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2,582,682

DRILLING MOTION TAKE-OFF

Filed June 26, 1948

2 SHEETS—SHEET 1

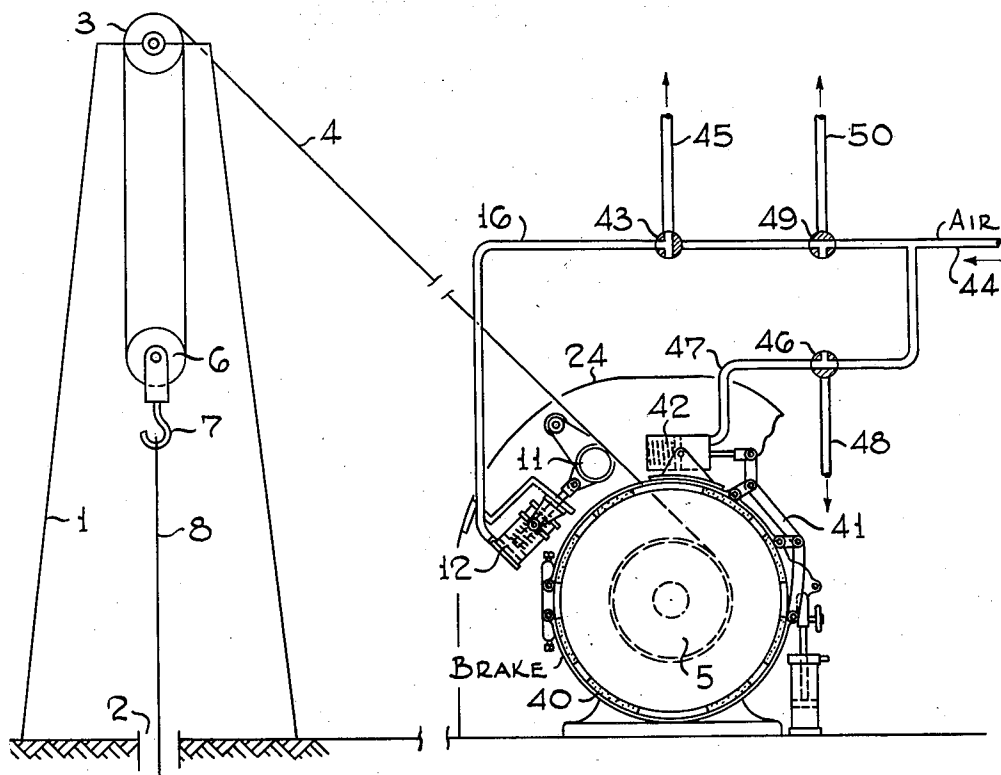


FIG.-1

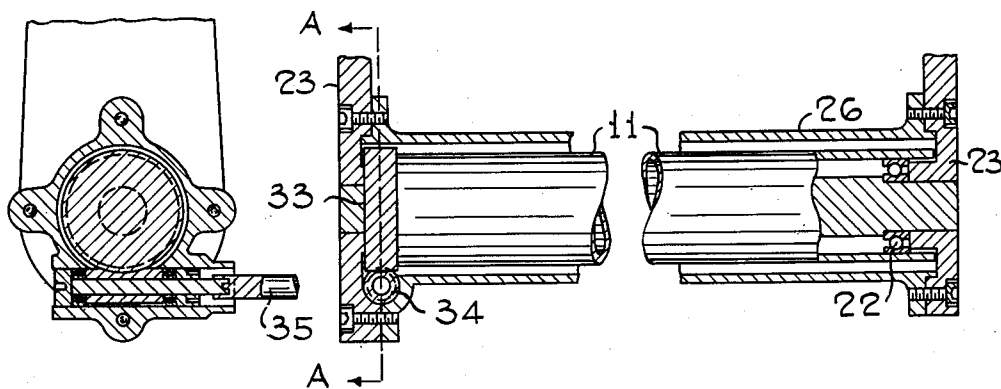


FIG.-4A

FIG.-4

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2 SHEETS—SHEET 2

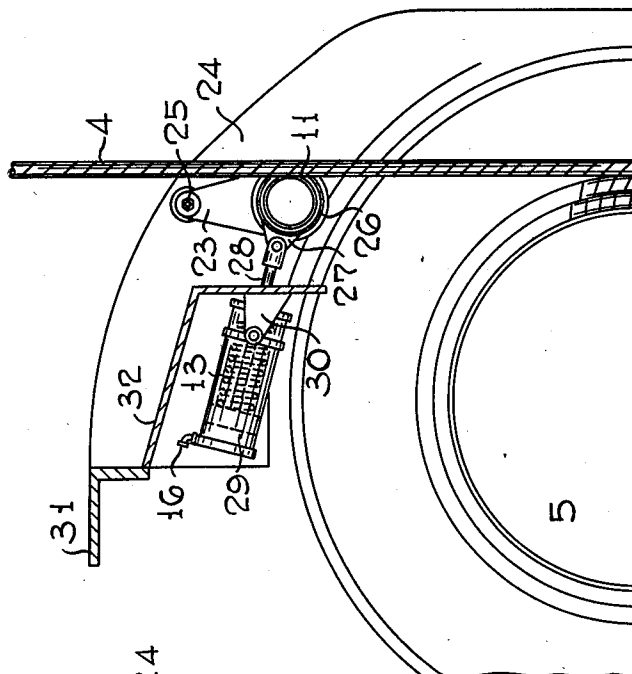


Fig. 3

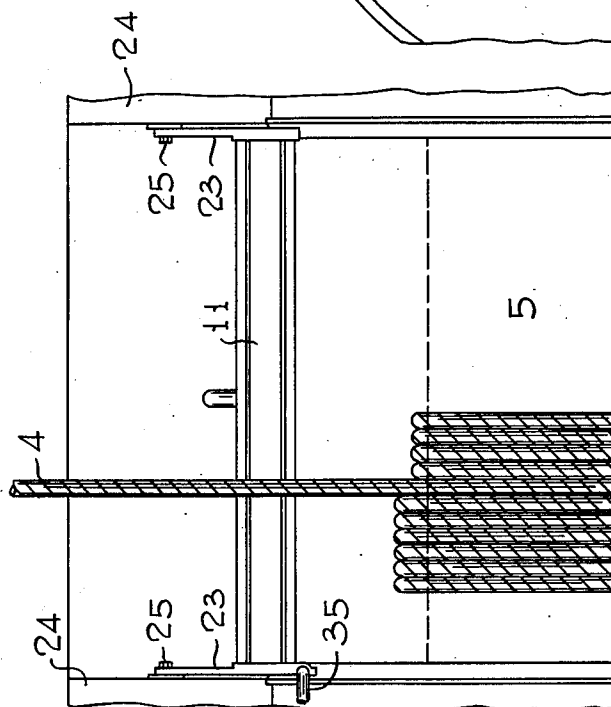


Fig. 2

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UNITED STATES PATENT OFFICE

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DRILLING MOTION TAKE-OFF

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mesne assignments, to Standard Oil Develop-
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of Delaware

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7 Claims. (Cl. 33—129)

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This invention relates to an improved motion take-off device which is particularly adapted for use in transmitting the motion of a line or cable to indicating, recording or other devices. The invention is described herein with particular reference to its use in drilling wells.

The operation of well drilling, especially deep petroleum wells, is usually accomplished with a drill bit attached to the end of a long string of drill pipe which is supported through suitable blocks at the well head by a hoisting cable. This cable is let out as the drill progresses in the earth. However, the motion of this cable is not continuous as the drilling operation is frequently interrupted to permit spudding to connect additional lengths of drilling pipe to the string, to withdraw the string from the earth in order to replace the drill bit, and for numerous other purposes such as well logging, etc. These operations involve reversing the motion of the hoisting cable to raise the traveling block.

Also in drilling deep wells it is desirable to provide continuously an accurate record of the progress of the drill bit through the earth. Various means have heretofore been proposed for accomplishing this which generally involve strings of wire or twine connected to the traveling block. The presence of such strings complicates the operations at the well head in order to avoid breaking them; also the reciprocal motion of the strings as the traveling block moves up and down requires special attention to the device in order to transmit a record of motion only in the direction desired.

It is an object of the present invention to provide a motion take-off which avoids these difficulties. It is a further object of this invention to provide a motion take-off means which is directly associated with the hoisting cable or live line at a point remote from the derrick blocks and the operations incident thereto. It is a still further object of this invention to provide a motion take-off which is automatically operable in conjunction with the operation of the draw works hoisting drum so that motion is indicated only during the downward motion of the traveling block and no take-off is made of the reverse motion of the hoisting cable as it is rewound upon the drum.

These and other objects of this invention will be apparent from the following description and the drawings.

Referring to the drawings:

Fig. 1 is a diagrammatic elevation in partial section of a drilling rig and illustrates the use of the present invention on the live drilling line

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or cable leaving the draw works hoisting drum at the well head, adapted for automatic control with the operation of the draw works.

Fig. 2 is a partial sectional elevation of the draw works hoisting drum and the attached motion take-off device;

Fig. 3 is an end view in section of Fig. 2;

Fig. 4 is a detail view in partial section of the motion take-off roller; Fig. 4A is an end section of Fig. 4 along the plane A—A.

The same numbers refer to the same elements throughout the several figures.

Referring to Fig. 1, a derrick 1 mounted over a borehole 2 is provided with conventional hoisting mechanism such as the crown block 3, a drilling line 4 having one end secured to a hoisting drum 5 and suspending a traveling block 6 from the crown block, a hook 7 supporting a drill string and elevator assembly indicated diagrammatically by the line 8.

The motion take-off means comprises a roller 11 (shown in greater detail in Figs. 2 to 4) which is provided with means for pushing it against the line 4, such as the air operated piston 29 in housing 12 which is provided with a spring 13 for withdrawing the roller 11 from contact with the line 4 on release of the air supply.

The engagement of the roller with the live line may be controlled by any suitable means subject to manual or automatic operation. Manual operation involves simply the opening and closing of a valve 43 connecting a compressed air supply line 44 to the air line 16, the valve being arranged to vent air pressure from line 16 through line 45 when closed. Automatic operation of the device may be arranged with a similar valve connected through any suitable electrical, mechanical and/or hydraulic linkages to suitable devices actuated by the starting or stopping operation of the draw works. For example, rotation of the drum 5 is stopped by a brake mechanism such as a brake band 40 and brake contracting linkage 41 operated by an air piston or other suitable means 42. Air pressure supplied through valve 46 to line 47 thus applies the brake 40. The valves 43 and 46 may be linked together for simultaneous operation. Thus opening valve 46 locks the brake and stops rotation of the drum 5 while closing valve 43, vents air pressure from line 16 and disengages roller 11 from contact with line 4. Conversely, release of brake 40 by closing valve 46 and venting air from the brake cylinder through line 48 also turns valve 43 to supply air pressure to line 16 thereby advancing roller 11 against line 4. If it is desired to release the brake for operation of the draw works for

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any other purpose than drilling, engagement of roller 11 with line 4 may be prevented by means of a second valve 49 on air supply line 44 which is similar to valve 43. Turning valve 49 to the closed position shuts off air supply 44 and releases any pressure in line 16 through vent 50. Operation of this second valve 49 may also be automatically controlled by connection with valves, brakes or other operating control devices of other parts of the drilling operations.

The automatic control device illustrated is presented in simple diagrammatic form and illustrates one embodiment of the invention. The operation of the roller to contact the live line 4 only during forward progress of the bit in drilling operation may also be controlled automatically by connecting the air pressure line 16 to the drilling air pressure control system used for operation of walking feed-off air brakes for draw works, described in my copending application, Serial No. 691,486, filed August 19, 1946 which has matured into Patent No. 2,489,449, and further described in an article "Automatic Drilling Control" by True and Crookston in the Oil and Gas Journal, November 1, 1947.

Referring to Figs. 2 to 4, the roller 11 is supported at both ends on suitable bearings such as roller bearings 22 in end brackets 23 which are pivotally supported on pins 25 projecting from the sides of the drum housing 24. Connecting with the end bracket members 23 is a shield 26 covering a portion of the roller opposite the line 4 and leaving the face of the roller exposed to contact this line. A bracket 27 on shield 26 is pivotally connected through piston shaft 28 to piston 29 which operates in piston cylinder or housing 12. This cylinder is pivotally supported as by the trunnion and bracket 30 connection to the drum housing or header 31 through any suitable means. For example, this bracket may be mounted directly on an existing wire line guard 32.

The rotary motion of the roller 11 may be transmitted to remote indicating and recording devices by any suitable method such as by gear 33 (Fig. 4) mounted on the end of the roller and gear 34 to which is attached a flexible drive shaft 35. Other suitable means may also be used such as an autosynchronous motor provided at one end of the roller in place of the gear assembly and electrically linked to a second autosynchronous motor which can be remotely located from the first and used to drive any desired meters or indicating devices.

In the operation of the device illustrated above, the roller 11 can thus be used whenever desired to transmit motion of the line 4 to any external point, without in any way interfering with the normal motion or location of the line as it is unwound from or rewound on the drum 5. The roller 11 can be brought into contact, and maintained in constant contact, if desired, with the moving line 4 in spite of the travel of this line back and forth across the drum as it is being wound or unwound thereon and also in spite of the changing distance of the line from the axis of the drum 5 due to increasing or decreasing thickness of the coil of the line on this drum. The roller 11 is pressed against the line 4 sufficiently firmly by the air pressure supply to provide accurate indication of the linear travel of this line, but not sufficiently to interfere with the normal operation of the line in drilling or other work.

While this invention has been described with

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reference to the specific device illustrated in the drawings and in its particular application to well drilling, it is obvious that many variations in the specific elements thereof and in the uses of the drum cable may be made without departing from the spirit of this invention. For example, the drum cable may be used as a hoisting line in any type of elevator or well, rigging device or other traction mechanism involving the use of a cable which moves in two directions during the operation.

I claim:

1. A motion take-off device comprising, in combination, a rotatably mounted drum, a working line having one end attached to said drum and coiled thereon, the other end of said line extending from said drum, a roller, extending across the face of said drum, adjustable supports for the ends of said roller arranged to support it rotatably in spaced relation to the face of said drum and in variable spaced relation to the line leaving said drum, reciprocally acting means rotatably connected with said roller for moving it into contact with said line leaving the drum and means associated with said roller for transmitting the rotation thereof to a point remote from said drum.

2. Device according to claim 3 comprising in addition braking means adapted to stop the rotation of said drum, and control means connecting with said braking means and said reciprocally acting means, said control means being adapted to remove said roller from contact with said line when said braking means are fully applied to stop the rotation of said drum.

3. Device according to claim 4 comprising in addition a second control means associated with said first control means and adapted to permit release of said braking means without activating said reciprocally acting means, whereby optional rotation of said drum is permitted without engagement of said roller with said line.

4. A motion take-off device comprising, in combination, a drum rotatably mounted in a drum housing, a working line having one end attached to said drum and coiled thereon, a roller extending across the face of said drum in spaced relation thereto and to said working line, brackets pivotally mounted on said drum housing and rotatably supporting the ends of said roller, a rigid guard member connecting said brackets and extending across the rear of said roller, an air piston pivotally mounted on said drum housing and having a piston shaft pivotally connected to said guard member, a spring associated with said piston and arranged normally to hold said roller out of contact with said working line, means for supplying compressed air to said piston whereby said roller is forced against said working line, a gear drive connecting one end of said roller to a flexible drive shaft whereby rotation of said roller is transmitted to a point remote from said drum.

5. A device according to claim 7 comprising, in addition, braking means adapted to stop the rotation of said drum, control means associated with said braking means, air actuated piston means adapted to operate said brake means, said last mentioned air actuated piston means and said first air piston being connected through control valves to a common air supply, thereby providing automatic means for engaging said roller with said working line during a desired state of operation of said drum.

6. A device according to claim 8 in which the

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two said air pistons are arranged to automatically engage said roller with said working line during only the unwinding motion of said drum.

7. A motion take-off device comprising, in combination, a drum rotatably mounted in a drum housing, braking means adapted to stop the rotation of said drum, a working line having one end attached to said drum and coiled thereon, the other end of said line extending from said drum, a roller extending across the face of said drum, adjustable supports for the ends of said roller on said drum housing and arranged to support said roller rotatably in spaced relation to the face of said drum and in variable spaced relation to the line leaving said drum, means rotatably connected with said roller for moving it into contact with said line leaving the drum, and means associated with said roller for transmitting the rotation thereof to a point remote from said drum, actuating means to control the operation of said drum braking means and said roller displacing means and a

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common control means for said actuating means thereby providing automatic engagement of said roller with said working line during a desired state of operation of said drum.

ROBERT R. CROOKSTON.

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