(No Model.)

H. H. WILDERMAN.

DRILLING MACHINE.

No. 484,270. Patented Oct. 11, 1892.

Fig: 2.

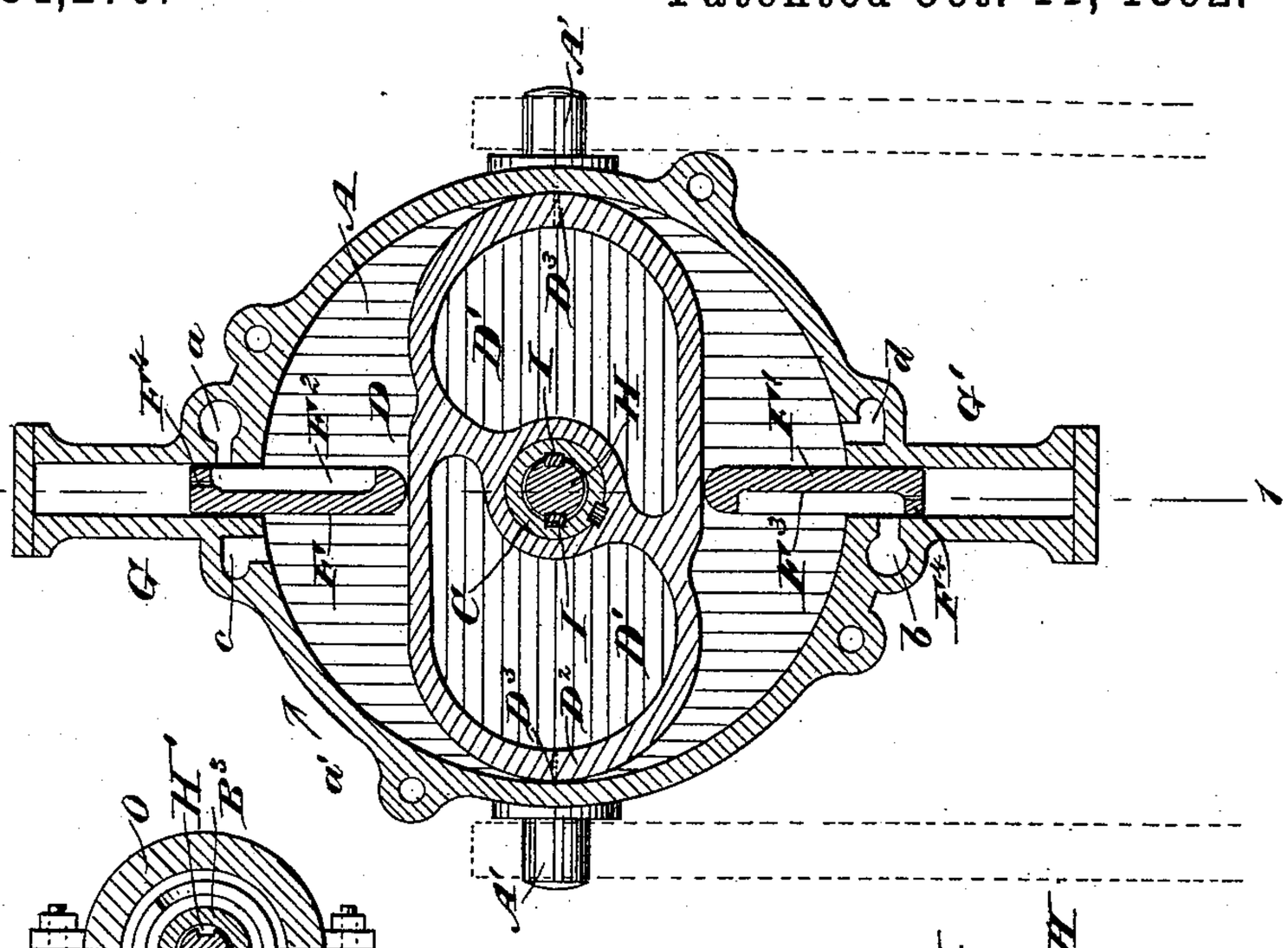


Fig: 4.

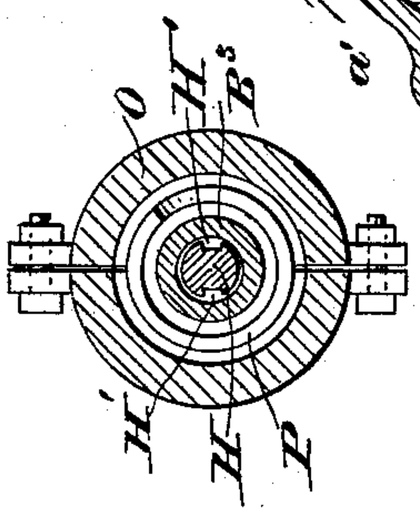


Fig: 3.

Fig: 5.

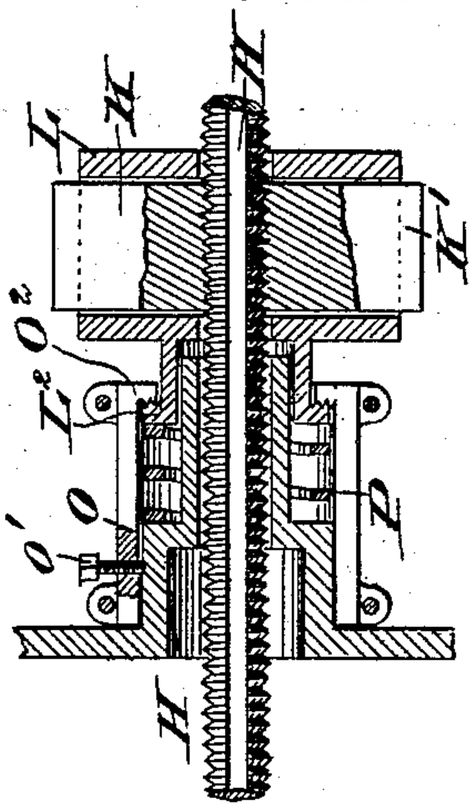
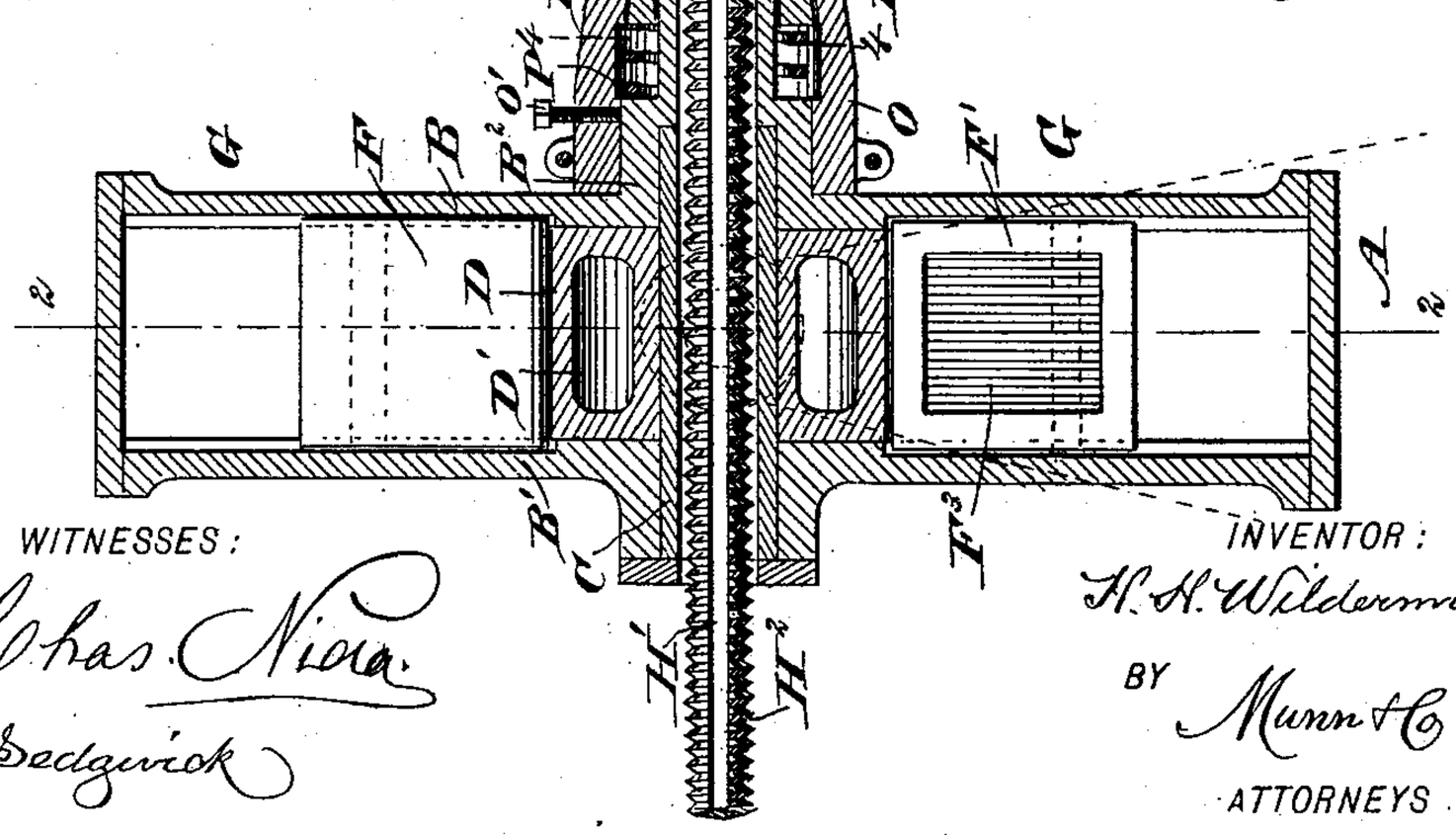


Fig: 1.



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HUGH HARRISON WILDERMAN, OF BELLEVILLE, ILLINOIS.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 484,270, dated October 11, 1892.

Application filed November 20, 1891. Serial No. 412,505. (No model.)

To all whom it may concern:

Be it known that I, HUGH HARRISON WILDERMAN, of Belleville, in the county of St. Clair and State of Illinois, have invented a new and Improved Drilling-Machine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved drilling-machine which is simple and durable in construction, very effective in operation, and more especially designed for drilling coal, rocks, &c.

The invention consists of a rotary engine arranged centrally on the drilling-shaft for turning and feeding the same.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement on the line 1 1 of Fig. 2. Fig. 2 is a transverse section of the same on the line 2 2 of Fig. 1. Fig. 3 is a transverse section of part of the feed mechanism on the line 3 3 of Fig. 1. Fig. 4 is a like view of another part of the same on the line 4 4 of Fig. 1, and Fig. 5 is a sectional side elevation of a modified form of part of the feed mechanism.

The improved drilling-machine is provided with a rotary engine having a cylinder A, formed with two heads B and B′, in which is journaled centrally a hollow shaft C, on which is fastened within the cylinder A a piston D, made in oval shape, as is plainly shown in Fig. 2, the outer ends extending close to the inner surface of the rim of the cylinder A. The piston D is provided with two cavities D′, and the outer walls D^2 are made sufficiently heavy to counterbalance the piston, so as to prevent uneven wear of the shaft C in its bearings in the heads B B′. In the walls D^2 are formed apertures D^3 for permitting oil or other lubricant to pass from the cavities D′ through the said apertures into the cylinder A to lubricate the piston in the said cylinder. The cavities D′ are filled with the lubricant, and the latter on the rotation of the piston is forced out by centrifugal force through the openings D^3, thus lubricating the cylinder at the time the machine is running.

The rim of the piston D is engaged at diametrically-opposite sides by abutments F and F′, mounted to slide radially in casings G and G′, respectively, secured or formed on the cylinder A, as is plainly shown in Fig. 2. The abutments F and F′ are provided on opposite faces with cavities F^2 and F^3, respectively, connecting with the inlet-ports *a* and *b*, formed in the rim of the cylinder A and connected with a suitable source of motive-agent supply. Opposite the ports *a b* on the other sides of the abutments F and F′, respectively, are formed exhaust-ports *c* and *d*, respectively, opening into the interior of the cylinder A and connected with a suitable exhaust-pipe. In the ends of the abutments F and F′ are formed openings F^4, leading from the respective cavities F^2 and F^3 into the casings G and G′, so that the motive agent can pass through the openings F^4 into the casings to force the abutments in contact with the rim of the piston D, and also to form a cushion in the said casings for the abutments to prevent concussion when the latter move into an outermost position. It will be seen that by this arrangement the motive agent operating the ports *a* and *b* passes into the cylinder A at opposite sides of the said abutments, thus pressing on both ends of the piston D, thereby turning the same in the direction of the arrow *a*′, and consequently imparting a rotary motion to the shaft C. The motive agent in the rear of the abutments F and F′ exhausts through the ports *c* and *d* as soon as the respective end of the piston D has passed the said exhaust-port and the next following abutment.

The drill-shaft H is mounted to slide in and to turn with the hollow shaft C, through which it passes centrally, as is plainly shown in Figs. 1 and 2. The drill-shaft H is provided at opposite sides with longitudinally-extending grooves H′, engaged by keys I, held in the hollow shaft C, so that when the latter is rotated a rotary motion is imparted to the shaft H, which latter, however, is free to slide in the shaft C in either direction.

The forward end of the shaft H carries the usual drilling-tool J, and is provided with a

screw-thread H^2, engaged by half-nuts K and K′, mounted to slide in a casing L, formed at its under side with a conical hub L′, fitted into a correspondingly-shaped sleeve O, made in two parts and secured by a set-screw O′, or other means, on the hub B^2, formed on the head B of the cylinder A. The bore of the conical hub L′ is fitted on the reduced end B^3 of the hub B^2, sufficient space being left between the lower end of the conical hub L′ and the hub B^2 for a coiled spring P, resting with one end on the back end of the said conical hub L′ and the forward end of the hub B^2. The outer ends of the half-nuts K and K′ are connected with a screw-rod N, carrying a right and left thread and mounted to turn in the casing L and serving to move the said half-nuts into or out of contact with the screw-thread H^2 of the drill-shaft H. On moving the half-nuts K and K′ outward out of engagement with the screw-thread H^2 then the drill-shaft H can be moved outward in the hollow shaft C and the reduced end B^3 of the head B until the said drill-shaft is in an uppermost position. The half-nuts K and K′ are then again moved inward toward each other, so that the inner ends engage the thread H^2, and feeding of the drill-shaft may be begun as soon as the said shaft is rotated.

On the rim of the cylinder A are cast or formed trunnions A′, for conveniently supporting the machine in a suitable framework or post of any approved construction.

The operation is as follows: When the several parts are in the position illustrated in Figs. 1 and 2, and a motive agent is passed through the ports *a* and *b*, then the piston D is turned in the cylinder A, thereby imparting a rotary motion to the shaft C, which latter, by the keys I, rotates the drill-shaft H. The rotary motion of the latter causes a feeding of the same by its thread H^2, engaging the half-nuts K and K′, so that the shaft H is fed outward. The drilling-tool J thus drills an aperture in the material, the revolving of the drill-shaft and the forward feed being accomplished from the rotary engine A, which carries the said shaft. It will be seen that the shaft H receives a positive feed from the rotary engine A and the half-nuts K and K′, according to the number of threads to the inch which are formed on the shaft H. In drilling coal and similar material, nine or ten threads are arranged to the inch on the shaft H, so that nine or ten revolutions of the piston D feed the drilling-tool J the distance of about one inch. By varying the pitch of the thread H^2, the feed will be increased or diminished, it being assumed that the number of revolutions of the piston D in the cylinder A remains the same. Now in case the drilling-tool J should strike a hard substance in the bed which it is drilling, then the drilling-tool cannot cut as fast, as the feed-bar would be fed foward positively in the manner above described, and in order to overcome this difficulty the spring P is introduced, pressing on the back end of the conical hub L′ of the casing L. It will be seen that when the drilling-tool J strikes the harder substance and cannot cut as fast as it is fed out, then the extra pressure caused by the difference of the rate of feed and the cut of the drill will cause the hub L′ of the casing L to push backward on the spring P, so that the latter is compressed and at the same time the hub L′ is free to revolve in the sleeve O. A forward movement of the shaft H does not then take place except by the pressure of the coil-spring P. It will be seen that the casing L, the nuts K K′, and the shaft H all rotate together, and the feeding will all be done by the spring P until the drilling-tool J has cut far enough ahead to let the spring P push the conical hub L′ back again upon its seat in the casing, so that the feed will again commence from the half-nuts K and K′. In case the substance is not very hard, then the feed will be caused partly by the nuts K and K′ and partly by the frictional contact of the spring P, the hub L′, and sleeve O in the manner above described. The advantage of this feed mechanism is that it stops all crowding of the machine automatically and prevents the latter from choking down in very hard material or breaking the drilling-tool J and the parts connected with it, and at the same time the feed of the drill varies automatically, according to the hardness of the substance to be drilled.

I do not limit myself to the special construction of the spring P, the casing L, and sleeve O, as other suitable mechanism may be substituted to accomplish the same purpose. For instance, as shown in Fig. 5, the hub L is cylindrical and formed at its inner end with a flange L^2, having friction or clutch teeth engaging corresponding teeth formed on a flange O^2 of the sleeve O. The spring P presses on the flange L^2 to hold the clutch-teeth in engagement or frictional contact, and the action is the same as above described in reference to the conical hub L′ and sleeve O.

It will be seen that in this machine the shaft H is actuated directly from the piston of the engine, so that no loss of power takes place and no additional gearing or other means is necessary to transmit the power of the engine to the shaft.

As the piston D is balanced both as to weight and the pressure of the motive agent, all wear and friction from centrifugal force is avoided and complete steadiness while running the machine is obtained. As the piston is arranged with a constant supply of lubricant, the latter is distributed to the cylinder, the valves, and other parts, so that hot bearings and the like are prevented.

I do not claim in this application the special construction of the rotary engine.

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

1. In a drilling-machine, the combination, with a longitudinally-yielding drill-shaft, of

a rotary engine arranged centrally on the said drill-shaft for turning and feeding the same, substantially as shown and described.

2. In a drilling-machine, the combination, with a drill-shaft formed with a screw-thread, of a yielding nut engaging the said thread on the drill-shaft to permit the shaft to yield longitudinally, and a rotary engine held centrally on the said shaft and imparting a rotary motion to the same, substantially as shown and described.

3. In a drilling-machine, the combination, with a rotary engine provided with a cylinder and a hollow shaft, and a piston secured on the said shaft and operating in the said cylinder, of a drill-shaft mounted to slide in and to turn with the said hollow shaft, the said drill-shaft being provided with a screw-thread and laterally-movable nuts supported yieldingly from the said cylinder and engaging the said screw-thread on the drill-shaft to feed the screws and permit it to yield longitudinally, substantially as shown and described.

4. In a drilling-machine, the combination, with a drill-shaft having a positive rotary motion and provided with a screw-thread, of a nut engaging the said screw-thread, and a casing containing the said nut and mounted to slide yieldingly, substantially as shown and described.

5. In a drilling-machine, the combination, with a drill-shaft having a rotary motion and provided with a screw-thread, of a nut engaging the said screw-thread, a casing containing the said nut and formed with a conical hub, a sleeve formed with a conical seat for the said hub, and a spring pressing on the said conical hub, substantially as shown and described.

6. In a drilling-machine, the combination, with a drill-shaft having a rotary motion and provided with a screw-thread, of a nut engaging the said screw-thread, a casing containing the said nut and formed with a conical hub, a sleeve formed with a conical seat for the said hub, a spring pressing on the said conical hub, and a rotary engine supporting on its cylinder the said sleeve and imparting a positive rotary motion to the said shaft, substantially as shown and described.

HUGH HARRISON WILDERMAN.

Witnesses:
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JOHN C. BORN.