Nov. 28, 1939. A. J. RICK 2,181,344

ROPE

Filed Oct. 10, 1938

Fig. 2.

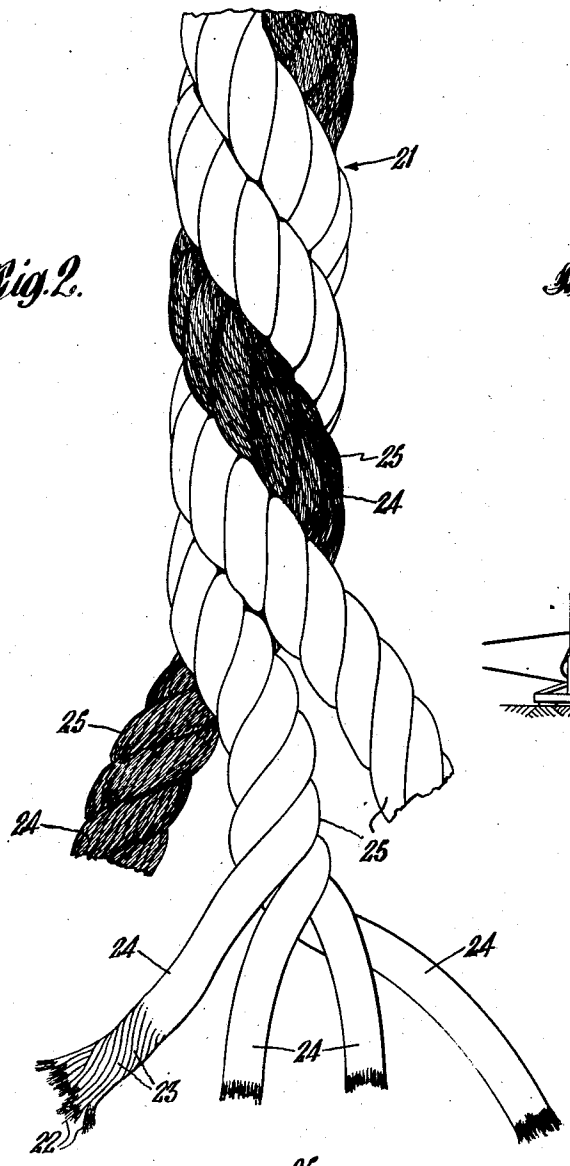


Fig. 1.

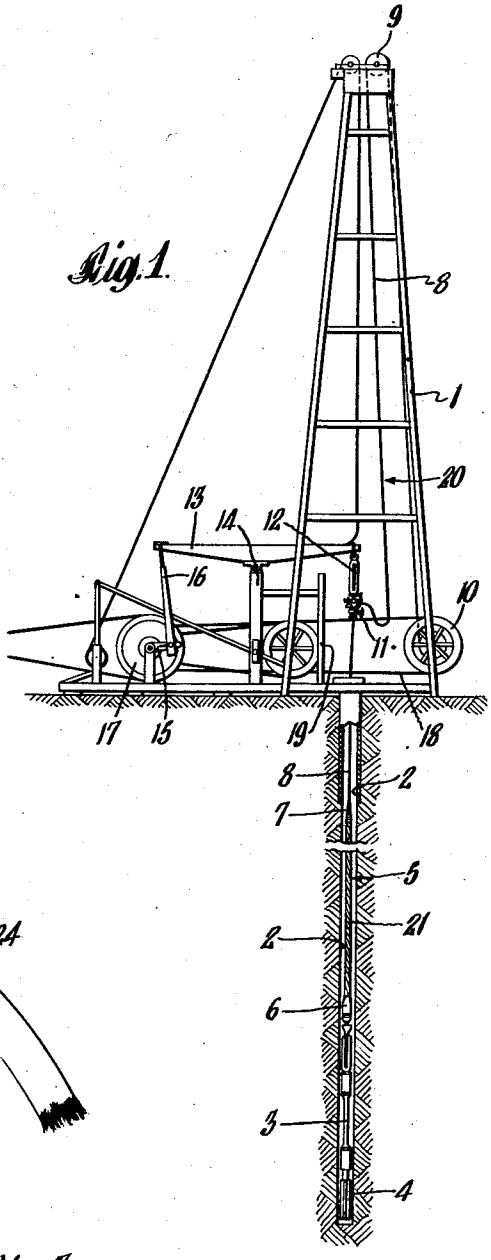
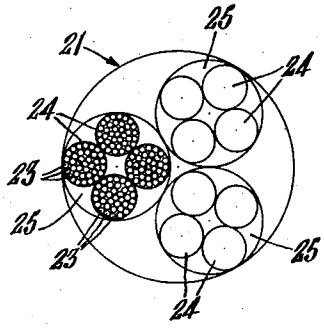


Fig. 3.



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UNITED STATES PATENT OFFICE

2,181,344

ROPE

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Application October 10, 1938, Serial No. 234,087

1 Claim. (Cl. 57—144)

This invention relates to drilling apparatus and particularly to the cable portion thereof and to a novel cable material suitable for use as a drilling cable, cracker or other uses.

In drilling apparatus, such as that used in drilling wells or the like, the drill is generally suspended by a length of cable formed from hemp or other suitable vegetable fibres, or by a metal cable having attached thereto at the drill end a cracker formed from hemp or other vegetable fibres. As is well known, the drilling cable is secured to a walking beam and the drill is alternately raised and lowered in order to strike the drill against the bottom of the hole. In order to simulate a hammering action by the drill stem, a cracker is provided which is capable of temporarily stretching, owing to the momentum of the drill stem when the walking beam is halted at the end of its downward stroke and effecting a "whip-cracking" action. In many cases no separate metal cable is employed but the entire drilling cable is formed from hemp or other vegetable fibres such as manila, sisal and the like and performs the function of a cracker.

It will be understood that the term "drilling cable" as used herein designates generally the drill suspending means whether this be either a cable of hemp or other vegetable fibres or a metal cable having attached thereto a cracker formed from vegetable fibres. The term "cable" is used herein to designate either a cable of hemp or the like or a cracker of such material, and the term "metal cable" is employed where such is meant.

It is necessary that the drilling cable be sufficiently strong to support the weight of the drill stem and drill and it is important that it be of such construction that it has high elasticity to permit the whip-cracking action required of it, with relatively low, or substantially no, permanent stretch or deformation so that it will return to its original length rapidly. If the drilling cable does not cause the drill stem to spring back rapidly, the drilling action will be retarded accordingly.

Another desired property of the drilling cable is that it shall be capable of withstanding considerable intense and prolonged internal wear. As will be understood, the repeated extension and contraction of the drilling cable causes considerable wear between the several ropes or strands of the cable and between the several lessoms, as well as between the yarns of the lessoms and between the fibres. Even though the yarns from which the strands are spun are impregnated with a lubricating material, it has been difficult heretofore to obtain a drilling cable capable of standing up under prolonged service.

An object of the present invention is the provision of drilling apparatus having a cable or cracker which has relatively high elasticity and relatively low stretch or deformation.

Another object of the invention is the provision of drilling apparatus having a cable or cracker which has a relatively low internal movement of the strands or lessoms, relatively low internal friction, relatively low cutting in on the strands or lessoms, which has a relatively large number of internal friction surfaces and which has relatively high wearing qualities.

Still another object of the invention is the provision of a cable formed from vegetable fibres, which has a relatively large number of internal lubricating surfaces, a relatively high lubricant capacity, and which has improved ability for resisting internal wear under repeated extensions and contractions.

Another object of the invention is the provision of a cable having a substantially greater resistance to internal wear than prior cables having the same weight of fibres per unit length.

Various other features and advantages of the invention will be apparent from the following particular description and from an inspection of the accompanying drawing.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claim appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawing forming a part hereof, in which—

Fig. 1 is a diagrammatic elevational view illustrating drilling apparatus employing the invention;

Fig. 2 is an enlarged, somewhat diagrammatic view of the cable forming the drill cable or cracker, the cable being partially untwisted at the end and one of the ropes being further untwisted; and

Fig. 3 is a further enlarged and further diagrammatic view representing a cross-sectional or end view of the cable of Fig. 2, the several lessoms being shown as circular, for convenience, although it will be understood that in a cable they will be more or less flattened at the points of mutual contact.

In the following description and in the claim, various details will be identified by specific names

for convenience, but they are intended to be as generic in their application as the art will permit. Like reference characters denote like parts in the several figures of the drawing.

There is illustrated in Fig. 1 one form of drilling apparatus for the purpose of illustrating the invention, which apparatus includes a derrick 1 mounted over the hole 3 which is being drilled. A string of tools including a drill stem 3 and a drill 4 is suspended by a drilling cable 20, comprising in this case a cracker 5 secured in a rope socket 6, and a metal cable 8 attached to the cracker 5 as by a tapered joint 7. The drilling cable 20 is trained over a crown pulley 9 rotatably mounted over the top of the derrick and trained around a bull wheel 10 suitably mounted for rotation.

The drilling cable 8 is held in a clamp 11 adjustably secured on a temper screw 12 carried by a walking beam 13. The clamp 11 is adjustable on the temper screw 12 in the usual manner and for the customary purpose of paying out the drilling cable as the drilling of the hole progresses. The walking beam 13 is rockably mounted in a Samson post 14 and is driven from a crank 15 by a connecting pitman 16. A headache post 19 is provided for the usual purpose.

The crank 15 is driven from a driving wheel 17 which is driven from a suitable source of power (not shown). The bull wheel 10 is connected by a suitable drive 18 to the driving wheel 17 for actuation thereby.

The cracker 5 is formed from vegetable fibre cable hereinafter more fully described. It will be understood that for the initial drilling of the hole 2, and in certain cases for the entire drilling operation, no separate metal cable will be employed but the entire drilling cable will be formed from vegetable fibre cable similar to that from which the cracker 5 is formed.

In the drilling operation, the driving wheel 17 is driven and operates, through the crank 15, pitman 16, walking beam 13, temper screw 12 and clamp 11, to impart a reciprocating movement to the drilling cable 20 to effect a reciprocating, pounding action of the drill stem 3 and the drill 4. When the temper screw 12 is raised, it likewise raises the cracker 5 and the drill stem 3 and upon the return and downward stroke of the temper screw 12, the drill stem 3 is allowed to drop and, upon the halting of the downward movement of the walking beam 13, the momentum of the drill stem 3 causes the cracker 5 to be stretched considerably. However, owing to the resiliency of the cracker 5, it is not permanently deformed but imparts an initial upward movement to the drill stem 3 in advance of the upward stroke of the temper screw 12.

Referring now particularly to Figs. 2 and 3, there is illustrated a novel cable 21 employed in forming the cable or cracker of the drilling apparatus. The cable 21 is formed by spinning a large number of fibres 22 to form yarns 23. The fibres 22 preferably are manila, hemp, sisal or other generally similar vegetable fibres of a suitable nature. The yarns 23 are in turn twisted together to form rope strands or lessoms 24. Four such rope strands or lessoms 24 are laid to form a cable strand or rope 25 and three such ropes 25 are in turn laid to form the cable 21.

During each of the successive steps in forming the cable from the spinning of the yarns to the laying of the cable, suitable tension is applied to the component parts which are employed in forming the several portions of the cable. For example, the yarns 23 are spun under tension, the lessoms 24 formed with the yarns under tension. In like manner, the cable 21 is laid under tension. The tension employed in the manufacture of the cable is such as to provide a relatively hard, stiff cable with a tight twist which has a very low permanent stretch.

During the manufacture of the cable, certain or all of the component parts are lubricated with a suitable lubricating material. This permits the relatively high twist necessary to obtain a hard cable. Furthermore, the lubrication reduces internal friction and wear.

The employment of twelve lessoms, four in each rope, provides a cable which is substantially rounder and more uniform in cross section than a cable formed from a lesser number of lessoms. Furthermore, a larger number of crowns are provided and a larger number of internal friction surfaces; also, there are more lubricating surfaces. Owing to the number and arrangement of the lessoms, there are small voids both internally and externally than in a cable as heretofore made.

The provision of a cable having ropes formed from four lessoms each provide a substantially greater number of internal friction surfaces than in a cable having fewer lessoms and thus the cable has a greater resistance to internal wear caused by repeated extension and contraction, inasmuch as the total internal pressure is distributed over a larger surface. Furthermore, since the cross-sectional area is more solid and there are more points of support between adjacent lessoms, there is less "cutting in" of the strands and less severe wear owing to this action.

Inasmuch as the cable is laid with a relatively tight lay and the cross-section is substantially fuller than that of a cable having fewer lessoms, there is less internal movement of the fibres, yarns, lessoms and ropes upon extension and contraction than in a cable having fewer lessoms with a result that there is surprisingly less internal wear in the cable. The cable also is highly resilient.

The employment of a relatively higher number of lessoms than heretofore provides a larger number of external crowns and thus the cable is capable of withstanding more external wear than cables heretofore constructed. It is well known that considerable external wear occurs and particularly where is often the case, the hole is offset or not exactly vertical. In such cases, the exterior of the cable rubs against the side of the hole and substantial wear occurs. The present invention overcomes this disadvantage to a considerable degree.

In manufacturing a cable of any selected size, the lessoms are formed proportionally smaller in cross section than where less than twelve lessoms are employed and with a correspondingly smaller amount of fibres, whereby the finished cable has the same weight per unit length. However, owing to the advantages of the present invention, the cable has a substantially higher resistance to wear.

In fact, a 2½ inch cable formed in accordance with the present invention has been found to have as high as approximately 33⅓% greater wearing ability than a conventional cable of the same size.

Where the cable is employed as a cracker, it preferably is secured to the wire cable by a tapered joint in a manner analogous to that employed in making a tapered joint between a wire cable and a cracker formed from a hemp cable of the conventional type. In view of the improved qualities of the cable formed in accordance with the present invention, and particularly the greater number of lessom crowns per unit length, the cable will have a substantially better grip in the wire cable. It is, therefore, possible to use a proportionally shorter joint than heretofore.

The twelve lessom cable provided by the present invention is hard, resilient and notably resistant to permanent stretch and to internal and external wear, and is especially well adapted for use in constructing drilling cables or crackers. This cable also is suitable for other uses where the above-described properties are advantageous.

While certain novel features of the invention have been disclosed herein, and are pointed out in the annexed claim, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

A drilling cable at least a portion of which is of hard resilient construction comprising lubricant-impregnated, hard vegetable fibres, defining a plurality of yarns, said yarns in turn defining twelve lessoms laid to form three cable-laid strands, said fibres, yarns, lessoms and strands in the order named being progressively under higher degrees of twist.

AUGUST J. RICK.