(No Model.)

W. W. SWAN.

BALL BEARING DRILLING SWIVEL.

No. 521,942. Patented June 26, 1894.

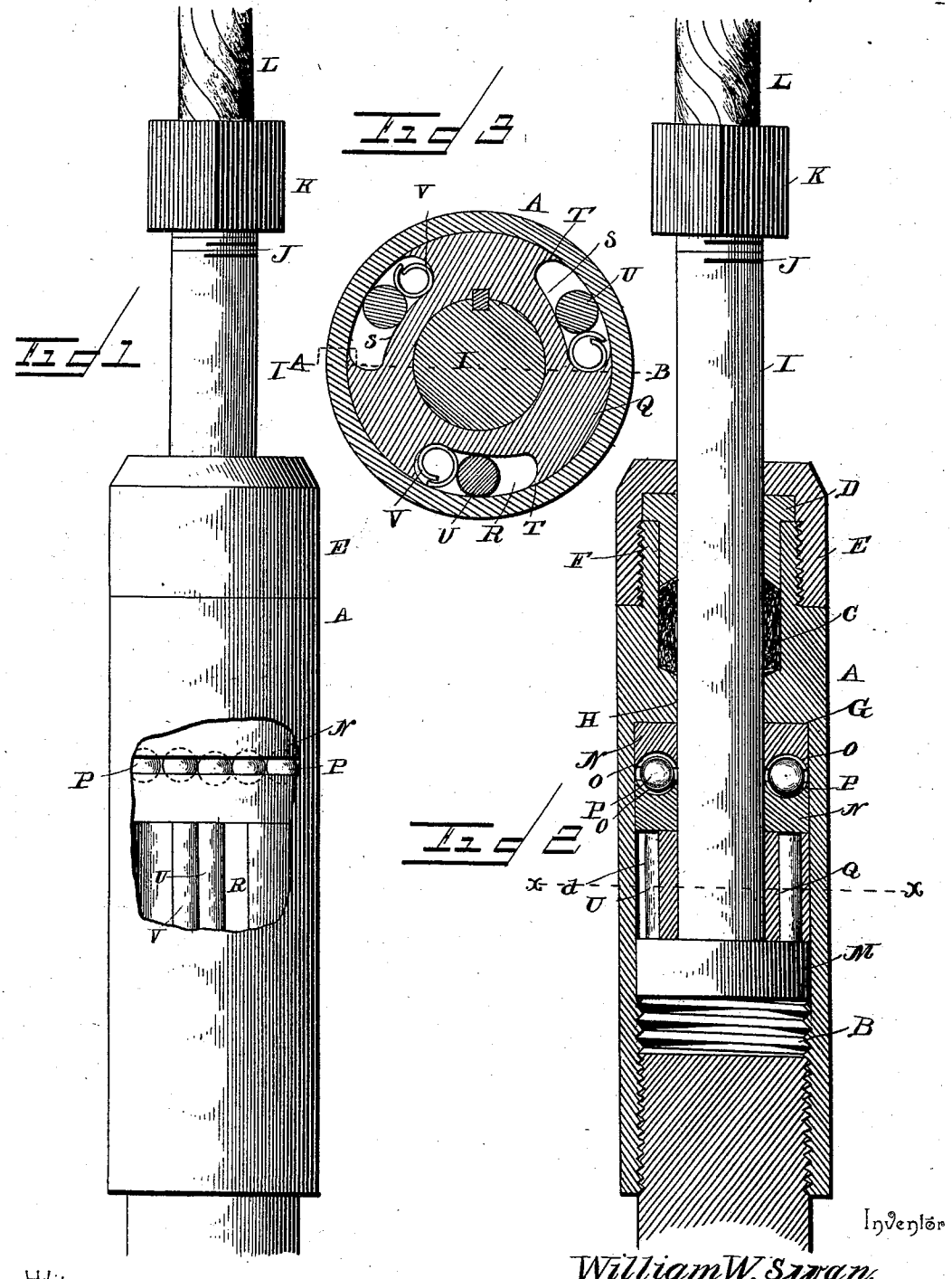

Fig. 1

Fig. 3

Fig. 2

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Witnesses

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BALL-BEARING DRILLING-SWIVEL.

SPECIFICATION forming part of Letters Patent No. 521,942, dated June 26, 1894.

Application filed August 14, 1893. Serial No. 483,133. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WALLACE SWAN, a citizen of the United States, residing at Andover, in the county of Day and State of South Dakota, have invented a new and useful Ball-Bearing Drilling-Swivel, of which the following is a specification.

This invention relates to ball bearing drilling swivels; and it has for its object to provide a drilling swivel adapted to form the connection between the lower end of a drilling rope or cable and the upper end of the drilling tool, whereby the "twist" of the rope or cable may be utilized for automatically transmitting motion to the drilling tool, and thereby turn the same in the hole being drilled, in order to keep the hole round and straight, and with this in view the swivel is especially adapted for use in connection with cable rigs for drilling wells, whether such rigs use steel, iron, manila, or hemp strand-cables.

This invention is also designed for, and can be used to the same advantage, with well machinery using iron rods, wooden poles, or gas pipe in place of rope, by using a short piece of rope one foot or more in length, between the rods and swivel, or between the swivel and walking beam or machinery. In this way the same result is accomplished as with rope or cable.

Heretofore in drilling by the ordinary methods, it has always been necessary for a man to stand and turn the drill by hand at each and every stroke in order to keep the hole round and straight. This has always been a very tedious and unreliable method, whereby my invention secures the same result automatically, and at the same time makes it possible and practicable to substitute wire rope in the place of manila or hemp rope, which has before proven unsuccessful owing to the stiffness of the wire rope and the difficulty experienced in coiling and uncoiling the same while twisting by hand on the rope for the purpose of turning the drill.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the accompanying drawings:—Figure 1 is a side elevation partly in section of a drilling swivel constructed in accordance with the present invention. Fig. 2 is a central longitudinal sectional view of the swivel showing the same coupled to the lower end of a drill rope, the section being on the line A—B of Fig. 3. Fig. 3 is a horizontal sectional view on the line *x—x* of Fig. 2.

Referring to the accompanying drawings, A represents the cylindrical swivel casing or shell having a lower interiorly threaded end B, adapted to receive the upper threaded end of any ordinary drilling tool stem employed for drilling wells. The said swivel casing or shell A, is provided at its upper end with a stuffing box C, adapted to contain any suitable packing held therein by the gland D, which is clamped onto the upper end of the casing or shell by the cap nut E, engaging the upper exteriorly threaded neck F, of the casing or shell, which is further provided at a point therein below the stuffing box with an interior shoulder G, surrounding a centrally disposed opening H, formed in the body of the casing or shell at the base of the stuffing box and loosely accommodating the swivel rod I. The swivel rod I, turns loosely in the central bearing opening H, and projecting through and above the stuffing box is provided with an upper exteriorly threaded end J, removably screwed into the rope socket K, which is fitted onto the lower end of the drilling rope L, which may be formed of strands of metal or other suitable material, and is designed to be operated by the ordinary well drilling apparatus. The swivel rod I, while free to turn within the swivel casing or shell, and vice versa, has a perfectly water-tight connection with such casing or shell, so that in drilling holes water or oil cannot possibly gain access into the shell or casing and thereby interfere with the free working of the swivel. The swivel rod I, terminates at its lower end inside of the casing or shell in a cylindrical head M, which snugly fits the interior bore of the casing or shell and forms a ball bearing and friction ratchet space between the same and the interior shoulder G, of the shell or casing.

In the space formed between the rod head

M, and the shoulder G, are arranged the separate superposed bearing rings N. The separate bearing rings N, loosely embrace the turning swivel rod I, and one of said rings rests flat against the interior shoulder G, of the swivel casing or shell. The said bearing rings are adapted to be slightly separated from each other, and are provided in their opposing faces with the rounded face bearing grooves, O, which together form a circular bearing space accommodating a series of steel bearing balls P, which have a bearing contact in the grooves of both of the superposed bearing rings, and by reason of the ball bearing just described the turning of the swivel casing or shell and the swivel rod is rendered free and easy.

Intermediate of the rod head M, and the lower one of the bearing rings N, is located a cylindrical clutch hub Q. The cylindrical clutch hub Q, is keyed to the lower end of the rod I, above its head, and is provided in the periphery thereof with a series of cam grooves R, having inclined bases S, and curved ends T. The said cam grooves R, formed in the sides or periphery of the clutch hub Q, are adapted to accommodate therein the elongated friction or clutch rollers U, adapted to roll on the inclined bases of the grooves, and to clutch with the inner sides of the swivel casing or shell or to freely roll against the same according to the twist of the rope L. Vertical cylindrical springs V, are located in the widened ends of the cam grooves, and are provided with overlapping edges *v*, one of which edges contacts with one side of the friction or clutch rollers U, and serves to hold the same in contact with both the inclined bases of the cam grooves and the inside of the casing or shell, whereby such rollers will quickly clutch with the casing or shell and prevent any lost motion.

Now it is well understood that when a weight is attached to one end of a suspended rope composed of strands, such weight will cause the rope to twist or turn in a direction which would tend to lengthen the same out by unraveling, and again supposing such weight to be eased off from the same rope, the latter would quickly twist or turn back again to its normal condition. Now, this potential energy contained in the twist of the rope is relied on to operate the herein-described swivel, it being apparent that the weight of the swivel and the drilling tool will cause the drilling rope to twist or turn so as to impart motion to the swivel rod I. The turning of the swivel rod in one direction turns the hub Q, therewith, so that the friction or clutch rollers will clutch with the sides of the swivel casing or shell and turn the same so that the drilling tool will be turned within the hole. In drilling, there is an instant or period in every stroke at which time the entire weight of the drill and tools is taken off of the rope. During this period or instant, the clutch or ratchet devices will be inactive so as to permit the rope to quickly turn or twist back to its normal condition. This operation is repeated during each and every stroke.

The operation just described is rendered effective by reason of the fact that the weight of the tools employed in drilling is ordinarily sufficient to cause the length of drilling rope or cable to untwist with sufficient energy to turn such drilling tools in the well, and it will of course be understood by those skilled in the art that it is not necessary to give the drilling bit much of a turn at each stroke, for it is simply necessary to turn the same sufficiently, however slight, so as to shift its position and thereby direct its downward stroke against another part or portion of the bottom of the well. This operation will continue automatically and thereby insure the round and straight drilling of the hole, and the proper shifting of the bit to prevent it from striking twice on the same point. It is to be further noted that this automatic operation may be depended upon for the reason that since the drilling swivel is connected directly with the drilling tool and suspended from the lower end of the drilling rope or cable, such swivel and drilling tool will necessarily more quickly respond to the torsion of the rope or cable, and since, at the moment the bit strikes the bottom of the well, the rope or cable is relieved of its weight and quickly resumes its normal twist, it will be clear that when the rope or cable commences the up stroke, the entire weight of the tools will be again placed thereon and will cause it to untwist as already described.

Changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. The combination with a well drilling rope or cable; of a cylindrical drilling swivel adapted to have one of its members suspended from the lower end of said rope and its other member connected to the drilling tool, said swivel being adapted to turn bodily with the drilling rope as the same untwists in response to the suspended weight thereon, substantially as set forth.

2. In a drilling swivel for well drilling apparatus, a cylindrical swivel casing or shell having a tool socket at one end adapted to receive one end of the drilling tool, a swivel rod mounted inside of said casing or shell and connected at its outer end to the lower end of the drilling rope, or cable, and a ratchet or clutch device mounted inside of the cylindrical casing and adapted to hold the latter tight on the rod, when the rope twists in one direction, substantially as set forth.

3. In a drilling swivel for well drilling apparatus, a cylindrical swivel casing or shell having a tool socket at one end and a stuffing

box at its other end, a swivel rod mounted within the casing, and adapted to be suspended from the lower end of the drilling rope or cable, interior ball bearings for the casing or shell, and a ratchet or clutch device inclosed inside of the swivel casing and rendered active by the turning or twisting of the drilling rope or cable in one direction, substantially as set forth.

4. In a drilling swivel for well drilling apparatus, a cylindrical inclosed casing or shell having a tool socket at its lower end, a stuffing box at its upper end and an interior shoulder, a swivel rod journaled in the inclosed casing or shell and having a head at its inner end, separate removable superposed bearing rings arranged inside of the casing and one of which rests flat against the interior shoulder thereof, said bearing rings having opposing rounded face bearing grooves, and held in their relative positions by the disposition of the swivel rod head thereunder, and bearing balls arranged between the two bearing rings, substantially as set forth.

5. In a drill swivel, the cylindrical swivel casing or shell having a tool socket at one end, a swivel rod journaled in the casing or shell and terminating at its inner end in a head, a clutch hub keyed to the swivel rod at one side of its head and provided with a peripheral series of open inclined cam grooves having curved ends, elongated vertically disposed friction or clutch rollers arranged within said cam grooves, and vertical cylindrical springs located in one of the curved ends of said grooves and normally bearing at one side of said rollers, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM WALLACE SWAN.

Witnesses:

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