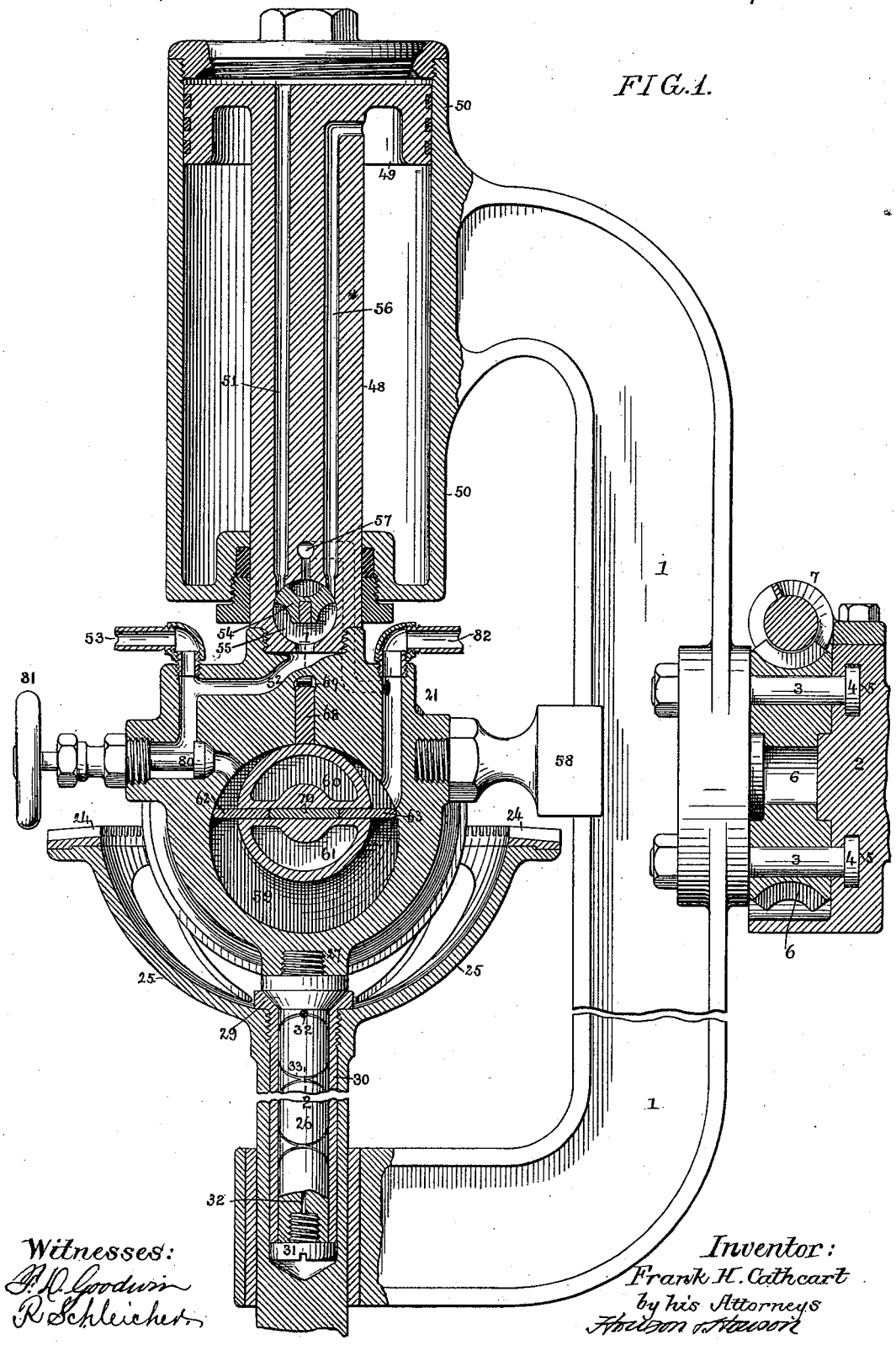
(No Model.) 4 Sheets—Sheet 1.

F. H. CATHCART.

POWER DRIVEN TOOL.

No. 494,461. Patented Mar. 28, 1893.

FIG. 1.



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(No Model.)

4 Sheets—Sheet 2.

F. H. CATHCART.

POWER DRIVEN TOOL.

No. 494,461. Patented Mar. 28, 1893.

FIG. 2.

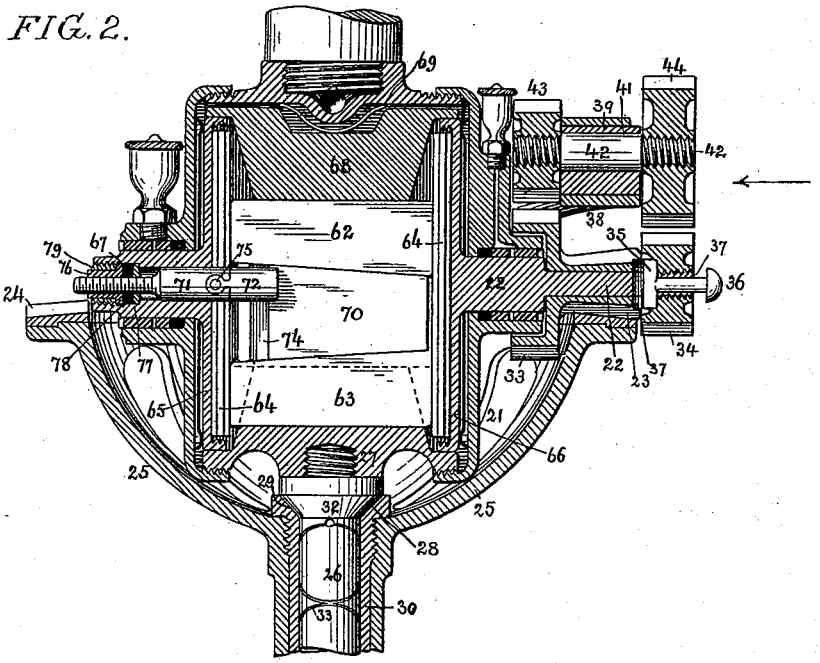
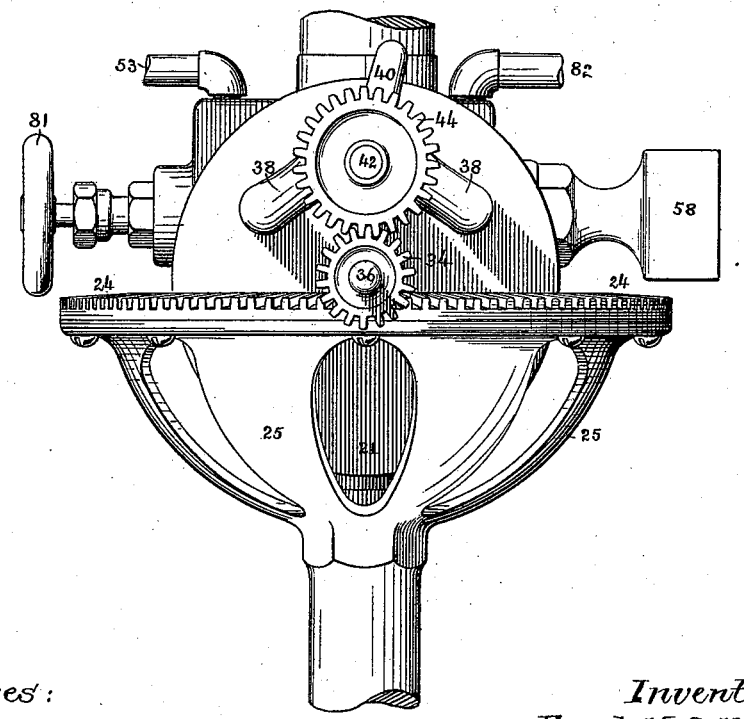


FIG. 3.



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(No Model.) 4 Sheets—Sheet 3.

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POWER DRIVEN TOOL.

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FIG. 5.

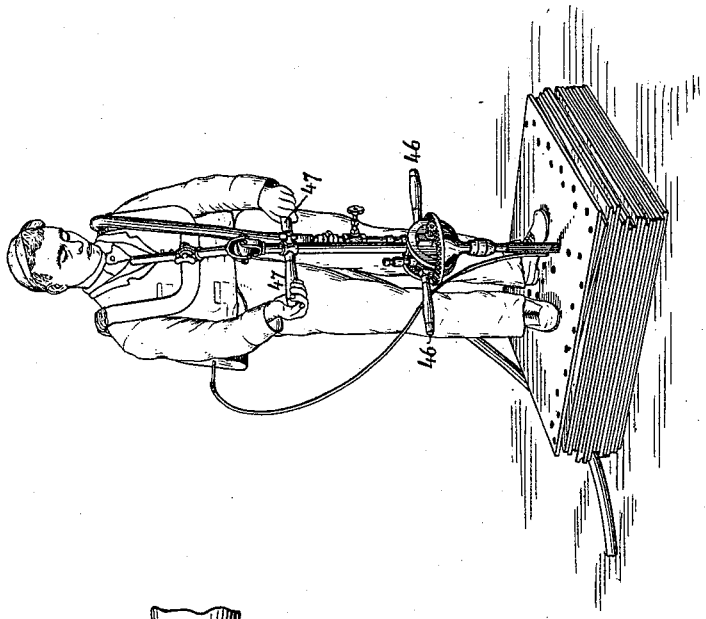
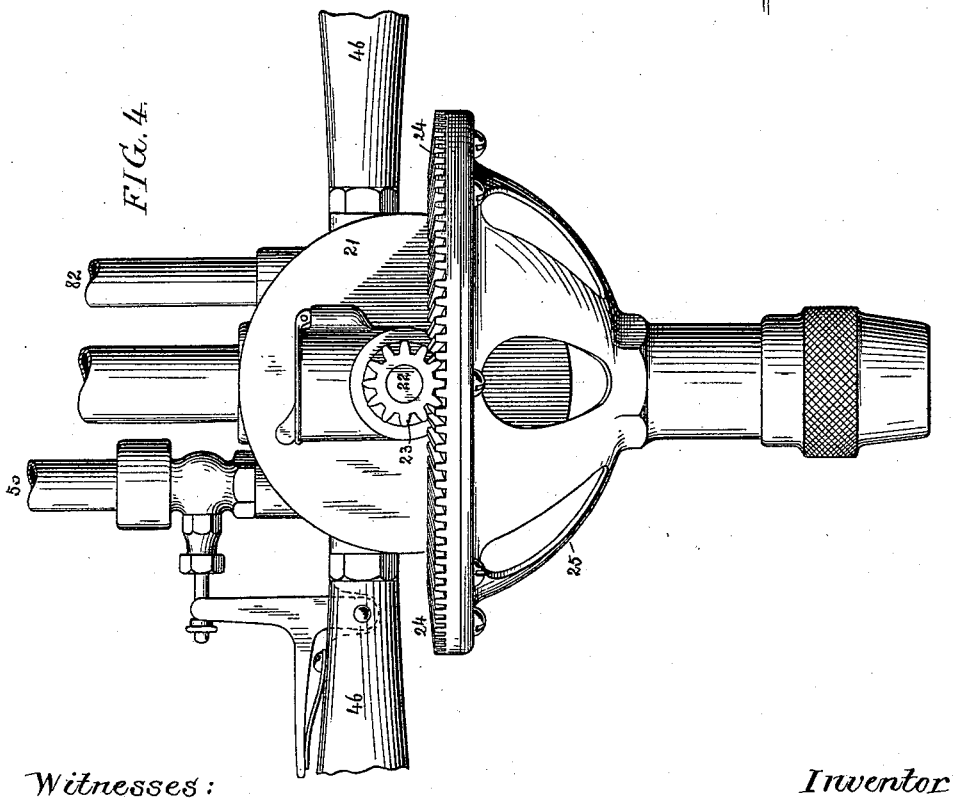


FIG. 4.



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(No Model.) 4 Sheets—Sheet 4.

F. H. CATHCART.

POWER DRIVEN TOOL.

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FIG. 7.

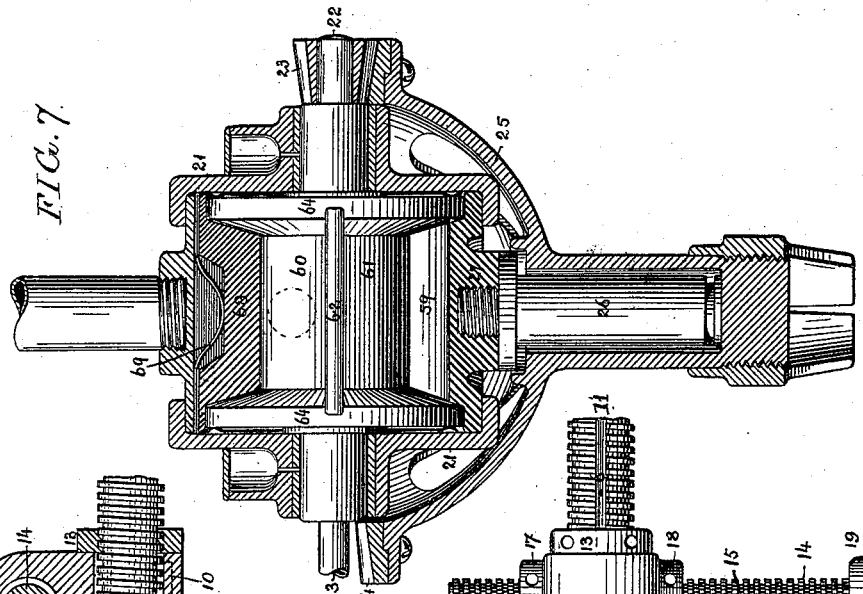


FIG. 9.

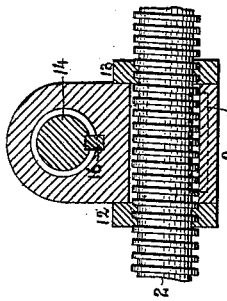


FIG. 8.

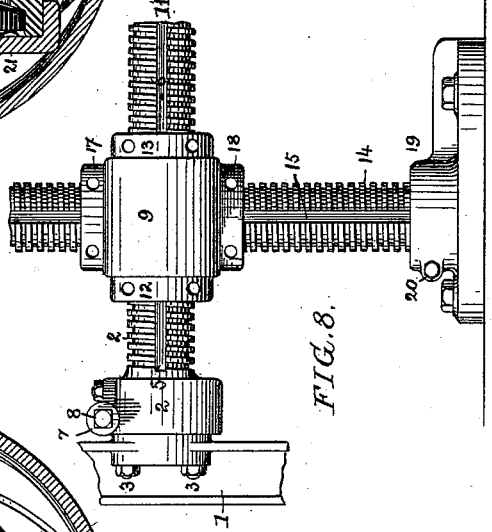
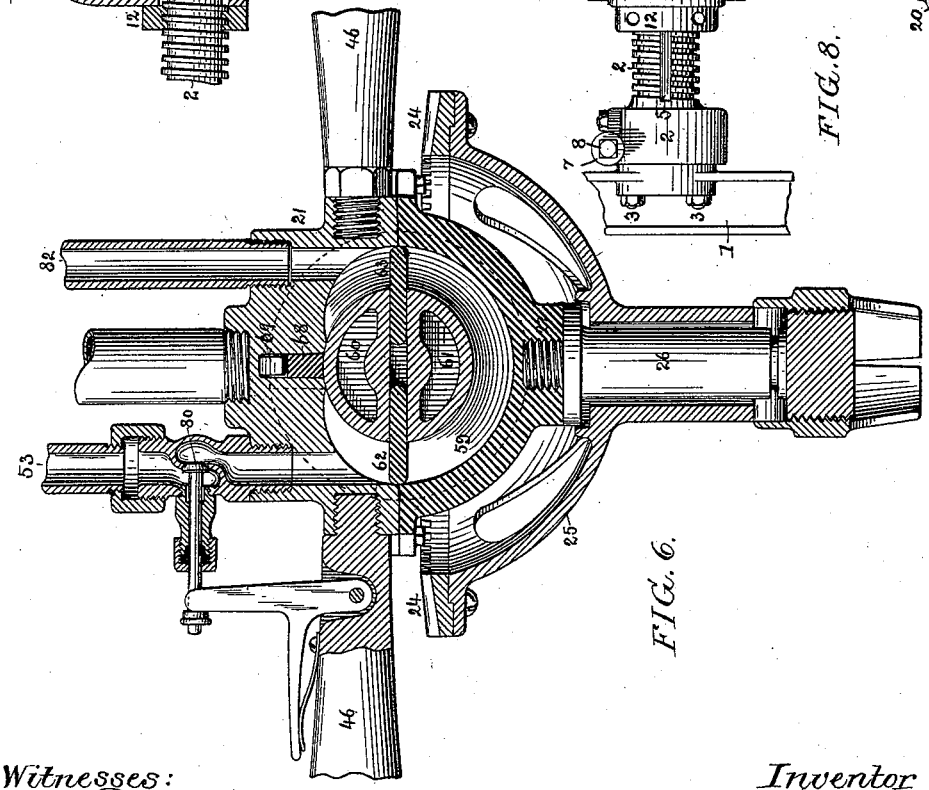


FIG. 6.



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UNITED STATES PATENT OFFICE.

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POWER-DRIVEN TOOL.

SPECIFICATION forming part of Letters Patent No. 494,461, dated March 28, 1893.

Application filed June 24, 1892. Serial No. 437,884. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. CATHCART, a citizen of the United States, and a resident of Lower Merion township, Montgomery county, Pennsylvania, have invented certain Improvements in Power-Driven Tools, of which the following is a specification.

The object of my invention is to construct a self contained power operated tool which may be applied to many uses, but is especially applicable as a drill, reamer, milling tool, or die sinker, and it comprises, in general, a tool carrier provided at one end with a gear wheel to which motion is imparted by gears, on or operated from the shaft of a motor, and devices for effecting the longitudinal movement of the motor and tool carrier to feed it to and from its work. The motor proper, may be driven by any suitable power either electricity, steam or other fluid, but in practice I have found it desirable to employ a fluid operated motor and the device will be hereinafter described with reference to a construction in which such a fluid operated motor is employed, although it will be understood that I do not wish to limit myself to the particular kind or construction of motor or motive power described.

In the accompanying drawings:—Figure 1, is a sectional elevation of a power driven tool constructed in accordance with my invention. Fig. 2, is a transverse sectional view of a portion of the same on the line *a a*, Fig. 1, showing some of the parts in a different position. Fig. 3, is an elevation looking in the direction of the arrow Fig. 2. Fig. 4, is a view similar to Fig. 3, but illustrating a modified construction. Fig. 5, is a view illustrating the manner of using the tool by hand. Figs. 6 and 7, are views illustrating a modified construction of motor which may be employed to drive the tool. Fig. 8, is an elevation of an "old man," which may be employed to carry the tool; and Fig. 9, is a sectional plan view of the same on the line *b b*, Fig. 8.

Referring to the drawings 1 represents a frame in which the tool is supported, the frame being secured to the horizontal arm 2 of the "old man" by a series of bolts 3 which extend from the frame 1 to the end of the arm 2 and are there provided with heads 4 adapted to travel in a circular undercut recess 5 in the end of the arm 2. The bolts 2 also serve to secure to the frame 1 a worm wheel 6 with which engages a worm 7 mounted in suitable bearings on the end of the arm 2 and provided with a squared end 8 to which a key or crank may be attached for turning the frame 1 to any desired angle. This arm 2 passes through a socket 9 provided with a tongue 10 which is adapted to a groove 11 in the arm 2 and with the threaded portion of the arm 2 engage two nuts 12 and 13, by turning which the arm 2 may be longitudinally adjusted to move the frame 1 to any desired distance. A vertical adjustment is secured by a similar arrangement; the vertical arm 14 of the "old man" being provided with a groove 15 engaged by a feather or tongue 16 fixed in a portion of the frame of which the socket 9 forms part, and engaging with the threaded portion of this vertical arm are nuts 17 and 18 similar to the nuts 12 and 13. The arm 14 is supported in a base 19 which is formed in two parts held together by a clamping nut 20 by loosening which the vertical arm 14 may be turned around on its axis and when the nut 20 is tightened, will be held firmly in place. By this means the frame 1, which carries the tool, may be adjusted to any position to do any desired work.

21 represents a frame in which is contained a motor for driving the tool and on the driven shaft 22 of this motor is mounted a gear wheel 23 by which the rotation of the motor shaft may be imparted to the tool; this gear wheel 23 meshes with a bevel gear 24 secured to the upper portion of a hollow body 25 surrounding the frame 21, and this body is preferably semi-spherical in form although, of course, it may be bowl-shaped, elliptical, conical, or of other form, if desired.

26 represents a stem forming an axis for the tool shank, and this stem may be formed integral with the frame 21 if desired, although I prefer to thread its upper end, as at 27, and screw it into the lower portion of the frame 21, as shown in the drawings. Immediately below the enlarged upper end of this stem 26 is an inclined shoulder 28 against which presses a similarly inclined shoulder 29 forming part of a circumferential sleeve 30, and these two parts being held together by a screw 31, the head of which is sufficiently large to extend

over the end of the sleeve 30 and thus hold the sleeve to the stem to prevent any longitudinal movement. This stem 26 is provided with a central passage—communicating by radial passages 32 with the exterior of the stem and surrounding the stem is a series of grooved passages 33 the various passages being for the purpose of containing and distributing a supply of lubricant between the stem and the sleeve 30.

Near the upper end of the sleeve 30 is secured the hollow body 25, the shank of which extends down around the sleeve 30, through a guiding orifice in the lower end of the frame 1, and is provided with a chuck or other suitable device for the reception of any tool which it may be desired to employ.

In the construction shown in Fig. 2, the shaft 22 is provided with a supporting surface for two gear wheels 23 and 33 formed integral or secured to each other so that they will rotate together loosely on the hub or shaft. On the extreme outer end of this shaft 22 is secured a pinion 34 which rotates at all times with the shaft and provision is made for the coupling and uncoupling of the shaft and the gears 23 and 33 when such coupling is desired, preferably by means of a cross bar 35 extending in a diametral line through a slot in the shaft and secured to a handled stem 36 projecting through the end of the shaft, the diametral bar being of a length greater than the diameter of the shaft and being normally within a suitably shaped recess in the gear wheel 34, but, when occasion requires, the pushing in of the handled stem 36 will cause the engagement of the diametral bar 35 with a suitably shaped recess or opening 37 in the gear wheel 23 and this coupling of the shaft 22 with the bevel pinion 23 will cause the rotation of the tool shank at the normal rate of speed.

38 represents a bracket secured to the casing or frame 21 and provided with an orifice for the reception of an eccentric 39 having an operating handle 40. Through an opening 41 in this eccentric extends a shaft 42 carrying on one end a gear wheel 43 and on the opposite end a gear wheel 44.

It will be observed that when the shaft 42 is allowed to assume its lowest position by the movement of the eccentric 39 the teeth of the wheel 43 will mesh with the teeth of the wheel 33 and the teeth of the wheel 44 will mesh with those of the wheel 34, so that if the diametral locking bar 35 be in the position shown in Fig. 2 and the gears down instead of up, out of position, as illustrated in said figure, the teeth will be engaged and the rotations of the shaft 22 will be imparted to the hollow body 25 and the bevel gear 24 on its upper surface through the medium of the wheels 34, 44, 43, 33 and 23; the relative sizes of the gears making it possible to either increase or decrease the resultant speed of the bevel gear 24 and the tool, or, as shown in Fig. 4, this intermediate gearing may be dispensed with and the gear wheel 23 be connected directly to the bevel gear 24.

Where the device is used as a hand tool as illustrated in Fig. 5, it is provided with handles 46 and 47, or with the handles 46 only, so that one man may be able to operate the same.

In Fig. 5, the device is illustrated as carried by a man who gives to the upper handles 47 sufficient pressure to force the tool (in this case a reamer) through openings punched or drilled in the metal, and the tool proper is supported by braces connected to a frame work carried by the operator, by a universal joint so as to enable him to freely move the tool from one point to another.

In heavier work where it is desirable that the pressure to force the tool through the work shall be greater than can be given by hand power, the top of the tool body is preferably provided with a piston rod 48 carrying a piston 49 adapted to a cylinder 50 carried by or forming part of the frame 1 and the shank of the tool is guided in a suitable opening in the lower part of such frame work. Sufficient pressure is exerted by the admission of a pressure of steam, air, or other fluid between the top of the piston and the top of the cylinder through the passage 51 which communicates with a branch 52 of the port 53 through which the operating fluid is supplied to the motor and the pressure being regulated by a valve 54 adapted to turn in a circular chamber 55. This valve 54 also controls the admission of the operating fluid through a similar passage 56 in the piston rod leading to the underside of the piston the valve being preferably in the nature of an ordinary D-slide valve so that when turned in one direction or the other communication will be opened between one side of the piston and exhaust 57 and opened between the other side of the piston and the pressure, and vice versa. The action of the expansible operating fluid between the top of the piston and the cylinder is found very convenient in tools of this class, as the pressure is constant and keeps up with the pressure of the drill or other tool as it descends, the pressure being even and regular, and being a decided advantage over the ordinary screw pressure where the drill is moved intermittently and has at no two times the same amount of pressure.

The frame 21 is provided with a guiding block 58 which embraces a guide on the frame 1 and prevents the frame 21 from turning with the tool shank.

The motive power employed to rotate the shaft 22 may be of any desired construction, but is preferably of the character described in an application for Letters Patent filed by me of even date herewith, and the construction of which will be readily seen on reference to Figs. 1 and 2; 59 being a two part cylinder or chamber within which the piston rotates and this piston being formed of two portions 60 61, which, when placed together, form

a cylindrical body, the diameter of which is slightly less at the center than at the ends forming a "spool-like" body. This halving of the piston body makes it possible to readily form the channel or passage in which the piston blades 62, 63 may work back and forth as required in following the preferably elliptical contour of the chamber 59. The two portions of the piston are kept at the proper distance apart by spacing blocks 64 of slightly greater thickness than the thickness of the piston blades, so that the blades may work in and out without any unnecessary friction and the two halves of the body, thus spaced, are held together and form a practically solid structure, by end disks 65, 66, which screw onto the threaded peripheries of the end portions of the piston as will be seen on reference to Fig. 2. The disks 65, 66 are provided with journals 67 and 22, which find bearings in the casing of frame 21 and one of which 22, forms the shaft by which the rotations of the piston may be imparted to the tool.

The piston blades 62, 63 are of sufficient length to extend almost from end to end of the piston body and find a support at each end as well as at the center, in contradistinction to the usual form of rotary engine in which the ends of the piston blades are usually unsupported.

At that portion of the cylinder 59 where the piston blade is caused to descend wholly within the guiding slot within the body of the piston is placed what may be termed the fixed abutment 68 made of a separate piece of hardened metal and so arranged as to fit the contour of the piston body exactly, the inclining of the greater end portions of the piston body conforming to similarly shaped inclined portions on the abutment 68, and the inclined portions being at the most suitable angle for automatically taking up any wear which may occur and also with a view of having all portions of the surface of the fixed abutment exposed to the same, or nearly the same amount of wearing friction, or in place of using fixed abutments I may back them by springs 69, which force the abutment in a radial line toward the center of the piston.

The edges of the piston blades, within the piston body, are inclined from each other so as to form an angular space within which is fitted a wedge shaped adjusting block 70 of sufficient length to form a backing for the piston blades for almost their entire length, and to this block are connected devices for effecting its longitudinal movement for the purpose of forcing the pistons farther apart to compensate for the increasing diameter of the chamber 59 as it wears by the friction of the blades. These adjusting devices comprise a stem 71 which fits under one portion of the adjusting block, and a second piece of hardened metal 72 provided with a projecting tongue adapted to a groove 74 extending transversely across the adjusting block so that while the stem 71 retains its position at the center of rotation of the piston the wedge shaped adjusting block to which it is attached will slide freely to-and-fro with the piston blades as they are moved transversely across the piston body, by the action of the elliptical chamber. The portion 72 is provided with what might be termed a circular dove tailed projection 75 adapted to a suitably shaped recess in the body of the stem 71 and will effectually prevent any longitudinal displacement of the two parts while lateral displacement is prevented by the closely fitting passage in the axis of the head 65 through which the stem passes. The shank of the stem 71 is threaded and to this threaded portion is adapted a nut 76 the inner end of which is flanged and between the flanged portion and a ring 77 bearing against a shoulder in the passage in the head 65 is placed packing 78 of any suitable character, and this packing may be tightened from time to time by a gland nut 79 surrounding the nut 76 and pressing upon its enlarged inner end, the stem 71 being adjusted longitudinally by the application of a key or wrench to its rectangular end.

In operation the fluid under pressure is admitted through the port 53, its flow being governed by a valve 80 under the control of a hand wheel 81 and the fluid being exhausted after operating upon the piston blades through the channel or passage 82.

In Figs. 6 and 7, which represent modifications of a form of fluid operated motor, the piston blades are held apart by a pressure of fluid entering through a pipe 83 which communicates with the main supply, and the wedge adjustment may in this event be dispensed with.

It will, of course, be understood that various modifications of my invention may be employed, such for instance as the reversal of the position of the cylinder and its plunger, the plunger being carried by the frame 1 and the cylinder forming part of or carried by the motor frame and many different modifications may be made in the character of the motive power employed and the exact construction of fluid motor herein described.

The tool forming the subject of this invention is applicable to many purposes, such for instance as the drilling of solid matters, reaming, or counter-sinking holes, milling off rivet heads, die sinking and routing machines, the cleansing of boiler flues or tubes, the polishing of small articles or the interior of tubes or pipes, the screwing or unscrewing of bolts or screws in boilers or wherever a large number of bolts are employed for drilling for coal or stone, or similar purposes, &c.

Having thus described my invention, I claim, and desire to secure by Letters Patent—

1. The combination of a rotated motor, a casing within which said motor is contained, a tool shank operatively connected to and ro-

tated by said motor, and a fluid pressure cylinder adapted to continuously feed the motor and tool toward the work, substantially as specified.

2. The combination of a rotated motor, the casing within which said motor is contained, a tool shank operatively connected to and rotated by said motor, and a fluid pressure cylinder adapted to advance and retract both the motor and tool toward and from the work, substantially as specified.

3. The combination of a supporting and guiding frame, a motor casing guided by the frame, a motor contained within said casing, a tool shank operatively connected to and rotated by said motor, a cylinder, as 50, carried by the frame, and a piston connected to the motor casing and adapted to be traveled within said cylinder, substantially as specified.

4. The combination of a casing, a fluid motor contained therein, a tool shank operatively connected to and rotated by said motor, a pressure cylinder, a piston within said pressure cylinder, a piston rod connecting the piston to said casing, communicating fluid passages in the piston rod and in the casing, controlling valves, a fluid supply, as 53, and an exhaust, as 82, substantially as specified.

5. The combination with a rotated tool of a feeding device for advancing and retracting said tool, said feeding device comprising a pressure cylinder, as 50, a piston within said cylinder, a piston rod, as 48, forming communication between the piston and the tool, fluid passages in said rod and communicating with a chamber, as 55, supply and escape passages also communicating with said chamber and a controlling valve in said chamber, substantially as specified.

6. The combination of a rotated motor, a casing within which said motor is contained, a tool mandrel operatively connected to and rotated by said motor, and an axis for said tool mandrel secured to or forming part of said motor casing, substantially as specified.

7. The combination of a rotated motor, a casing within which said motor is contained, a tool mandrel, a cup-like body, as 25, secured to or forming part of said tool mandrel, gear teeth on said cup-like body, and a pinion rotated by said motor and meshing with the gear teeth on said cup like body, substantially as specified.

8. The combination of a rotated motor, a casing within which said motor is contained, an axis, as 26, secured to or formed integral with the casing, a hollow body, as 25, mounted on said axis, a tool shank secured to said hollow body, gear teeth on said hollow body, and a pinion rotated by the motor and meshing with said gear teeth, substantially as specified.

9. The combination of a motor, a pinion rotated by said motor, a casing within which said motor is contained, an axis, as 26, secured to or formed integral with said casing, a loose sleeve, as 30, surrounding said axis, a hollow body, as 25, partly surrounding the motor casing, and secured to said sleeve 30, a tool shank secured to said hollow body, and gear teeth on said hollow body meshing with the teeth of the said pinion, substantially as specified.

10. The combination in a rotated tool, a plunger, a frame by which said plunger is carried, fluid passages in the piston of said plunger, a valve for controlling the same and a fixed cylinder inclosing said plunger, substantially as specified.

11. The combination of the frame 1, a supporting arm 2, therefor, a worm wheel carried by said frame 1, and a worm carried by said arm 2, and meshing with said worm wheel, substantially as specified.

12. The combination of the frame 1, the arm 2, having an undercut circular slot, a series of bolts projecting from the frame 1 and adapted to said slot, a worm wheel carried by said frame and a worm carried by the arm 2 and engaging with said worm wheel, substantially as specified.

13. The combination of the frame 1, the longitudinally adjustable arm 2, the vertical arm, and a clamping foot in which said vertical arm is swiveled, with devices for securing the said vertical arm in said clamping foot, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK H. CATHCART.

Witnesses:
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CHAS. H. HAESELER.