attorneys

Patented Aug. 18, 1936 2,051,286

# UNITED STATES PATENT OFFICE

2,051,286

## WATER COOLED BRAKE FOR DRAW WORKS

Burwell Boykin, Jr., Beaumont, Tex.

Application June 23, 1933, Serial No. 677,195

1 Claim. (Cl. 188—1)

My invention relates to brakes used on hoisting drums employed particularly on the draw works of well drilling rigs. The invention is applicable generally to drums of this type.

It is an object of the invention to provide a brake to be employed with hoisting drums which is so constructed as to obtain the most efficient cooling of the braking surface during operation.

It is another object to provide a brake which is easily operated and regulated during the operation of the reel with which it is used.

I desire to provide a disc type of friction brake which can be operated without experiencing the common difficulties encountered with the usual brake drum. I desire to eliminate, so far as possible, the heavy starting and stopping inertia which is experienced with the common type of brake.

I further desire to take the shock of application of the brake from the operating lever so that danger resulting from the impact of the load upon the drum may be removed from the operating control handled by the driller.

It is a further object to provide a braking device which may be spaced from the end of the hoisting drum so that more room may be obtained for a full sized drum.

In the drawings herewith Fig. 1 is a front view partly in elevation and partly in transverse section illustrating a hoisting drum with one embodiment of my brake applied thereto.

Fig. 2 is a side elevation of the drum shown in Fig. 1.

Fig. 3 is an end view of a hoisting drum with a slightly different embodiment of the invention used therewith.

Fig. 4 is a broken view in longitudinal section of one form of my water-cooled brake mounted upon the drum shaft.

Fig. 5 is a front elevation of a still different embodiment of the invention.

It is to be understood that my invention may be applied generally to hoisting drums of large and small capacity. It may be used with draw works connected with well drilling rigs of the two or three jackpost type. In Figs. 1 and 2 I have shown a draw works such as is employed with the two jackpost type, the jackposts being shown at 1. Upon these jackposts are mounted a line shaft 2 and a drum shaft 3. With reference particularly to Fig. 2, there is a jackshaft 4 mounted upon bearings 5 secured upon the inclined post 6, said inclined post being secured at its lower end to the sill 7 and at its upper end to the jackpost 1.

The line shaft 2 has thereon a cat-head 9 at each end thereof. Between the posts are mounted the high speed gear 10, the actuating gear 11, the low speed gear 12, and the additional actuating gear 13, and it is to be understood that the line shaft 2 may be rotated through either of the sprocket wheels 11 or 13, depending upon the speed of rotation of the shaft 2 which is desired.

The drum shaft 3 is operated through a high speed gear 14 or the low speed gear 15 from the line shaft in the usual manner. Mounted upon the drum shaft between the posts 1 is the reel or drum 16. Said reel has no brake drum at the end in the usual manner, the brake being set at the ends of the shaft as will be presently described. There is, therefore, between the two jackposts space upon which I contemplate mounting a drum 16 which is longer than usual and of large outer diameter. Said drum is mounted upon the shaft in the usual manner and will be rotated at various speeds depending upon the particular arrangement of the sprocket wheels through which the drum may be driven. It is to be understood that the sprocket wheels 14 and 15 are adapted to be clutched into engagement with the shaft by clutches 17 and 18, respectively.

While it is desirable in some instances to employ a brake at only one end of the drum, I contemplate the use of two brake members, one at each end of the drum shaft.

In Fig. 1 I have shown two brake members of approximately identical construction, one on each end of the shaft. Each of these brake members comprises a disc 19 fixed to the shaft and rotatable therewith. Said disc has, adjacent the outer margin thereof, brake plates 20, one on each side of the disc made up of annular strips of brake lining secured to the sides of the disc as will be understood from the drawings.

On opposite sides of the disc are the circular plates 21 which have hubs 22 thereon mounted slidably upon the shaft 3. They are held non-rotatable relative to the shaft by means of a link 23 as shown in Fig. 2, said link being extended downwardly and secured to a bracket 24 mounted upon the sill 25. Each of these plates has adjacent the outer margin thereof, a water cooled friction member 24. With reference particularly to Fig. 1 it will be seen that these two friction members have an inner face 25 adjacent the brake lining upon the disc and a chamber 26 spacing the friction wall from the main body of the plate. The chamber 26 is an annular closed chamber adapted to allow the circulation of cooling liquid therethrough. For this purpose, a pipe 27 is secured through the wall of the plate 21 and

screwed within the outer wall of the chamber 26. A similar pipe 27a is secured to the lower portion of the chamber 26 so that liquid may be circulated into one side of the circulating chamber and out the other side so as to keep the friction surface 25 constantly cooled through the circulation of the liquid.

It is to be noted that the friction member 24 is annular in shape and secured detachably to the plate 21 by bolts 28. This allows the friction member to be replaced when wear occurs.

The two plates 21 which support the friction members are movable toward and away from the disc 19 by any desirable means, and I have shown the two plates as being connected at intervals around their outer margins by through-bolts 30. There are coiled springs 31 on each of these bolts bearing at their ends upon the plates 21 and tending to hold them resiliently apart. Beyond the outer plate 21 the bolts 30 are extended and have thereon a pair of sleeves 32 and 33, the adjacent surfaces of which are cam-shaped as shown at 34, so that when the outer sleeve 35 is rotated relative to the sleeve 32 which is integral with plate 21, the plates will be forced toward each other so as to apply the brake. The outer sleeve 33 is rotated by means of a crank arm 35 thereon secured by means of a link 36 to a crank arm 37 mounted on a collar 38 rotatable upon the drum shaft 3.

As will be seen from Fig. 2, the collar 38 has four crank arms 37 thereon, so that the rotation of the collar 38 will move all of said crank arms and through the links 36 the brake operating means will be actuated.

The collar 38 is rotatable on the shaft to apply or release the brakes by means of an arm 40 extending radially outward from the collar and connected by means of a link 41 with the crank arm 42 upon the brake shaft 43. It is to be understood that the brake shaft may be rotated to apply the brakes by any preferred means such as a pedal or, if desired, by hand lever not shown.

Upon the brake shaft is a crank arm 44 connected across beneath the drum to a similar crank arm 45 upon the shaft 46 by means of a link 47.

It is to be understood that the shaft 46 extends to the rear of the drum across to the other end to transmit rotation to the brake at the opposite end of the brake drum, so that the two brakes may be operated simultaneously. This is the usual procedure, and need not be further described.

Between the brake and the adjacent jackpost 1, at one end of the drum shaft, is an idler sprocket 48 to accommodate the drive chain between the jackshaft 4 and the drilling rotary, not shown. This feature forms no part of the present invention.

In the operation of my drum the brake may be easily applied, and as the brake members are at the ends of the shaft they take up very little space and do not interfere with the space occupied by the brake drum. For that reason, the reel may be materially longer than usual, and will accommodate a large amount of cable without the winding of one layer of cable upon another. In this way I am enabled to prevent wear or injury to the cable much more effectively than could be done when the hoisting drum is shortened so as to provide for brake drums at either end thereof. The brake is further capable of cooling in a most effective manner so that heat generated by the friction of the drum will be easily dissipated.

Another advantage lies in the lightness of the braking member. Very little inertia is present so that the drum may be easily started or stopped without the power usually required to overcome the inertia of the brake drum. This is a feature which leads to a smooth operation of the hoisting drum.

It will also be noted that the application of the brake may be smooth and even, so that there will be no jerking or kicking of the brake relative to the means by which the brakes are applied. The operator will not, therefore, be liable to injury from the slipping of the brake lever during the operation of the device.

A feature of particular advantage connected with the device lies in the positive and smooth control by which the operator can handle the hoisting device. It is much easier on the operator than is the usual type of brake drum.

In Figs. 3 and 4 I have shown a type of modification of my brake adapted for use on lighter forms of hoisting drums. In this case there is upon the disc 50 a friction member 51 upon one side only of the disc. This friction member is shown as being made up of a plurality of layers of brake lining arranged approximately as seen in the modification previously described. The friction member cooperating with the disc 50 is mounted upon the plate 52, said plate having an annular channel 53 thereon adjacent the outer margin, said channel being closed on the side toward the brake lining 51 by a friction plate 54.

The friction plate 54 may be arranged removably in position so that when it becomes worn in use it may be replaced. The cooling fluid is fed to the chamber 53 through circulating pipes 55 and 56 in the manner previously noted. In this modification the plate 52 is held stationary by a link 86 secured to the plate at 57.

The friction disc is moved toward the friction plate 54 by means of a cam-shaped clutch including a collar 58 and a cooperating collar 59 adjacent thereto, the two collars having a diagonally arranged cam surface cooperating with the other collar as shown at 60. The collar 59 is held from rotation on the shaft 3 by means of an arm 61 connected at 62 to the stationary frame member 52. The collar 58 is rotated by means of an arm 63 thereon connected at its outer end to a link 64 which is in turn connected at 65 to a link 66 held at its opposite end pivotally to the arm 61 by the pivot pin 67. The two links 64 and 66 form a toggle lever which is operated by a rod 68 to move the collar 58 to apply the brake in an obvious manner.

To facilitate the operation of the clutch which applies the brake, I have shown anti-friction bearing members 69 and 70 at each side of the cooperating collars 58 and 59.

The operation of this device is quite similar to that of the device previously described. The brake may be applied when desired by moving the disc 50 against the friction member which acts as a snubber to resist the rotation of the drum shaft. It is possible to exert a light or heavy pressure on the brake as desired, depending upon the load which is being handled and on the speed of operation thereof. The device is capable of easy and accurate operation which is not only easier on the operator, but is safer and more efficient.

For ordinary work, the brake, comprising the disc and the friction members connected therewith, which has been described, will be entirely sufficient. However, in extremely heavy duty it is advisable to employ the usual brake drum and

to use the disc brake as a snubber in connection therewith so that the usual brake drum will operate more smoothly and effectively. In Fig. 5, I have shown an installation wherein this combination is employed. This is what is ordinarily called the three jackpost installation. I have the two jackposts 1, as shown in Fig. 1 of the drawings, and in addition thereto is a third jackpost 1' which serves to support one end of the line shaft 2'. The drum shaft is shown at 3. It is mounted in bearings upon the two jackposts as in the previous embodiment and is adapted to be rotated by a sprocket chain connection with the line shaft in the usual manner, this arrangement for rotation being no part of the present invention.

Mounted upon the shaft is a hoisting drum 16'. This drum has at each end thereof a brake drum 12, which is also of ordinary construction. There is upon the brake drum a brake band 13, which is anchored at one end, as shown at 14, and the other end thereof is connected at 15 to an operating shaft 16. Said shaft 16 is supported for rotative movement in bearings 17 and has thereon a lever arm 18 within the control of the operator. It is to be understood that the brake bands may be applied to the drums by the movement of the brake lever 18 in the usual manner. The difficulty with brakes of this character has been that they will seize and operate with a jerking motion and are extremely hard to control by the operator. I have found, however, that when the disc brake, which I have herein shown, is employed upon the end of the shaft, as in Fig. 5, it may be operated in combination with the old type of brake and the jerky movement of the band upon the drum may be avoided. I, therefore, contemplate the operation of the disc type of brake as a snubber in connection with the old type of brake and am thus enabled to control the smooth operation of the draw works with much less work to the operator handling the brakes. Thus, when the load is being lowered into the well the brake band may be tightened upon the drum sufficiently to allow the load to drop at an even rate and the application simultaneously of the disc brake will not only increase the ease of control but will prevent the seizing of the brake bands upon the drum as is common where no additional assistance is provided in the handling of the load. I, therefore, consider it an important arrangement whereby the two types of brakes may be used, one to supplement the other in simultaneously controlling the loads which are encountered in well drilling operations.

Having described my invention, what I claim is:

In a draw works installation for well drilling operations, a plurality of jackposts, a drum shaft journaled for rotation thereon, a hoisting drum on said shaft, a brake drum at each end of said hoisting drum, brake bands thereon and means to operate said brake bands, in combination with a snubbing device mounted adjacent the end of said shaft, including a disc on said shaft and water cooled friction rings adapted to be moved into contact with said disc.

BURWELL BOYKIN, JR.