S. MORIMURA.

DRILL JAR.

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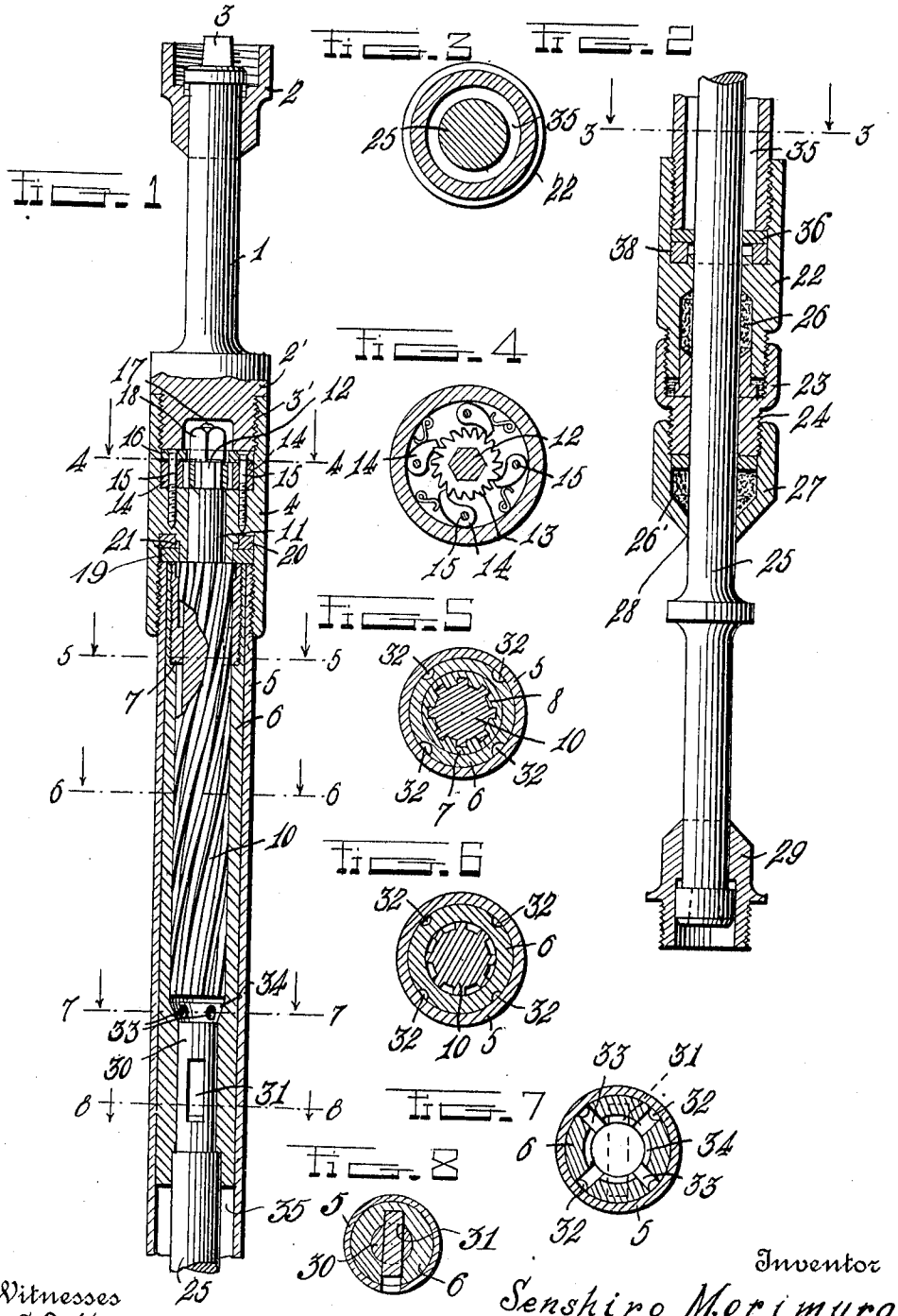
984,386. Patented Feb. 14, 1911.



Witnesses

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DRILL-JAR.

984,386. Specification of Letters Patent. **Patented Feb. 14, 1911.**

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To all whom it may concern:

Be it known that I, SENSHIRO MORIMURA, a subject of the Emperor of Japan, residing at Tokyo, Japan, have invented certain new and useful Improvements in Drill-Jars; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to well-drilling tools and more particularly to the jars.

The principal object of the present invention is to provide an improved construction of jars which will turn the cutting bit at each blow, to prevent it from becoming fast in the rock and to secure round and straight holes. As is well known, oil or Artesian well drilling tools are operated either by means of a hand power drilling rig, the horse power drilling rig, the steam drilling rig or the cam lever hand system or a walking beam rig. Drilling is performed by repeatedly lifting and dropping the bit which is the lowest of a series of iron and steel bars connected together one after the other and which series is called the string of tools. It is composed of the bit, auger stem, jars and rope socket. The top of the bit is screwed into the foot of the auger stem, which is to secure an additional force to the blow of the bit. The top of the auger stem is screwed into the foot of the drilling jars and to the top of this is screwed the rope socket to which the drilling cable is attached. Sometimes the sinker bar is added to the jars and rope socket to give additional weight and to assist in the descent of the drilling cable and the lowering of the string of tools and working of the drill jars. This string of tools, with the cutting edges of the bit at the lower end, is alternately lifted from two to five feet and let fall, from twenty-five to fifty times a minute and so drills its way into the rock or earth. During this operation the purpose of the jars is to turn the bit so that the bit will strike in a different position as each blow is delivered which will facilitate the drilling operation as well as obviate liability of the bit becoming fast in the rock.

With this and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:—Figures 1 and 2 represent a longitudinal section of a drilling jar embodying my improvements. Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 2; and, Figs. 4, 5, 6 and 7 are similar views taken on the lines 4—4, 5—5, 6—6, and 7—7, respectively, of Fig. 1. Fig. 8 is a section taken on the line 8—8 of Fig. 1.

Referring to the drawings for a more particular description of the invention, the jars comprise the upper section 1 provided with the coupling member 2 and tenon 3, which are adapted for connection with the rope socket. The lower end of section 1 is provided with a reduced threaded extension 2′, which is screwed to the upper interiorly threaded end 3′ of the coupling sleeve 4, the lower end of which sleeve is connected to the upper end of the outer casing 5. The plunger sleeve 6 is mounted in the casing 5, and has screwed to its upper end the turning sleeve 7 provided with a plurality of interior teeth 8, which engage spirally disposed threads formed on the exterior surface of the rifle bar 10 which is disposed within the sleeve 6 and is provided with a reduced extension 11 at its upper end, which extends through the coupling sleeve 4. The upper end of the extension 11 of the rifle bar is provided with a hexagonal portion 12 upon which is arranged a ratchet wheel 13, which is held against rotation in one direction by a series of pawls 14 pivoted upon the screws 15, which pass through the outer end of the pawls and screw into the sleeve 4. A protective ring 16 is arranged over the pawls to protect the same from injury. The reduced extension 11 of the rifle bar extends above the pawls 12 and terminates in a threaded extension 17 upon which is screwed a nut 18 which holds the rifle bar against any sliding movement. An annular metal ring 19 is arranged within the sleeve 3 upon the upper ends of the outer casing and plunger sleeve while a rubber cushioning ring 20 is arranged upon the ring 19 to absorb or reduce the shock between the ring 20 and the upper ends of the outer casing and plunger sleeve, when the bit delivers its blow. It is to be observed that the space in which the ring 20 is

located is provided with an inwardly cut portion 21, into which a portion of the cushioning ring extends when the bit delivers its blow. The lower end of the outer casing 5 is screwed to the upper end of the coupling 22 which in turn is screwed to the upper interiorly-threaded end of the sleeve 23 having a reduced portion 24 which closely fits the piston rod 25. Stuffing boxes 26 and 26′ of any ordinary form are arranged within the lower end of the coupling sleeve 22 and the sleeve 27 screwed to the lower end of the member 23, the sleeve 27 having a sharpened scraping end 28 which closely fits the piston rod and scrapes any dirt or other debris which may collect thereon. The lower end of the piston rod is provided with the coupling 29 whereby it may be connected with the auger stem. The piston rod 25 is provided at its upper end with a reduced portion 30 which fits in the lower end of the plunger sleeve 6 and is connected therewith by the cotter 31. By this construction it will be evident that the piston rod is in reality a continuation of the sleeve 6 and that the rod and sleeve are actuated simultaneously. The piston sleeve is provided in its outer face or surface with a plurality of longitudinal oil grooves or channels 32 which communicate through the ports 33 with the space 34 between the lower end of the rifle bar and the upper end of the extension 30 of the piston rod, or in other words, with the interior of the piston sleeve.

In the accompanying drawings, Fig. 1 shows the position of the plunger sleeve and piston rod when at the upper end of the outer casing or cylinder 5 or the position of the piston rod and plunger sleeve when the cutting bit delivers its blow. As was heretofore stated, when the bit delivers its blow the upper end of the casing 5 and plunger sleeve knocks against the ring 19, which forces a portion of the cushioning ring 20 into the space 21, the cushioning ring absorbing or greatly reducing the shock between the metal ring 19 and the upper ends of the casing and plunger sleeve 6. Assuming the rope socket to be connected with the walking beam of a drilling machine, when the walking beam swings upwardly and pulls upon the drilling cable the string of tools are caused to ascend, while the cylinder or casing 5 also ascends or slides upon the plunger sleeve until the metal ring 36 at the lower end of the cylinder or casing strikes against the lower end of the piston sleeve. During this operation the rifle bar is not permitted to rotate because of the pawls and ratchet device, and consequently the casing is constrained to turn about the rifle bar and twist the drilling rope. Also during the above described operation the oil which is in the space 35 between the piston rod at the lower end of the cylinder or casing 5 is forced through grooves 32 and ports 33 into the interior of the piston sleeve and acts as an oil cushion for the plunger sleeve. A cushioning ring or washer 38 of rubber or other resilient material may also be arranged between the ring 36 and lower end of the casing 5 to lessen the shock when the ring 36 strikes the lower end of the sleeve 6. The drilling tools continue to ascend until the cutting bit is out of the ground when the drilling rope untwists of its own accord and causes the plunger sleeve to revolve in an opposite direction and owing to the grooved and toothed engagement between the rifle bar and the sleeve or ring 7 to ascend to its normal position, when the oil again flows through the ports 33 and along the grooves 32 to the space 35. The pitch of the grooves of the rifle bar is preferably such as to turn the cutting bit seven-eighths of a revolution at a time so that the bit will always strike the ground in a relatively different position, which will greatly facilitate in the drilling operation and obviate any liability of the bit getting caught in the rock.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various 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 as defined in the appended claims.

Having thus described and ascertained the nature of my invention, what I claim as new and desire to secure by Letters Patent is:

1. A drilling jar comprising a spirally grooved rifle bar, a plunger sleeve having a toothed and sliding engagement therewith, a piston rod at the lower end of said sleeve, a casing inclosing the above mentioned parts, means at the lower end of the piston rod to adapt it for engagement with an auger stem, a coupling sleeve connected with the upper end of the casing, said sleeve having an annular recess with a reduced portion formed therein, a metal ring in the large portion of said recess, and a cushioning ring in the reduced portion of said recess, said cushioning ring normally extending into the enlarged portion of the recess, leaving a space between the lower projecting portion of the cushioning ring and the inner side of the large portion thereof.

2. In a drilling jar, a spirally and exteriorly grooved rifle bar, a plunger sleeve having a sliding and toothed engagement with said bar, a piston rod extending into the lower end of the plunger sleeve, leaving a space between the upper end of the piston rod and the lower end of the rifle bar, a plurality of grooves formed in the exterior sur-

face of the plunger sleeve having radial ports communicating with the space between the upper end of the piston rod and the lower end of the rifle bar, and means to hold the rifle bar against rotation in one direction.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

SENSHIRO MORIMURA.

Witnesses:
E. EDMONSTON, Jr.,
S. M. MCCOLL.