

W. HARTEL.
POWER DRILL.

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1,061,474.

Patented May 13, 1913.

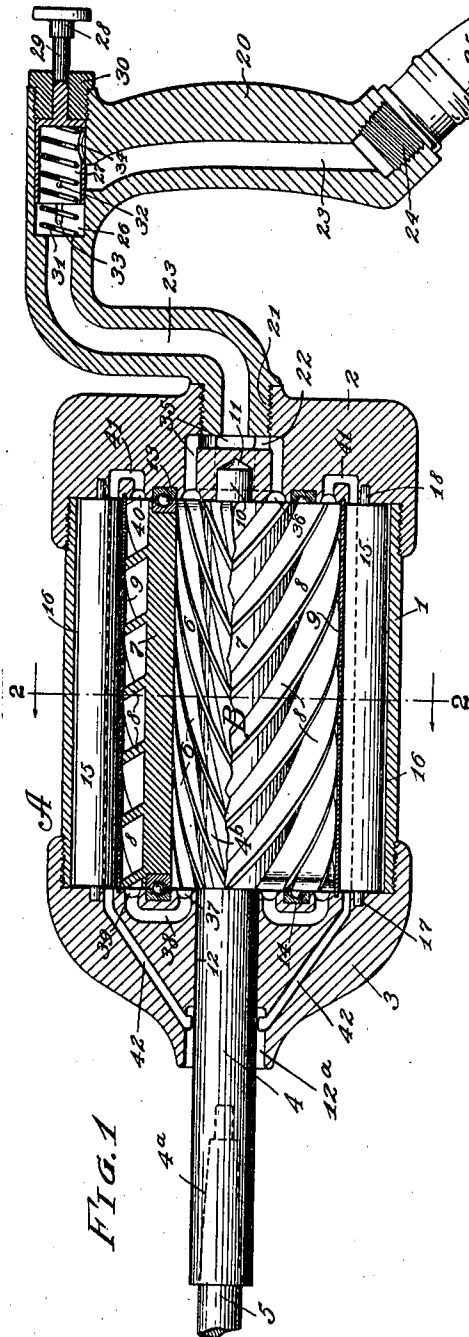


FIG. 1

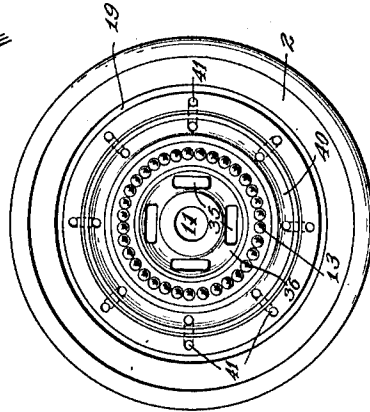


FIG. 3

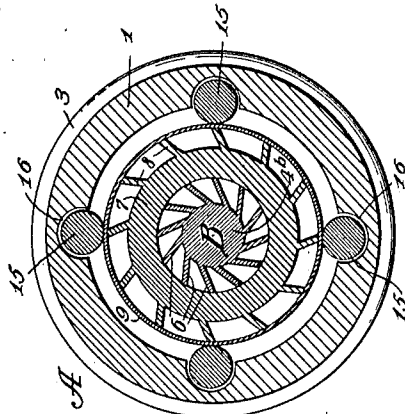


FIG. 2

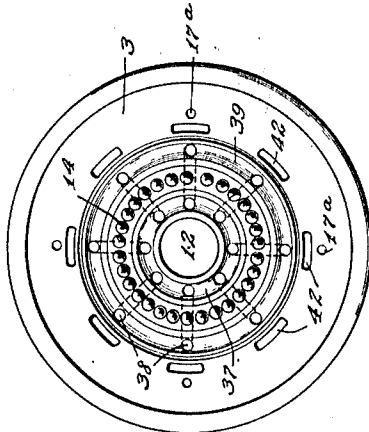


FIG. 4

WITNESSES:

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POWER-DRILL.

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To all whom it may concern:

Be it known that I, WILLIAM HARTEL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Power-Drills, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to power drills of the portable type, which are especially adapted for use in structural iron work, the construction of steel bridges, in boring holes in railway rails, and wherever the nature of the work requires a drill of comparatively high power but which work is of such size or shape that it is impossible to accomplish it on a drill press.

Among the objects of the invention are the provision of a drill of this character which is compact and of substantial construction, which is capable of high speed, and yet can be easily and effectively controlled by the operator; the provision of a drill of the rotary type adapted to be operated by compressed air or other expandible fluid of greater simplicity than any heretofore used; the provision of a device of this character wherein the pressure fluid is used expansively, the expansion being broken up into several stages, whereby high efficiency is obtained; the provision of a power drill of a construction that will permit of its being readily disassembled for the purpose of inspection and repair of its parts; while further objects and advantages will be come apparent as the description proceeds.

Generally speaking, the invention may also be defined as consisting of the combination of elements embodied in the claims hereto annexed and illustrated in the drawings forming a part hereof, wherein—

Figure 1 is a central longitudinal section of my power drill, the drill-stock and portion of the rotor being shown in elevation; Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1 and looking in the direction of the arrows; Fig. 3 is an inner face view of the head-block of my drill, and Fig. 4 is a similar view of the tail-block thereof.

Like reference characters are used to designate corresponding parts throughout the several views of the drawing.

The case A of my power drill consists

generally of a cylindrical wall 1 which is threaded at each end, and of head and tail-blocks 2 and 3 having laterally extending and internally threaded flanges which are adapted to receive the threaded ends of the cylindrical wall 1.

4 represents the drill-stock which is provided with the usual socket 4^a for the reception of the shank of a drill or other tool 5, a portion of which is shown in Fig. 1. The drill-stock is driven by a rotor B which is contained within the casing, and a part of which is conveniently formed of an extension 4^b of the drill-stock 4. The extension 4^b of the drill-stock from which the aforesaid portion of the rotor is formed is provided with a plurality of vanes or blades 6 which extend from the core of the rotor at an angle to its radius and also at an angle to the longitudinal axis of the rotor, thereby forming a series of spiral vanes or blades thereabout. A drum 7, the interior diameter of which is substantially equal to the diameter of the circle defined by the outer edges of the blades 6, is shrunk upon the blades; and upon the exterior of this drum is provided a series of vanes or blades 8, similar to the blades 6 previously described, extending spirally about the drum, but inclined in the opposite direction to the inclination of the blades 6. A cylindrical shell 9 is shrunk upon the blades 8, and overhangs the blades at each end, and these overhanging portions are contained within annular grooves in the head and tail blocks 2 and 3 of the casing. From this description, it will be seen that a rotor has been produced containing one series of helical ports or passageways extending longitudinally through the rotor near its center and a second series of like ports extending through the rotor near its periphery but inclined in the opposite direction, the purpose of the opposed direction of inclination of the two series of ports being explained hereinafter.

The rotor is centrally supported within the casing by a trunnion 10 which projects from the end opposite to the drill-stock 4 and has a bearing in a socket 11 formed in the center of the inner face of the head block 2, and the drill-stock which is journaled within a bore 12 formed through the center of the tail block 3. To provide for the end thrust of the rotor I have employed the ball bearings 13 and 14 between the head and

tail-pieces 2 and 3 respectively and the adjacent ends of the rotor, and to resist any side thrust which the rotor may tend to exert upon the casing, I have provided the rollers 15 which occupy grooves 16 within the cylindrical wall 1, the spindles 17 of which are journaled within the sockets 17^a of the tail block 3 and the spindles 18 of the rollers are supported within the groove 19 of the head block 2.

A handle 20 is secured to the head block 2 as by means of a threaded projection 21 of the handle which is adapted to be received by an internally threaded socket in the head block. There is sufficient difference between the length of the threaded projection 21 and the depth of the socket to produce a chamber 22 beyond the end of said projection when the handle is screwed into place. A port 23 which extends through the handle, communicates at its inner end with the chamber 22 and at its outer end it is enlarged and threaded to form a socket for the reception of the hose fitting 24 of the pressure fluid supply hose 25. The port 23 is interrupted intermediate of its ends by a valve chamber 26 extending into the handle from the rear side thereof. This valve chamber cuts at right angles, the branch of the port 23 which extends through the grip of the handle, but its longitudinal axis is coincident with the center of the upper portion of the branch of the port 23 which leads to the chamber 22. Within the valve chamber is adapted to reciprocate a hollow cylindrical valve body 27, which may be actuated by a thumb button 28 secured to a stem 29 projecting from the head of the valve body through a hole within the plug 30. The spiral spring 31, interposed between the end wall of the valve chamber and the interior of the head of the valve body, tends to hold the valve in inoperative position, and the valve body is prevented from turning by a pin 32 which projects into a groove 33 within the side wall of the valve chamber. A hole 34 within the cylindrical wall of the valve body is adapted to register with the branch of the port 23 within the grip of the handle, when the valve is pushed inwardly.

The chamber 22 communicates, through ports 35, with the annular groove 36 within the inner face of the head-block 2, and this groove lies within the zone of the ends of the vanes or blades 6 of the rotor. Adjacent the opposite ends of the vanes or blades 6 and in the inner face of the tail block 3, is a similar groove 37. This groove has communication, through ports 38, with a similar concentric groove 39 in the inner face of the tail block 3, which lies in the zone of the end of the vanes or blades 8 of the rotor. Within the inner face of the head block 2 adjacent the opposite ends of

said blades 8 is an annular groove 40 communicating, through ports 41, with the space between the shell 9 and the cylindrical wall 1 of the casing A. This space communicates with the atmosphere through the inclined ports 42 in the tail block 3 which open into an enlargement of the bore 12.

In the use of my power drill the operator grasps the handle 20 with one hand in a manner that will permit him to easily operate the valve button 28 with his thumb, and with his other hand he supports the casing of the drill. Upon the actuation of the valve 27 communication is established between the branches of the port 23 which extend through the handle 20 and pressure fluid (preferably compressed air) is thereby admitted into the chamber 22 therethrough. From the chamber 22 the air is directed, through the ports 35, against the blades 6 of the rotor, causing the rotor to be revolved in a right hand direction. The air then continues its course through the spiral ports between the blades 6 to the annular groove 37 in the tail-block 3, from where it is conducted, through ports 38, to the annular groove 39. As it exhausts from the ports 38 it impinges against the blades 8 of the rotor, and, because of the direction of inclination of said blades, causes an increase in the momentum of the rotor initiated by the impinging of the air in the first instance against the blades 6. From the outer series of spiral ports the air passes into the annular groove 40 in the head block 2, thence through the ports 41 into the space between the shell 9 and the cylindrical wall 1 of the casing A. From here it is conducted through the inclined ports 42 in the tail-block and directed toward the drill-stock 4, where it is exhausted, through the enlargement 12^a of the bore 12, into the atmosphere. The air thus exhausted about the drill-stock 4 is directed forward because of the shape of the enlargement of the bore 12 and tends to cool the drill.

While I have shown this rotor B as being provided with but two series of spiral blades, I do not wish to confine myself to such, as any number of series may be employed as is deemed advisable, without departing from the spirit of my invention; likewise, while I have shown the ports 35 and ports 38 as parallel with the axis of the rotor and opening into annular grooves 36 and 39 respectively, I wish it to be understood that such ports could be inclined at any angle with respect to the blades 6 and 8, and conduct the air directly thereagainst, exclusive of the annular grooves.

Furthermore, it will be apparent that the device is not restricted to use with drills or like boring tools, but can be used for driving emery-wheels or other light machinery, for example, by being secured to

the slide rest of a lathe so as to grind the centers of the material supported thereby.

Having thus described my invention, what I claim is:—

5 1. In a power drill, the combination of a drill-stock, a rotor for operating said drill-stock having a plurality of blades, and a casing for said rotor having ports therein for directing pressure fluid against said
10 blades whereby the rotor is caused to revolve and operate said drill-stock, said casing also having exhaust ports converging toward the drill, whereby the exhaust fluid will serve to cool the same.

15 2. In a power drill, the combination of a drill-stock, a rotor for operating said drill-stock and having a series of spiral blades, a casing for said rotor having ports therein through which pressure fluid is directed
20 against the blades thereby causing the rotor to revolve and operate the drill-stock, and bearings for said drill-stock carried by said casing, the bearing for the forward end of the drill stock being formed with an enlargement at its forward end and the casing
25 being formed with exhaust passages communicating with said enlargement whereby the exhaust fluid is directed upon the tool so as to cool the same.

30 3. In a power drill, the combination of a drill-stock having blades throughout a portion of its length which project at an angle with respect to its radius and also at an angle with respect to its longitudinal axis, a
35 drum surrounding said blades and secured thereto and having blades upon its exterior inclined with respect to its radius and also inclined with respect to its longitudinal axis but in the opposite direction with respect to
40 the inclination of the first mentioned blades, a cylindrical shell surrounding said latter blades and secured thereto, a casing within which the drill-stock is supported inclosing that portion provided with the blades and
45 having ports therein for directing pressure fluid against the first mentioned blades and additional ports for conducting the pressure fluid from the zone of said blades to the blades on the drum, and a valve for controlling the supply of pressure fluid to said
50 ports.

4. In a power drill, the combination of a drill-stock having blades throughout a portion of its length which project at an angle
55 with respect to its radius and also at an angle with respect to its longitudinal axis, a drum surrounding said blades and secured thereto, blades upon the exterior of said drum inclined with respect to its radius and
60 also inclined with respect to its longitudinal axis but in the opposite direction with respect to the inclination of the first-mentioned blades, a cylindrical shell surrounding said latter blades and secured thereto,
65 a casing within which the drill-stock is sup-

ported inclosing that portion provided with the blades, and provided with ports for directing pressure fluid against the first mentioned blades, rollers journaled within the casing against which the aforesaid cylindrical shell is adapted to bear, and additional ports for conducting the pressure fluid from the zone of said first blades to the blades on the drum.

5. In a power drill, the combination of a casing comprising a cylindrical shell, a head block having ports therein, and a tail block which is also provided with ports, a rotor centrally located within said casing and having a series of inclined blades, a drill-stock secured to said rotor and projecting through a bore in the tail-block, a handle for the power drill secured to the head block and having a port therethrough communicating with the ports within said head block, and a valve within said handle by the actuation of which pressure fluid is caused to flow through the port within the handle and the ports within the head block and impinge against the blades of the rotor whereby the rotor is caused to rotate and operate the drill-stock.

6. In a power drill, the combination of a drill-stock, a rotor for operating the same and having a series of spiral ports extending longitudinally therethrough near its center and a second series of oppositely inclined spiral ports extending longitudinally therethrough near its periphery, a casing for said rotor comprising a cylindrical shell and head and tail-blocks, each containing ports located within the zones of the ends of the spiral ports of the rotor and adapted to direct pressure fluid against the sides of the said spiral ports for causing the rotor to revolve, the tail-block also having a second series of ports for throwing into communication with the atmosphere, the space between the rotor and the cylindrical shell of the casing, and a handle secured to the head block having a port communicating at its inner end with the ports within the head block and having connection at its opposite end with the pressure fluid supply.

7. In a power drill, the combination of a drill-stock, a rotor for operating the same and having a series of spiral ports extending longitudinally therethrough near its center and a second series of oppositely inclined spiral ports extending longitudinally therethrough near its periphery, a casing for said rotor comprising a cylindrical shell and a head-block and tail-block each containing ports located within the zones of the ends of the spiral ports of the rotor and adapted to direct pressure fluid against the sides of the spiral ports thereby revolving the rotor, the tail block also having a second series of ports for directing the exhaust pressure fluid toward and about the drill, a handle

secured to the head-block having a port communicating at its inner end with the ports within the head block and having connection at its opposite end with the pressure
5 fluid supply, and a valve within said handle whereby the supply of pressure fluid to the ports within the casing is controlled.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

WILLIAM HARTEL.

Witnesses:

HAROLD E. SMITH,
BRENNAN B. WEST.

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