V. J. WAHLSTROM.

DRILLING MACHINE AND DRILL.

APPLICATION FILED JUNE 29, 1909.

970,670.

Patented Sept. 20, 1910.

2 SHEETS—SHEET 1.

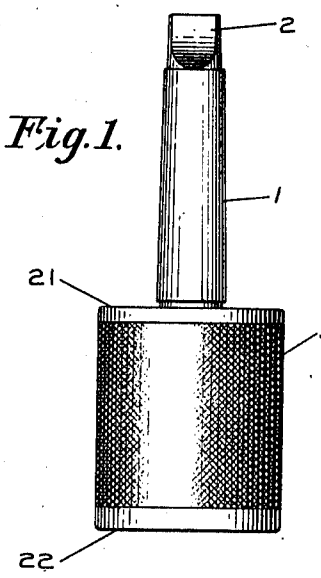

Fig. 1.

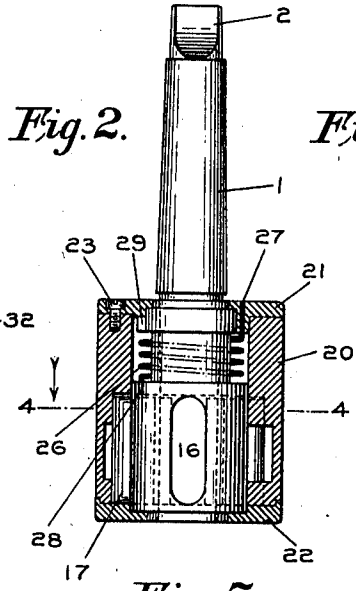

Fig. 2.

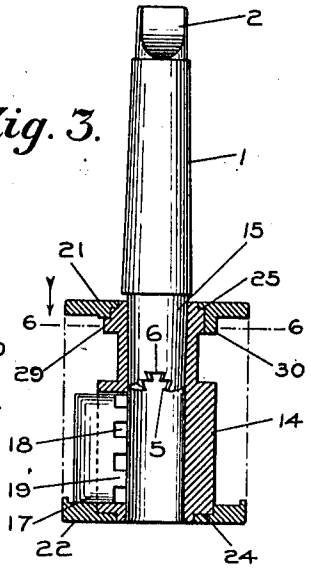

Fig. 3.

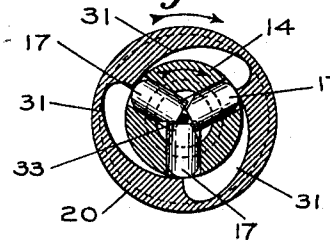

Fig. 4.

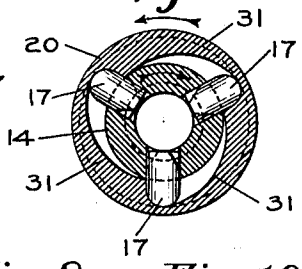

Fig. 5.

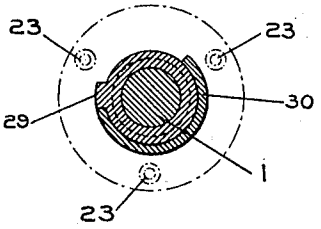

Fig. 6.

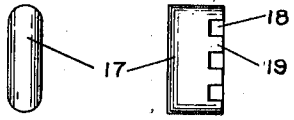

Fig. 7.

Fig. 8.

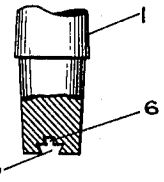

Fig. 10.

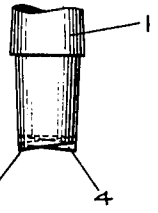

Fig. 11.

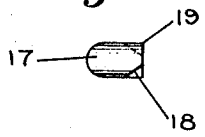

Fig. 9.

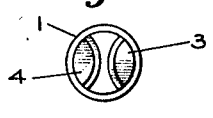

Fig. 12.

Attest.

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Fig. 14.

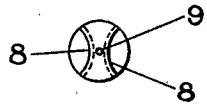

Fig. 21.

Fig. 13.

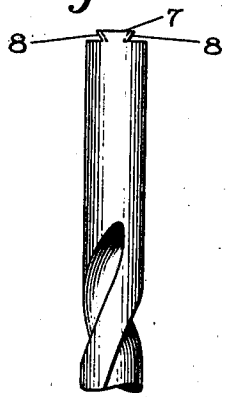

Fig. 15.

Fig. 19.

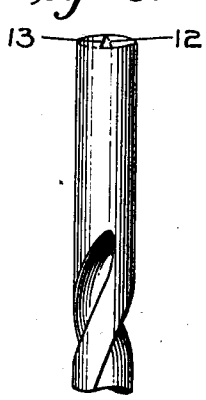

Fig. 20.

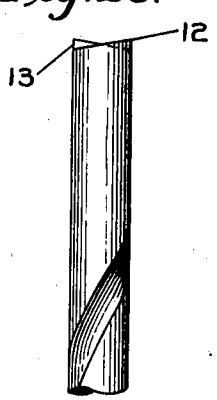

Fig. 16.

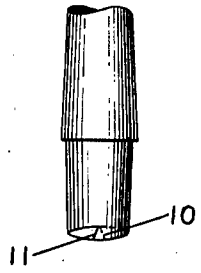

Fig. 17.

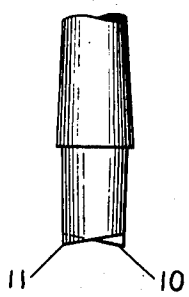

Fig. 18.

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UNITED STATES PATENT OFFICE.

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DRILLING-MACHINE AND DRILL.

970,670. Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed June 29, 1909. Serial No. 504,991.

To all whom it may concern:

Be it known that I, VERNER J. WAHLSTROM, a citizen of the United States, residing at New York, county of Kings, and State of New York, have invented certain new and useful Improvements in Drilling-Machines and Drills, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in drilling machines and drills.

In drilling machines the drills are connected to the driving spindles or driving shanks of the machine by coupling devices known as chucks. It is desirable that these chucks shall be of such construction that they will accommodate drills varying widely in diameter in order to enable the drilling machine to be readily used for drilling holes of different diameter without the necessity of changing the chucks in the machine. It is further desirable that the chucks shall be so constructed that when the drill is inserted the drive shall be positive, this not only insuring proper operation of the drill but also preventing the drill shank from being damaged by twisting in the chuck, and that the chuck be of such a construction as to permit the ready insertion and removal of the different drills which it may be desired to employ without stopping the machine, thereby enabling a change of drills to be rapidly accomplished.

It is one of the objects of this invention to produce an improved drilling machine of such a character that a drill may be readily inserted and removed therefrom, in which the drill when in position is positively engaged and driven, and which is adapted to receive drills differing widely in size.

A further object of the invention is to produce an improved drilling machine in which the drill driving member is so constructed that the drill is positively engaged and driven thereby and in which, when the drill is withdrawn from the work, it will not be disengaged from the driving member.

A further object of the invention is to produce an improved drilling mechanism the drill driving member of which is so constructed as to secure the ready and certain engagement thereof with the drill.

A further object of the invention is to produce an improved drilling mechanism the drill driving member of which is provided with a shoulder or shoulders the metal of the shoulder being so disposed as to effectively resist the strains set up in drilling.

A further object of the invention is to produce an improved drill having the top or end thereof which is engaged by the driving member of the drilling mechanism, of such a character that it will securely engage with and be positively driven by said driving member.

A further object of the invention is to produce an improved drill the top of which is provided with a driving tang the metal in which is so disposed that, when the tang is in engagement with a properly constructed driving member, it will effectively resist the strains set up in drilling.

With these and other objects not specifically referred to in view, the invention consists in certain constructions, and in certain parts, improvements and combinations as will be hereinafter fully described and then specifically set forth.

In the accompanying drawings—Figure 1 is a side elevation of the chuck of a drilling machine constructed in accordance with the invention. Fig. 2 is a vertical section through the outer sleeve of the construction shown in Fig. 1, the interior parts of the chuck being shown in elevation. Fig. 3 is a section through the interior of the chuck, the wall of the outer sleeve being removed. Fig. 4 is a section on the line 4—4 of Fig. 2. Fig. 5 is a view similar to Fig. 4, but showing the parts in a different position. Fig. 6 is a section on the line 6—6 of Fig. 3. Figs. 7, 8 and 9 are detail views of a centering device which may be employed. Fig. 10 is a detail view, partly in section, of the lower end of the drill driving member or shank which may be employed. Fig. 11 is a side elevation of the driving member shown in Fig. 10, the member being turned a quarter of a revolution from the position shown in Fig. 10. Fig. 12 is an underside plan view of the construction shown in Fig. 10. Figs. 13 and 14 illustrate, in side elevation and plan, respectively, a drill constructed to be used with the driving shank illustrated in Figs. 10 and 11. Fig. 15 is a view illustrating the drill shown in Fig. 13, the drill being turned a quarter of a revolu-

tion. Figs. 16 and 17 illustrate, in side elevation, the lower end of a modified form of drill driving member or shank, Fig. 17 representing the shank turned a quarter of a revolution from the position shown in Fig. 16. Figure 18 is an under side plan view of the construction shown in Figs. 16 and 17. Figs. 19 and 20 illustrate, in side elevation, a drill constructed to be employed with the driving member illustrated in Figs. 16 to 18, the drill as illustrated in Fig. 20 being turned a quarter of a revolution from the position shown in Fig. 19. Fig. 21 is a top plan view of the drill shown in Figs. 19 and 20.

Referring to the accompanying drawings which illustrate one embodiment of the invention and also a modification thereof, 1 indicates a driving member or shank, the upper end of this member being reduced at 2, so that it may engage with the spindle of a drilling machine in the ordinary way. In constructions embodying the invention, the drill driving member will be so constructed as to positively engage and drive the drill, and in the best constructions, the driving member will be constructed so as to provide for the use of drills varying widely in size. When, as in the particular construction illustrated, the driving shank is employed as the drill driving member, and means by which its engagement with the drill is effected may be widely varied. The drawings illustrate two constructions by which the engagement of the drill with the drill driving member may be effected.

Referring particularly to the construction illustrated in Figs. 3, 10 and 11, the bottom or under side of the shank 1 is provided with driving shoulders formed by two segment shaped lugs 3, 4, having convex interior faces, the under faces of these lugs, as clearly shown in Fig. 12, being beveled in opposite directions, said lugs forming driving shoulders. When it is desired to provide for the use of drills varying widely in size, the lugs may be formed by providing the end of the driving member with a plurality of recesses. In the constructions illustrated in the figures referred to two such recesses, marked 5 and 6, are shown. One or more of the driving faces of the lugs or shoulders will, in the best constructions embodying the invention, be undercut. In the particular construction illustrated, the driving faces of both the lugs are undercut, as clearly shown in Figs. 3 and 10.

When the drill driving member is constructed, as has been described, with a plurality of recesses, the drills employed therewith will be provided with driving tangs or projections which will engage the recesses, such a tang or projection, marked 7, being shown on the drill illustrated in Figs. 13, 14 and 15. This tang is formed by shouldering off the top of the drill. It will be understood that the tangs formed on what may be termed large drills will be so proportioned as to engage the lower recess 5 in the driving member. The tangs formed on the small drills, however, which are too small to be engaged by the driving faces of the lugs or shoulders next the large recess 5 will be inserted in the small recess 6. The construction, therefore, provides for the use of a very large number of drills varying widely in size. When, furthermore, the driving member is constructed, as has been described, with a driving shoulder or shoulders the driving faces of which are undercut, the driving tang on the drill will be undercut.

While, as has been indicated, constructions may be employed in which there is a single undercut face on a driving shoulder, in the best constructions both driving faces of the drill and driving member will be undercut, and this construction is shown in the drill illustrated in Figs. 13 to 14, these undercut faces being marked 8.

It has been stated that in the construction of driving member illustrated in Figs. 3, 10, 11 and 12, the driving shoulders on the driving member are provided by forming thereon two segment-shaped lugs the interior or driving faces of these lugs being convex. This construction has the advantage of enabling a considerable body of metal to be so located as to resist the strains developed in the drilling operation. When, therefore, this convex construction of driving shoulder is employed, the driving tang on the drill will be correspondingly but reversely shaped. Referring to the plan view, Fig. 14, for instance, it will be seen that the tang is formed by cutting segment shaped recesses on each of its sides. By this construction a tang is formed which is thicker near the circumference of the drill, where the strains set up in driving are the heaviest, than at its center. Further, by leaving the metal undisturbed at the center, the usual depression or center 9 may be formed so that the drill may be engaged by the lathe center when the drill is used in a lathe.

With the construction so far described, it will be seen that the drill may be readily engaged with and disengaged from the driving member. The tang of the drill may be presented in any position to the under side of the driving member, and if the tang does not at once slip into the recess it will be led thereinto by the oppositely beveled faces on the under sides of the lugs 3, 4, these beveled faces acting like a screw thread, causing the drill tang to slip readily into the recess. Once in the recess, its undercut faces, as the driving member turns, are engaged by the undercut faces of the lugs, and a positive and certain driving operation is insured. Further, when the drill is withdrawn from

the work, the undercut faces will prevent disengagement of the drill from the driving member.

Figs. 16 to 18 illustrate a modified form of driving member which may be employed. In this construction, the driving shoulders 10 and 11 are formed by facing off the underside of the driving member, the planes by which these shoulders are formed being at an angle to each other and at an angle to the axis of the driving member which is other than a right angle. Furthermore, in the best constructions, the shoulders 10, 11 formed by thus facing off the driving member will be undercut, as before described, and as shown in Fig. 16.

When the construction of driving member just referred to is employed, the drills to be used therewith should be constructed with shoulders similarly disposed as the shoulders 10, 11. Such a drill is illustrated in Figs. 19 to 21 inclusive in which the shoulders are marked 12, 13, these shoulders being formed in the same manner as the shoulders on the driving member and being undercut, as illustrated in Fig. 19.

In the best constructions embodying the invention, centering devices will be employed, the primary function of which is to hold the drill in proper relation to the driving member during the drilling operation. While the particular construction of centering device employed may be varied, in the construction illustrated, there is provided a holder 14, this holder being secured to the driving shank by reducing the lower end of the shank slightly, as indicated at 15, tapering the reduced portion and positioning the holder thereon with a driving fit. The holder may be provided with a plurality of centering devices, three being shown in the construction illustrated, although the number may be varied. While the construction and manner of mounting the centering devices may differ widely in character, in the construction shown the holder is provided with a plurality of openings 16 in which are inserted jaws 17, these jaws being loosely supported in the openings. If desired, these jaws may be provided with recesses 18 between which are formed teeth 19, these recesses and teeth being so arranged that the teeth on one jaw will enter the recesses on the corresponding jaw when the jaws are in their innermost position, thus enabling them to approach closely to each other and bear upon a small drill. When the invention is carried into effect by means of a construction embodying a holder and loosely mounted centering devices, an actuator should be provided for insuring engagement of the centering devices with the drills. While the construction of this actuator may be varied, it and the holder should be so mounted with respect to each other that they may have a limited movement to effect the engagement and release of the centering devices. In the construction illustrated, the holder has been described as being tightly secured to the driving shank by means of a tapered driving fit. When this construction of holder is employed, therefore, the actuator will be mounted so as to have a limited movement with respect to the holder. In the construction shown, the actuator comprises a sleeve 20 provided with a top 21 and a bottom 22, the top and bottom being secured in place by screws 23, or in any other suitable manner. The bottom may, if desired, be provided with a shoulder, as 24, and the lower end of the holder may be correspondingly shouldered off to fit this shoulder. In the construction illustrated, the top 21 of the actuator is similarly formed to provide a shoulder 25 which is engaged by a shoulder formed on the upper end of the holder. These shoulders 24 and 25, when employed, insure that the strains caused either by hammering the chuck into place on the driving shank and removing it therefrom will be borne largely by the metal of the holder. The limited movement of the actuator with respect to the holder is obtained, in the particular construction illustrated, by locating a spring 26 between the holder and the actuator. In the construction shown, the upper end 27 of this spring is secured to the top of the actuator and the lower end 28 is connected to the holder. In the best constructions and as shown, the spring will be normally under tension. To effect this, the holder is provided with a stop or projection 29 and the under side of the top 21 is provided with a substantially semi-circular rib, as 30, (see Figs. 3 and 6), the stop 29 being positioned between the ends of the rib.

While the means by which the actuator operates the centering devices may be varied, as shown, the actuator sleeve is provided with a plurality of cam faces 31. Although the actuator might be otherwise constructed, as shown there are as many of these cam faces as there are jaws. The exterior of the actuator sleeve may, if desired, be provided with a milled or roughened surface 32 to enable a good grip to be obtained thereon.

With the construction described, it being understood that the driving shank is engaged by the driving spindle of a drilling machine and is being rotated, if it be desired to insert a drill, the operator seizes the sleeve 20 and holds it. As the shank rotates, the holder 14 turns with respect to the actuator sleeve and against the tension of the spring until the stop 29 strikes one end of the semi-circular rib 30, at which time the high parts of the cam faces 31 have moved out from behind the jaws 17. When the lugs 29 strike the end of the semi-circular rib, the

actuator will move with the holder and the centrifugal force developed by the rotation of the entire construction will cause the jaws or centering devices 17 to be thrown out, so that a drill may be readily inserted and engaged with the driving shank or member in the manner hereinbefore described. The operator now lets go of the actuator sleeve and the spring draws the sleeve back, the cam faces forcing the centering devices or jaws inward until they grip the body or shank of the drill. The inward position of these centering devices is indicated in Fig. 4, in which they are operating upon a very small drill, marked 33. It will be understood that the jaws 17 exercise little if any driving action on the drill, the driving of the drill being effected by its positive engagement with the driving shoulders on the driving member or shank, the jaws centering and steadying the drill, and, further, preventing its dropping out when the drill is not operating on the work.

It will be understood that after the drill is inserted between the centering jaws and brought into contact with the work, the resistance of the work causes the undercut faces on the shank of the drill and the driving member 6 to become engaged. After the drilling is completed, and the drill is to be withdrawn from the work,—and it will be understood, of course, that the rotation of the drill is not stopped when it is withdrawn—if there is friction between the drill and the work, it will, in the main, have the effect of resisting the rotation of the drill so that the result will be to hold the undercut faces on the driving member and drill shank in engagement. The resistance to pulling the drill out of the work, therefore, will not be sufficient to effect the disengagement of the undercut shoulders, so that the drill may be withdrawn without disengagement from its driving member.

Constructions have been heretofore employed in which driving and gripping jaws were located in a holder and actuated by a sleeve provided with cam faces which caused the gripping jaws to engage the shank of the drill. In these constructions, however, the driving of the drill, as indicated, was effected by the grip of the jaws on the shank of the drill. While some of these constructions were valuable for certain purposes, they were open to the objection that unless the actuator was made so large as to be impracticable, and the walls of the actuator sleeve made excessively thick, the cam faces could not be made sufficiently long to provide for a wide range of drills, that is, drills varying widely as to the diameter of their shanks. It will be understood, of course, that the resistance offered by the work to the drill is very considerable, and in these constructions, in order to hold the drills firmly, it was necessary for the cam faces which actuated the gripping and driving jaws to be gradually inclined, for if they were steep, the twisting force which the drill exercised against the gripping jaws would drive them down the cam faces. A construction in which the drill is driven by a positive engagement with the driving member and the jaws are employed simply as centering devices enables a much wider range of drills to be employed with the chucks, for the reason that where the jaws are not relied upon to effect the driving of the drill, the cam faces which actuate them can be made much steeper. For instance, in the construction illustrated, where the outside diameter of the actuator sleeve is 2 7/8th inches and the extreme thickness of its walls from 1/2 inch to 9/16th inch, drills varying in diameter of their shanks from 1/32nd of an inch up to 3/4ths of an inch or even more can be readily accommodated.

Such changes and variations may be made in the construction by which the invention is carried into effect as fall within the scope of the appended claims. The invention is not, therefore, to be confined to the specific constructions hereinbefore described and illustrated in the accompanying drawings.

What is claimed is:—

1. The combination with a drill driving member having a driving shoulder provided with an undercut face, means for centering the drill with respect to the driving member.

2. The combination with a drill driving member having a plurality of driving shoulders the undersides of which are beveled in opposite directions and the driving faces of which are undercut, of means for centering the drill with respect to the driving member.

3. The combination with a drill driving member provided with a plurality of segment shaped lugs having undercut driving faces, of means for centering the drill with respect to the driving member.

4. The combination with a drill driving member provided with a plurality of segment shaped lugs the undersides of which are beveled in opposite directions and the driving faces of which are undercut, of means for centering the drill with respect to the driving member.

5. The combination with a drill driving member the underside of which is recessed to form undercut openings of different sizes, the walls of the openings operating as driving faces, of means for centering the drill with respect to the driving member.

6. The combination with a drill driving member having oppositely disposed driving lugs, said lugs providing between them communicating openings of different widths, one of the driving faces adjoining each opening being undercut, of means for cen-

tering the drill with respect to the driving member.

7. The combination with a drill driving member having oppositely disposed driving lugs, said lugs providing between them communicating openings of different widths, the under sides of the lugs being beveled in opposite directions, and one of the driving faces adjoining each opening being undercut, of means for centering the drill with respect to the driving member.

8. A drill the top of which is cut away to form a driving tang the opposite faces of which are undercut and the tang being thicker near the circumference of the drill than at its center.

9. The combination with a drill driving member having a driving shoulder provided with an undercut face, of a drill the top of which is provided with a corresponding undercut face, and means for holding the drill centered with respect to the driving member when the faces are in engagement.

10. The combination with a drill driving member having a plurality of driving shoulders, a face of said shoulders being undercut, of a drill the top of which is formed to provide corresponding faces, and means for holding the drill centered when the faces of the driving members and drill are in engagement.

11. The combination with a drill having a driving tang which is thicker near the circumference of the drill than at its center, of a driving member having segment shaped lugs with which the tang engages, and means for holding the drill centered when its tang is in engagement with the lugs of the driving member.

12. The combination with a drill driving member provided with a plurality of segment shaped lugs having undercut driving faces, of a drill having a driving tang which is thicker near the circumference of the drill than at its center and the faces of which are undercut, and means for holding the drill centered when its tang is in engagement with the lugs of the driving member.

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

VERNER J. WAHLSTROM.

Witnesses:
A. WHITE,
JOHN J. KEARNS.