W. R. FOX.

DRILL.

APPLICATION FILED JAN. 23, 1914.

1,212,472.

Patented Jan. 16, 1917.

2 SHEETS—SHEET 1.

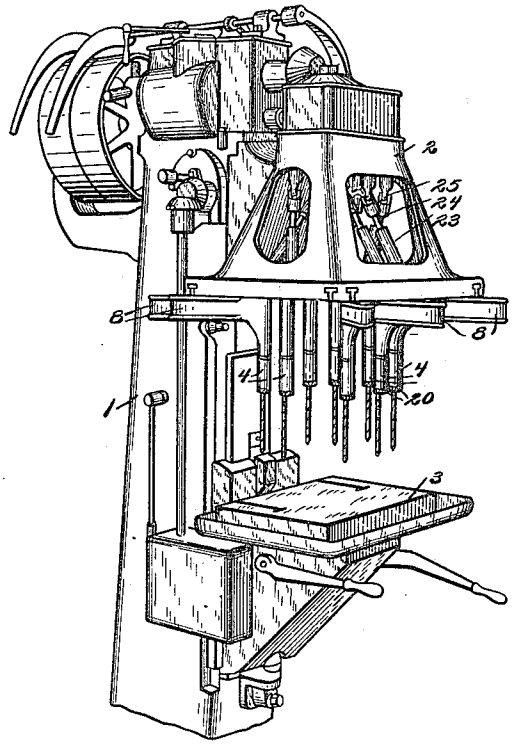


FIG. I.

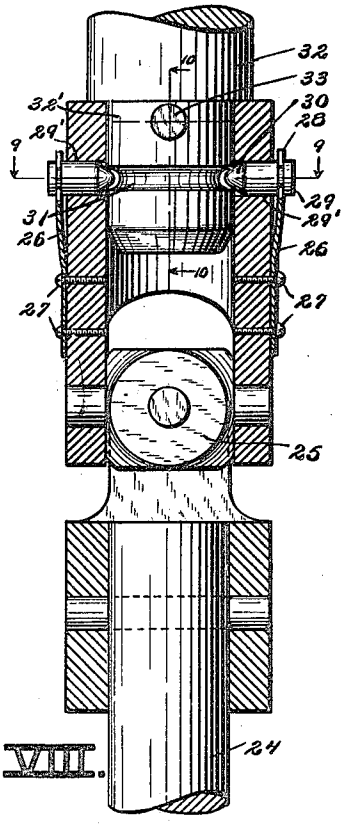


FIG. VIII.

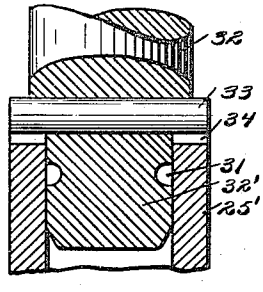


FIG. X.

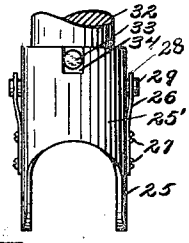


FIG. XI.

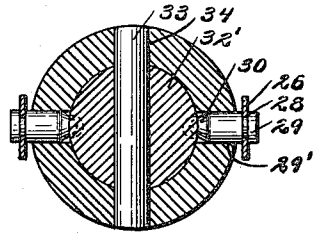


FIG. IX.

Witnesses

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2 SHEETS—SHEET 2.

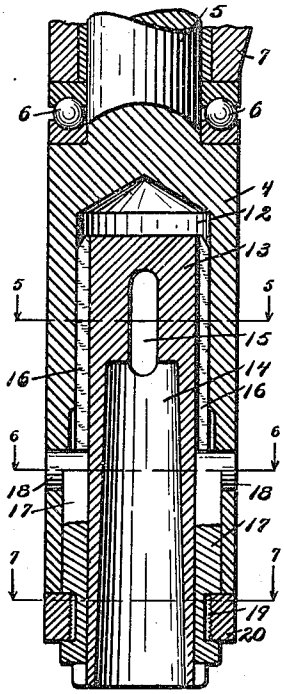


FIG. III.

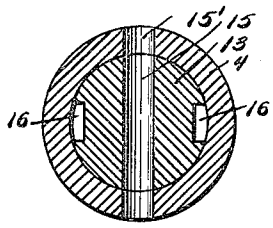


FIG. V.

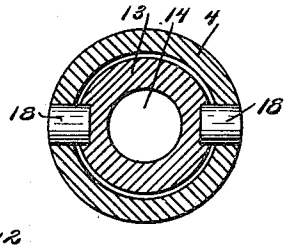


FIG. VI.

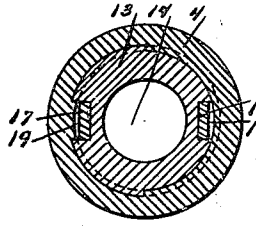


FIG. VII.

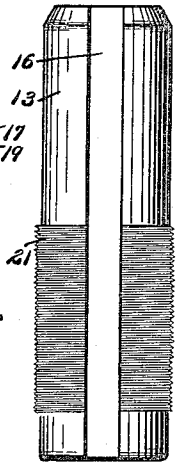


FIG. IV.

FIG. II.

Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM R. FOX, OF GRAND RAPIDS, MICHIGAN.

DRILL.

1,212,472. Specification of Letters Patent. Patented Jan. 16, 1917.

Application filed January 23, 1914. Serial No. 813,855.

To all whom it may concern:

Be it known that I, WILLIAM R. FOX, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Drills, of which the following is a specification.

This invention relates to improvements in drills and is especially adapted for use in connection with multiple drills.

The objects of this invention are: First, to provide an improved detachable slip socket connection between the spindle driving shaft and the drill spindle. Second, to provide improved means for adjusting the drill collet longitudinally of the drill spindle. Third, to provide improved means for lubricating the drill spindle.

Further objects, and objects relating to details and economies of structure and operation will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification.

The invention is clearly defined and pointed out in the claim.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing forming a part of this specification, in which:

Figure I is a perspective view of a drill embodying the features of my invention. Fig. II is a detail view, partly in section, through the head of the drill, showing the features of my invention embodied therein. Fig. III is a sectional view on the line 3—3 of Fig. II, showing in detail the adjustable collet. Fig. IV is a view in side elevation of the collet removed from the drill. Fig. V is a sectional view on the line 5—5 of Fig. III. Fig. VI is a sectional view on the line 6—6 of Figs. II and III. Fig. VII is a sectional view on the line 7—7 of Figs. II and III. Fig. VIII is a sectional view on the irregular line 8—8 of Fig. II, showing in detail the detachable slip socket connection with the spindle driving shaft. Fig. IX is a sectional view on the line 9—9 of Fig. VIII. Fig. X is a sectional view on the line 10—10 of Fig. VIII. Fig. XI is a view in side elevation of the slip socket connection with the driving shaft.

In the drawing, similar reference characters refer to similar parts throughout the several views and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

Considering the numbered parts of the drawing, 1 is the frame of a multiple drill provided with the head 2 and the work table 3. The drill is provided with a plurality of drill spindles 4 which are supported by and driven from the central supporting head 2. Each drill spindle 4 is provided with an upper portion 5 which is somewhat reduced in diameter and has a bearing in the bracket 7 carried by the removable adjusting arm 8. Ball bearings 6 are provided between the shoulder formed at the lower end of said reduced portion 5 and the bottom of the bracket 7. The adjusting arm 8 is provided with a slot 9 through which a bolt 10 carried by the lower part of the head 2 passes. By means of this bolt and slot connection the arm may be adjusted and entirely removed when desired.

An oil chamber 11 is provided in the bracket 7 and this oil chamber is provided with a wick 11′, the upper end of which comes in contact with the upper part of the spindle 5. This chamber is filled with oil and the wick carries this up against the spindle so that it is constantly lubricated.

The spindle 4 is provided with a socket 12 in which is inserted the collet 13, which is provided with a tapered socket 14 receiving the tapered shank of the drill. The oblong slot 15 is provided through the top of the collet 13 and a drift may be driven through said slot for the purpose of forcing the drill shank from the tapered socket. Grooved keyways 16 are disposed diametrically opposite each other and running longitudinally of the collet. Keys 17 are secured in the lower part of the spindle socket by means of pins 18 carried on the upper ends of said keys and secured in openings provided in the walls of the socket. These keys 17 are provided with notches 19 at the lower ends thereof in which the knurled adjusting nut 20 is supported. The upper portion of the collet 13 is plain while the lower portion thereof is provided with screw threads 21 engaging the threaded nut 20 for adjusting the collet with reference to the keys 17 and the spindle.

The upper part of the spindle 5 is connected by means of the universal joint 22 with the slip joint 23 engaging the shaft 24. The shaft 24 is connected by means of the universal joint 25 with a detachable slip

socket 25'. Flat springs 26 are secured to the lower part of the socket by means of the screws 27 and are provided with forked upper ends 28 which engage in suitable grooves in the outer ends of the locking pins 29 provided with the beveled ends 30 and passing through suitable openings 29' in the upper part of the slip socket. The spindle driving shaft 32 is provided with a reduced portion 32' fitting within the upper part of the detachable slip socket and a shoulder seating against the upper edge of said socket. The reduced portion of the driving shaft is provided with an annular groove 31 in which said locking pins 29 are adapted to engage. The end of the driving spindle 32 is beveled so as to engage the beveled portions of the locking pins to retract them. A pin 33 is passed through said driving bar just below the shoulder thereof and secured thereto. The pin 33 engages in diametrically opposite notches 34 in the upper edge of the slip socket.

From the description of the parts given above the operation of the structure should be very readily understood. The tapered shank of the drill is inserted in the tapered socket 14 of the collet 13. The collet 13 is secured against rotary movement in the spindle socket 12 by means of the keys 17 which are rigidly secured to the socket wall. The knurled nut 20 engages the threaded portion 21 on the lower portion of the collet and serves to adjust it longitudinally of the thimble, the grooved keyways 16 permitting the collet to slide longitudinally. The ball bearings 6 provide an anti-friction bearing between the shoulder on the spindle and on the lower end of the bracket 7. By means of the oil chamber 11, which is filled with lubricating oil, and the wick 11' engaging the upper end of the spindle, the latter is constantly lubricated. The spindle may be entirely disconnected from the driving shaft by means of the detachable slip socket connection and removed from the drill with the adjusting arm spindle. When the slip socket is forced up on the driving shaft the beveled end of said shaft engages the locking pins 29 and forces them back until they come into alinement with the groove 31 when the springs 26 force the locking pins inwardly into engagement with said groove. The outer ends of the pin 33 engage the top of the slip socket and the locking pins can only engage in the groove 31 when the ends of the pin 33 are seated in the notches 34 on the upper edge of the slip socket. This insures a driving connection between the spindle driving shaft and the slip socket.

I have illustrated my invention as applied to a multiple drill of the type shown in my prior Patent No. 1,058,045, dated April 8, 1913. I am aware that the particular embodiment which I have here shown is susceptible of considerable variation without departing from the spirit of my invention, and, therefore, I do not wish to be restricted to the same except as called for by the terms of the appended claim.

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

In a multiple drill, the combination of a plurality of drill spindles, a plurality of spindle driving shafts, driving means therefor, a plurality of shafts flexibly connecting said spindles with said spindle driving shafts, and quickly detachable means connecting said spindle driving shafts and said connecting shafts, all coacting substantially as described and for the purpose specified.

In witness whereof, I have hereunto set my hand and seal in the presence of two witnesses.

WILLIAM R. FOX. [L. S.]

Witnesses:
EARL STOKOE,
LILLIAN THURSTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."