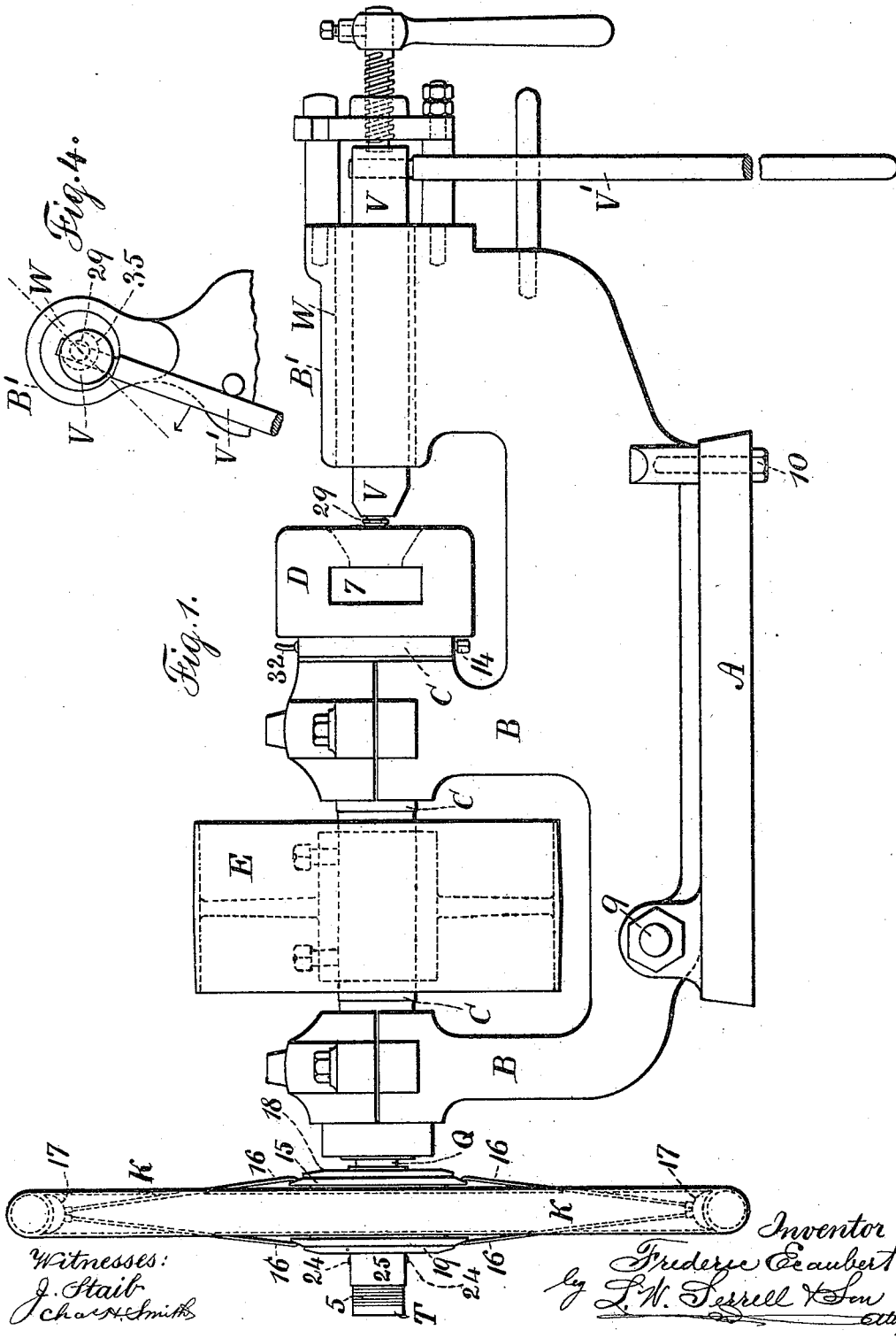


F. ECAUBERT.
HYDRAULIC HOLDER FOR ROTATING DIES.

(Application filed Apr. 4, 1898.)

(No Model.)

2 Sheets—Sheet I.



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2 Sheets—Sheet 2.

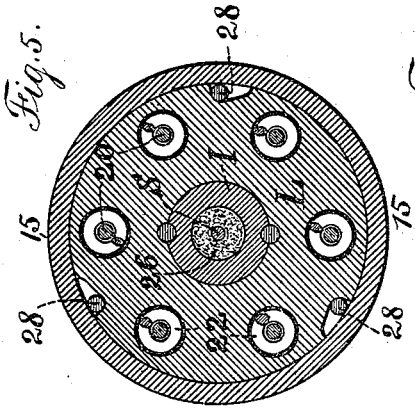


Fig. 5.

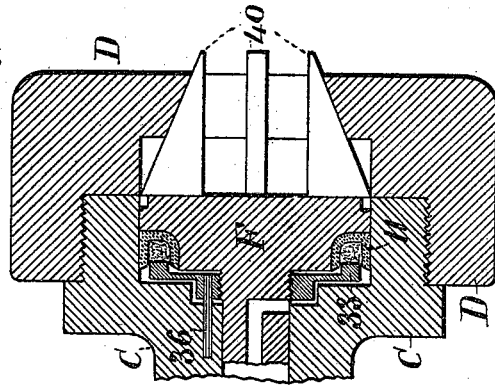


Fig. 6.

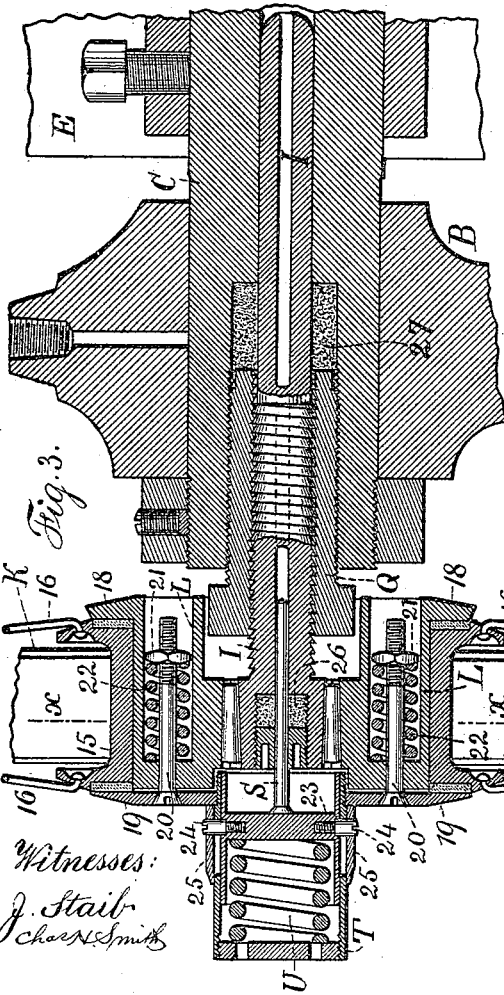


Fig. 3.

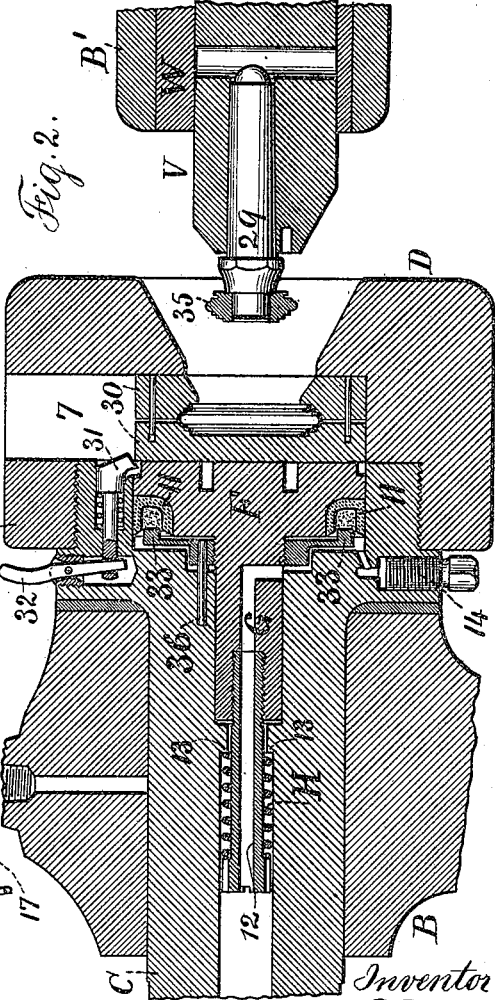


Fig. 2.

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UNITED STATES PATENT OFFICE.

FREDERIC ECAUBERT, OF NEW YORK, N. Y.

HYDRAULIC HOLDER FOR ROTATING DIES.

SPECIFICATION forming part of Letters Patent No. 618,651, dated January 31, 1899.

Application filed April 4, 1898. Serial No. 676,319. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC ECAUBERT, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented an Improvement in Hydraulic Holders for Rotating Dies, of which the following is a specification.

Dies have been constructed in which hydraulic pressure is used to force one die toward another, and in some instances articles have been held between clamps actuated by hydraulic pressure while tools have been applied to the article held. In the present instance hydraulic force is applied through a tubular mandrel or spindle to act upon dies to hold the same in the proper position and any article placed between them while such dies are being rotated in a lathe or similar mechanism during the time that the article held by the dies is being acted upon.

This device is especially intended for holding together the dies made use of in the manufacture of watchcase centers, lids, and other parts, the dies being of a size and shape adapted to receive and hold the part of the watchcase while being acted upon by a roller or other device that is pressed against the rotating watchcase-center or similar part while held between the dies.

In the present machine the dies that are employed to give shape to the watchcase or other article are received into a die-chuck that is mounted upon the end of a revolving mandrel, and this mandrel is tubular and at the end thereof is a cylindrical recess receiving a ram, the stem of which passes into the tubular mandrel, and around such stem is a spring acting to draw back the ram when not otherwise acted upon, and at the back end of the mandrel a screw is fitted that is actuated by a hand-wheel and serves to apply through the oil or other liquid the necessary force to act upon the ram and cause the same to hold the dies tightly together and within the die-chuck, and a hand-wheel approximately similar to a cycle-wheel is employed for giving motion to the screw-plunger or for holding such screw-plunger stationary while the mandrel revolves. In this way the dies can be held in a rigid and reliable manner while being revolved and a roller or other tool is brought to act upon the watchcase-center or other

article within the dies and expand the same, so that the watchcase is caused to fill in all the recesses or other shapes on the inside of the die and that the article produced is the counterpart of the interior configuration of the dies that are held as aforesaid, and I provide a gage by which the pressure that is exerted upon the ram can be easily observed, and which pressure exerts the proper force to hold the dies rigidly and in the proper relative position, but when the hand-wheel is turned back and the pressure in the hydraulic cylinder relieved the dies can be taken out very easily and quickly from the die holder or chuck.

In the drawings, Figure 1 is a side view of the mechanism complete. Fig. 2 is a section through the die-chuck and a portion of the mandrel. Fig. 3 is a similar view through the rear portion of the mandrel and the middle portion of the hand-wheel. Fig. 4 is a diagrammatic elevation of the puppet-head and parts carried by the same. Fig. 5 is a cross-section at $x x$, Fig. 3; and Fig. 6 is a diagrammatic section of a modified chuck.

A suitable bed or support is provided at A, and the lathe-stock B is supported by the bed A, and it is advantageous to cast upon the bed A ears for a pivot-bolt 9 to pass through and through the base of the lathe-stock, so that the lathe-stock and parts carried by it can be swung up or down, and at 10 screw-bolts are provided for bolting the lathe-stock to the support A and holding it firmly in position.

It is advantageous to connect the before-named parts by the pivot-bolt 9, so that the mandrel and parts connected therewith can be swung up into an inclined position for receiving into the hydraulic cylinder oil or other liquid material for actuating the ram and holding the dies, as hereinafter set forth.

The mandrel C is supported in the bearings upon the lathe-stock, as usual, and this mandrel has around it a pulley E, by which it is rotated at the proper speed, and upon the end of the mandrel the die-chuck D is to be screwed, and such die-chuck is to hold the dies employed in making watchcases or any other article by a rotary movement, and this die-chuck is changeable, so that the dies carried thereby can be of any desired character,

according to the article to be manufactured, and it is advantageous to make in one side of the die-chuck a mortise at 7, so that the dies can be slipped in through this mortise, and then hydraulic pressure is to be applied to hold the dies together, and when the work is done and the hydraulic pressure relieved the dies can fall out through the mortise 7 into the hand of the attendant when the die-chuck is in the proper position for so doing.

At the end of the mandrel C a cylindrical recess is formed for the reception of the hydraulic ram F, around which is an annular hydraulic packing 11, and the mandrel C is hollow and opens up into the cylinder containing the ram, so that the oil or other liquid under pressure can be made to act upon the ram F with the force required for holding the dies together during the spinning or other operations performed within such dies.

In order to guide the ram F, there is a stem G extending out from the center of the hydraulic ram and passing back into the tubular mandrel C, and a screw 12 is screwed into the end of the stem G and has around it a spring H, acting against a shoulder 13 in the tubular mandrel, so that this spring H draws back the ram F when the pressure is relieved, and it is generally advantageous to make the stem G and screw 12 tubular, with a lateral opening in the stem for the liquid under pressure to pass into the cylinder containing the ram F and act upon the dies by the hydraulic pressure that is exerted against the ram.

I remark that the hydraulic packing 11 may be of any desired character, usually leather is preferable, and in the form of a hollow ring, and I provide a screw-threaded recess and a plug 14 near the flange or collar of the mandrel, by the removal of which oil or other liquid can be inserted into the hydraulic cylinder and tubes leading to the same, as may be necessary from time to time to compensate for leakage, and in order to facilitate the escape of air or bubbles from the tubular mandrel it is generally advantageous to tip the lathe-stock upon the pivot-bolt 9 so as to bring the mandrel into an inclined position and cause the bubbles of air or gas to escape from the tubular mandrel.

At the rear end of the apparatus is a hand-wheel K with a hub L, and a screw-plunger I is connected with this hub, and the screw-plunger is made liquid-tight in the tubular mandrel in order that the screw-plunger may exert a powerful influence through the liquid in the tubular mandrel and upon the ram F to close the watchcase or other dies and hold them firmly while a bezel, back, or other article is being made within such dies.

I find it generally advantageous to use a screw-bushing Q in the rear end of the mandrel C and set the same up tightly against elastic packing at 27, and this bushing may be removed if the internal screw and its thread have worn loose. The hub L may be sufficiently recessed for the head of the screw.

The head of the screw-plunger I is received and secured into the central opening in the hub L, and around this hub is received the short cylinder 15, to which the wheel-spokes 16 are connected, the other ends of such wheel-spokes 16 passing into the felly 17 of the hand-wheel K, which hand-wheel is advantageously made with an inflated rubber tire similar to the tire of a cycle-wheel, and the rings 18 and 19 are at the ends of the wheel-cylinder 15, there being leather, cork, or other material in the annular recesses of the cylinder 15, and the bolts 20 act upon nuts 21, and springs 22 surround the bolts 20 and are compressed by the nuts, so that the springs 22 will apply the proper pressure by the rings 18 and 19 at the ends of the cylinder 15, so that ordinarily the friction devices at the hub of the hand-wheel K will hold the screw-plunger I stationary while the necessary hydraulic power is obtained by the rotation of the mandrel for forcing the ram against the dies and holding them firmly, and when the friction is insufficient the necessary holding power will have been obtained; but it is usually advantageous to be able to gage the pressure exerted within the hydraulic portion of the apparatus, and when that pressure has been obtained the operator can let go the hand-wheel K, and thereafter the hand-wheel revolves with the spindle during the spinning or other operations that are performed in the dies that are within the die-block.

By making the screw-plunger I hollow and fitting therein a pressure-plug S an indication can be obtained of the pressure exerted in the hydraulic portion of the apparatus, such plug S acting against a head 23 within the cylinder T, which contains a spring U, that is compressed by the action of the head 23, and this head 23 is connected by screws 24 passing through slots in the cylinder and connecting to the head 23 the cylindrical collar 25, which surrounds the cylinder T, and upon the surface of this cylinder T divisions are made to indicate pressure per square inch or other measure, it being understood that as the pressure acting upon the plug S increases such plug will move the head 23 and compress this spring U more or less, and by this means the pressure which may be necessary is readily indicated.

I remark that the packing 26 around the plug S prevents leakage at this point, and the packing at 27 is compressed by the screw-bushing Q around the plunger to prevent the escape of any oil around the screw-plunger.

It is preferable to make the divisions around the cylinder T of the spring-gage peripheral and parallel, so that the pressure is easily observed by the attendant, according to the position of the cylindrical collar upon the surface of the cylinder T.

A clutch mechanism is applied between the hub L and the cylinder 15 of the hand-wheel, and this clutch mechanism is advantageously constructed of small rollers 28 within notches

in the periphery of the hub L and parallel with the axis, the notches having inclined surfaces, so that in one direction the clutch-rollers will bind against the interior of the cylinder 15, and they will disconnect or release in the opposite direction, and the position of the parts is to be such that the clutch mechanism will come into action to positively connect the hub and the hand-wheel when the mandrel is stationary and the hand-wheel is being turned back to unscrew the ram and relieve the hydraulic pressure upon the dies.

The friction between the hub and the cylinder 15 of the hand-wheel regulates the force with which the screw-plunger is set up, and hence the hydraulic pressure by which the dies are held, and by the bolts 20, nuts 21, and springs 22 the friction that is exerted between the rings 18 and 19 and the ends of the cylinder 15 can be regulated with accuracy. Hence there is not any risk of too much hydraulic pressure being obtained by a careless workman holding the hand-wheel too long while the mandrel is being revolved by the power, because the friction will allow the hub and screw-plunger to revolve along with the mandrel, while the hand-wheel may be held stationary, and as an additional precaution against injury I use the spring-gage as a means for lessening or relieving the friction between the cylinder of the hand-wheel and the hub L, because it will be apparent that in consequence of the cylinder T, that carries the spring U of the gage, being connected to the ring 19, through which the bolts 20 pass, the pressure-plug S, acting through the head 23 and spring U, tends to force the cylinder T and the ring 19 away from the cylinder 15, and thereby relieves the friction of the ring 19 upon the cylinder 15 of the hand-wheel. In other words, the pressure exerted by the plug S against the spring of the gage is resisted by the springs 22, and these springs 22 yield under the action of the hydraulic pressure upon the plug and such springs 22 are compressed and their force in producing friction upon the ends of the cylinder 15 is lessened.

By the foregoing construction the parts can be so adjusted that the attendant is constantly able to inspect the pressure in the hydraulic clamping device, and by the automatic action of the parts he is enabled to know when the proper extent of pressure has been applied to hold the dies, and instantly he can let go of the hand-wheel and attend to the spinning up of the article that is held within the dies, as hereinafter described.

I remark that a lever or handle may project from the cylinder 15 instead of the hand-wheel K, with a rim extending around such cylinder; but as such lever would revolve with the mandrel it could not be as easily manipulated as a wheel with an elastic tire against which the hand can be applied.

Upon reference to my Patent No. 253,355 it will be seen that two-part dies are made use

of for holding a blank for a watchcase-center, and a roller peripherally grooved is used to expand the watchcase-center and shape the same within the dies, and this roller is supported by an eccentric arbor. I have shown this eccentric arbor at V, having a pin 29 for receiving the roller in the spinning operation, and the dies made use of are circular and are represented at 30, and the mortise 7 is sufficiently large for these dies to be slipped into the chuck with facility and to assume a central position, and it is advantageous to bore out the chuck in the central portion of the proper size to receive these dies and to cut the mortise laterally through one side of the chuck, with the edges of the mortise as parallel tangential lines to the circular recess that receives the dies; but any desired character of chuck may be made use of so long as the dies when inserted are properly supported so as to be concentric and in the proper position for the ram to act against the dies in holding them tightly together, and to prevent the dies dropping out or being thrown off centrifugally before the ram comes into action to hold them firmly a spring-latch 31 is made use of, such latch having a beveled end, so that the dies press the latch back as they are forced into position, and the latch springs over the edge of the dies to hold them in position after they have been inserted, and the handle 32, which is preferably in the form of a lever, as shown, is employed for drawing back the latch and allowing the dies to drop out when an operation has been completed, and it is advantageous to introduce the spring-latch into the end of the mandrel, so that the chuck D can be screwed upon the end of the mandrel or removed therefrom in order that the proper chuck may be connected to the mandrel, according to the dies that are to be made use of within such chuck.

I remark that it is generally advantageous to employ a disk 33 closely adjacent to the ram F and with its edges in contact with the hydraulic packing and to fill the packing with fiber, such as hemp, so that such packing will be retained in a fixed position and moved backward and forward with the ram in its clamping and relieving operations.

The eccentric arbor V is provided with a lever V', by which it is slid backward and forward within the portion B' of the lathe-stock, and this lever also is employed for turning the arbor and bringing the roller which is upon the eccentric-pin of the arbor into action within the watchcase center, lid, or other article that is being spun up in the dies.

The dies can be taken out laterally, opened, and the article that has been formed within the same removed, another blank put in position within the dies, and the dies returned into the chuck and the ram brought into action to hold the dies forcibly together and within the chuck for the spinning operations to be repeated.

It will be observed by the diagram Fig. 4 that the roller 35, that is made use of in spinning up the watchcase-center or other article, is axially in line with the mandrel when the lever V' is depressed and in the position of inaction; hence that the roller 35 can be moved into the dies by the end motion given to the eccentric arbor V, and that when the roller 35 is raised and the arbor V turned the roller 35 will be moved downward, so as to apply pressure to the interior of the watchcase-center perpendicularly below the axis of the mandrel, or nearly so. Hence the resistance or holding force exerted by the stock B' is in a vertical plane, or nearly so, and there is less tendency to spring the stock B' in this vertical plane than there would be if the roller 35 engaged the interior of the watchcase-center at a point nearly level with the axis of the mandrel, and in consequence of using a cylindrical arbor-stock W around the eccentric arbor V, such arbor-stock having an eccentric hole through it for the arbor V, I am enabled to bore out the lathe-stock B' axially in line with the mandrel, thereby insuring great accuracy in the parts B and B' of the lathe-stock.

It will be apparent that the present invention is available for holding tools in a revolving spindle or mandrel, as well as for holding dies within a die-holder or chuck, and that the hydraulic ram may be made to actuate the claws or clamping devices in lathe-chucks, and in Fig. 6 I have illustrated such a device by a diagram representing the clamping devices 40 as acted upon by the hydraulic ram F. This device, however, is simply illustrative of any character of holding or clamping device upon the spindle or mandrel that is rotated and to which any device is to be clamped or held by the hydraulic ram while being revolved.

In consequence of the spindle or mandrel being revolved and the plunger being screwed up by holding the hand-wheel the hydraulic pressure can be maintained by a friction upon the hand-wheel, and this is of importance, because if the article that has been grasped should become loose it is not necessary to stop the rotating spindle or mandrel to tighten the hold upon the same, because the friction of the hand upon the hand-wheel will effect the necessary turning of the screw-plunger in its relation to the mandrel or spindle for setting up the hydraulic ram and the necessary holding force can readily be secured, because the power exerted with a given pressure or friction upon the hand-wheel or its equivalent will produce more or less hydraulic pressure according to the pitch of the screw upon the plunger and the diameter of the plunger itself.

The disk 33 is prevented from turning by a pin 36, going into the bottom of the hydraulic cylinder; but the ram and its stem can be rotated by any suitable wrench. Hence

the disk can be screwed up to tighten the hydraulic packing.

I claim as my invention—

1. The combination with a revoluble mandrel or spindle and a die-holder or chuck, of a ram adapted to act upon the dies, while being revolved, and a tubular connection through the spindle to a source of fluid-pressure for acting upon the ram, substantially as set forth.

2. The combination with the revoluble spindle and die or holding chuck, of a ram within the chuck and adapted to act upon the die or other article, there being a cylinder for the ram and a tubular connection in the mandrel and a plunger and means for actuating the same to apply a fluid-pressure to the ram, substantially as set forth.

3. The combination with the revoluble spindle and chuck or holding device, of a ram within the chuck and adapted to act upon the chuck or article, there being a cylinder for the ram and a tubular connection in the mandrel and a screw-plunger and mechanism for revolving the screw-plunger in its relation to the mandrel and thereby applying a fluid-pressure to the ram, substantially as set forth.

4. The combination with the revoluble spindle and chuck, or holding device, of a ram within the chuck and adapted to act upon the chuck or article, there being a cylinder for the ram and a tubular connection in the mandrel and a screw-plunger and hand device for actuating the screw-plunger in relation to the mandrel, and a frictional connection between such hand-actuated device and the screw-plunger that allows the plunger to cease its action when a given fluid-pressure has been obtained, substantially as set forth.

5. The combination with the revoluble spindle and chuck or holding device, of a ram within the chuck and adapted to act upon the chuck or article, there being a cylinder for the ram and a tubular connection in the mandrel and a screw-plunger and hand device for actuating the screw-plunger in relation to the mandrel, and a frictional connection between such hand-actuated device and the screw-plunger that allows the plunger to cease its action when a given fluid-pressure has been obtained, a pressure-plug and a resisting-spring for the same acting to lessen the friction of the hand device as the fluid-pressure increases, substantially as set forth.

6. The combination with the revoluble mandrel or spindle and hydraulic mechanism for holding dies or other articles while revolved by the spindle, of a screw-plunger and mechanism acting upon the same to apply the fluid-pressure and a gage for indicating such fluid-pressure, substantially as set forth.

7. The combination with the revoluble spindle or mandrel and hydraulic holding mechanism connected to and revolving with such spindle, of a plunger within such spindle and mechanism for actuating the same, substantially as set forth.

8. The combination with the revoluble spindle or mandrel and hydraulic holding mechanism connected to and revolving with such spindle, of a plunger within such spindle and mechanism for actuating the same, and a gage for indicating the fluid-pressure, substantially as set forth.
9. The combination with the revoluble mandrel or spindle, of a die-holding chuck having a lateral mortise, a hydraulic ram within such chuck, and a tubular connection for applying a fluid-pressure to such ram, substantially as set forth.
10. The combination with the revoluble spindle or mandrel and a hydraulic ram thereupon, of a screw-plunger for applying a fluid-pressure to the ram, a hand-wheel and a frictional connection between the hand-wheel and the screw-plunger, substantially as set forth.
11. The combination with the revoluble spindle or mandrel and a hydraulic ram thereupon, of a screw-plunger for applying a fluid-pressure to the ram, a hand-wheel and a frictional connection between the hand-wheel and the screw-plunger, and a clutch acting in one direction to positively connect the hand-wheel and the screw-plunger, substantially as set forth.
12. The combination with the revoluble mandrel or spindle and the hydraulic ram mounted thereon, of a screw-plunger and tubular connections for applying a fluid-pressure to the ram, a hand-actuated device and frictional connection between the same and the screw, and a clutch mechanism acting in one direction only and a spring-gage for indicating the fluid-pressure, substantially as set forth.
13. The combination with the revoluble mandrel or spindle and the hydraulic ram mounted thereon, of a screw-plunger and tubular connections for applying a fluid-pressure to the ram, a hand-actuated device and frictional connection between the same and the screw, and a clutch mechanism acting in one direction only, and a spring-gage and a connection between the same and the frictional mechanism for lessening the friction as the fluid-pressure increases, substantially as set forth.
14. The combination with the revoluble spindle and hydraulic ram carried by the same, of mechanism for applying a fluid-pressure to the ram, a spring-gage for the same, having a cylinder with peripheral divisions to indicate the pressure, such cylinder being axially in line and rotating with the mandrel, substantially as set forth.
15. The combination with the rotating spindle or mandrel and the hydraulic ram carried by the same, of a screw-plunger for applying the fluid-pressure, a wheel and frictional connection between the same and the screw-plunger, an axial pressure-plug and a spring-gage moved by the pressure-plug for indicating the fluid-pressure, substantially as set forth.
16. In combination with a revolving hydraulic holding mechanism, a pressure-plug and spring-gage actuated by the pressure-plug, the spring-gage having a cylindrical surface with peripheral divisions, and a ring sliding upon such surface whereby the pressure can be easily observed while the gage is revolving with the mandrel, substantially as set forth.
17. The combination with the revolving spindle or mandrel and the hydraulic ram, carried thereby, of an axial screw-plunger, a hand-wheel connected with such screw-plunger and a pressure-gage having a cylinder with peripheral divisions and axially in line with the revolving mandrel, substantially as set forth.
18. The combination with the revolving spindle or mandrel and a hydraulic ram therewith connected, of an axial screw-plunger for applying the fluid-pressure, a hub connected to the plunger, a hand-wheel or its equivalent having a cylinder around the hub, friction-plates and springs within the hub for connecting the hand-actuated cylinder and the hub, and a clutch connection acting in one direction, substantially as set forth.
19. The combination with the revolving spindle or mandrel and a hydraulic ram therewith connected, of an axial screw-plunger for applying the fluid-pressure, a hub connected to the plunger, a hand-wheel or its equivalent having a cylinder around the hub, friction-plates and springs within the hub for connecting the hand-actuated cylinder and the hub, a spring-gage having an axial cylinder connected with one of the friction-plates and a pressure-plug for acting upon such gage, substantially as set forth.
20. The combination with the revoluble mandrel or spindle and the hydraulic ram therewith connected and mechanism for applying fluid-pressure, of an axial pressure-plug, a packing around the same, a disk against which the pressure-plug acts, a cylinder surrounding the disk, a spring within the cylinder and acting upon the disk, a ring around the cylinder and connections therefrom to the disk passing through slots in the cylinder, there being peripheral divisions upon the surface of the cylinder for indicating the pressure by the position of the ring, substantially as set forth.
21. The combination with the revoluble spindle or mandrel having a central opening or tube, and a hydraulic cylinder, of a ram within the cylinder, a stem to the ram and a spring acting upon the ram in the opposite direction to the fluid-pressure, substantially as set forth.
22. The combination with the revoluble mandrel, of a die-holding chuck having a lateral opening for the passage of the dies, and a spring-latch for holding the dies in position, substantially as set forth.
23. The combination with the revoluble mandrel having a hydraulic cylinder at one

end, of a ram within the cylinder, a die or tool holding chuck screwed upon the end of the mandrel and adapted to receive the dies or other tools and support the same while held
5 by fluid-pressure acting upon the ram, substantially as set forth.

24. The combination with a revoluble spindle or mandrel and the die-holding mechanism thereon, and the lathe-stock B B', of an
10 arbor-stock W passing through the lathe-stock B' and having an eccentric hole through the same, the eccentric arbor V passing through such hole and an actuating-lever for the same and the stud and roller 35 substantially in line with the mandrel of the lathe
15 when out of action, the roller acting in the lower part of the watchcase-center or similar article when the eccentric arbor is partially revolved, substantially as set forth.

25. The combination with the revoluble
20 arbor having a hydraulic cylinder and tubular connections, of a ram within such cylinder and a screw-plug for closing a supply-opening for oil or other material introduced
25 into the cylinder, substantially as set forth.

26. The combination with the revoluble arbor having a hydraulic cylinder and tubular connections, of a ram within such cylinder and a screw-plug for closing a supply-opening for oil or other material introduced into
30 the cylinder, a lathe-stock and pivotal support for the same that allows the mandrel to be inclined for the escape of bubbles of air or gas as the liquid may be introduced into the hydraulic cylinder, substantially as set
35 forth.

27. The combination with the revoluble spindle or mandrel and the hydraulic cylinder, of a ram in such cylinder adapted to apply pressure to the article to be rotated, a
40 screw-plunger and a wheel for the same, by which friction upon the wheel will apply a hydraulic pressure to the ram while the spindle is revolving, substantially as specified.

Signed by me this 2d day of April, 1898.

F. ECAUBERT.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.