No. 688,327. Patented Dec. 10, 1901.

G. J. O'DOHERTY.

NIPPLE THREADING MACHINE.

(Application filed Apr. 30, 1897.)

(No Model.) 4 Sheets—Sheet 1.

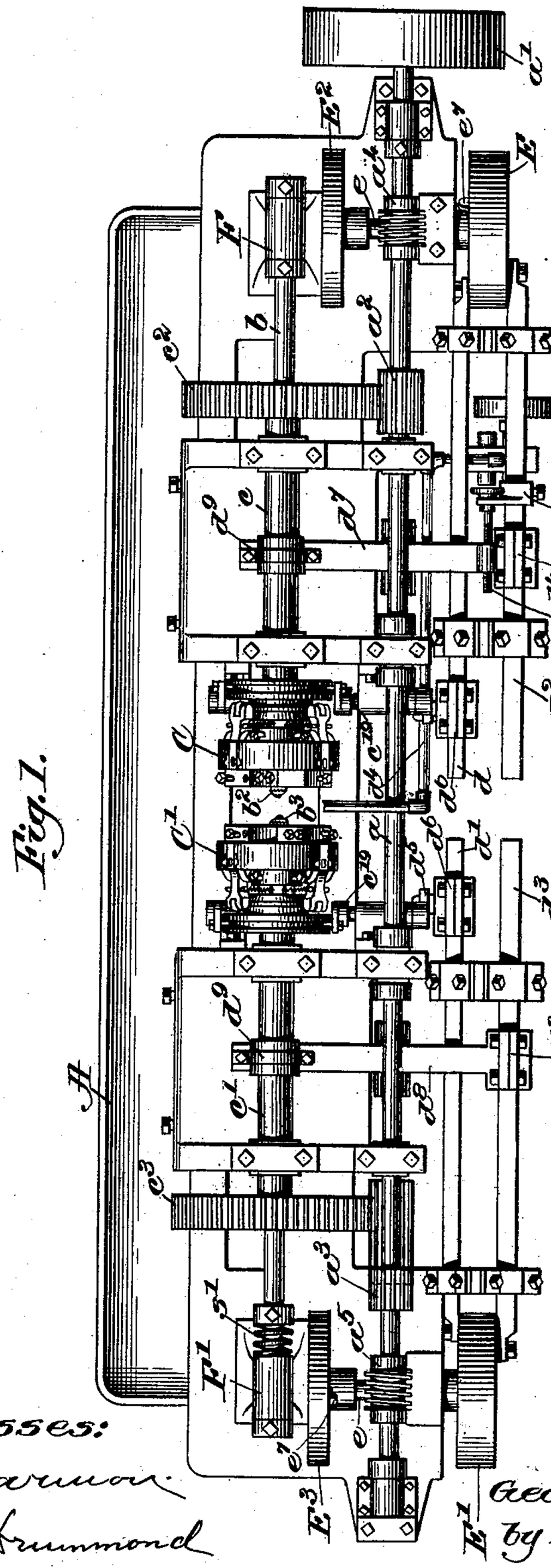

Fig. 1.

Fig. 2.

Fig. 3.

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NIPPLE THREADING MACHINE.

(Application filed Apr. 30, 1897.)

(No Model.) 4 Sheets—Sheet 2.

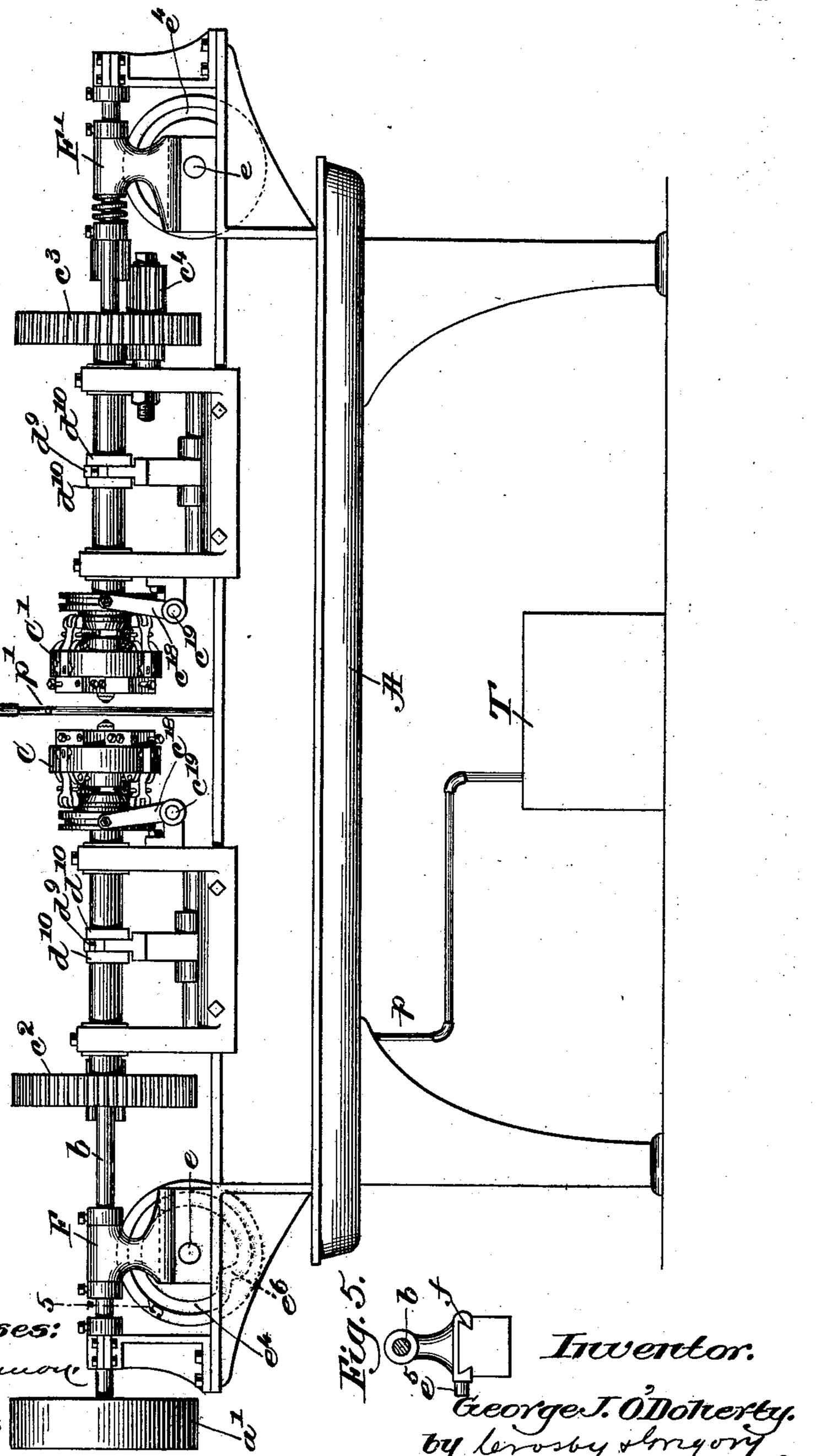

Fig. 4.

Fig. 5.

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NIPPLE THREADING MACHINE.

(Application filed Apr. 30, 1897.)

(No Model.) 4 Sheets—Sheet 3.

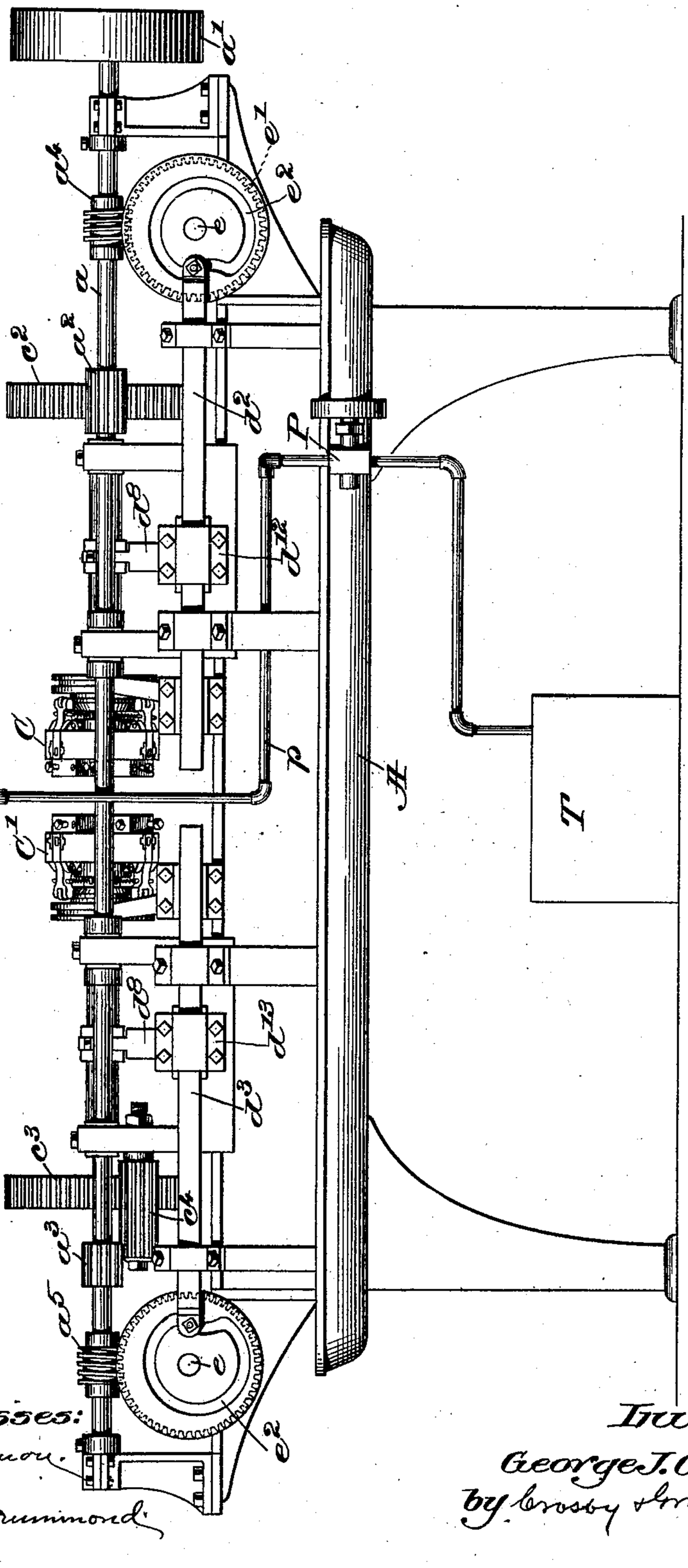

Fig. 6.

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NIPPLE THREADING MACHINE.

(Application filed Apr. 30, 1897.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 8.

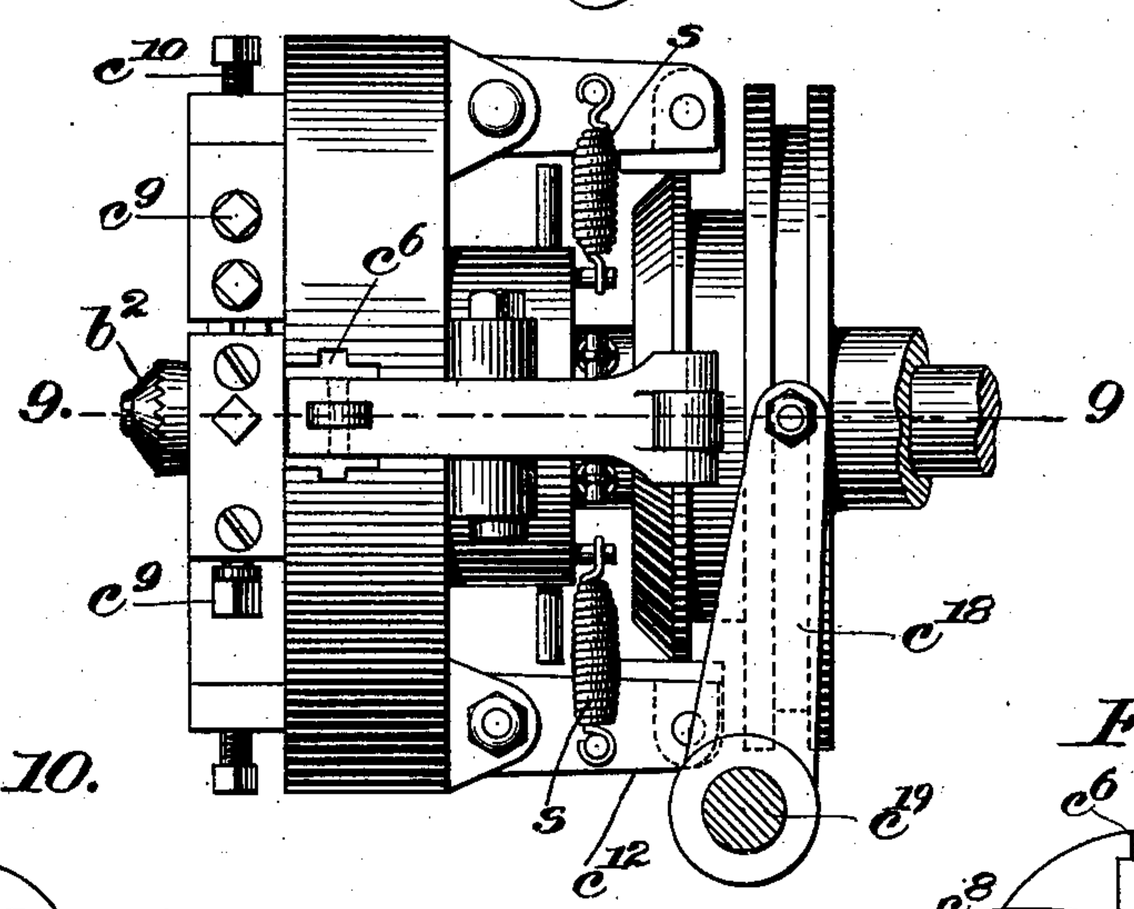


Fig. 10.

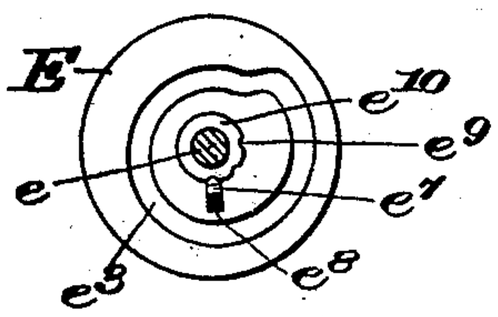


Fig. 7.

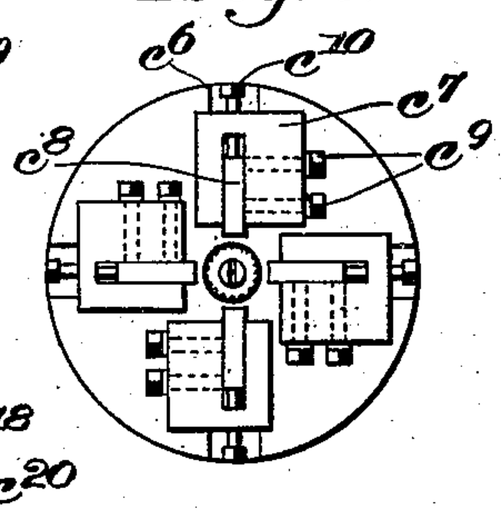


Fig. 9.

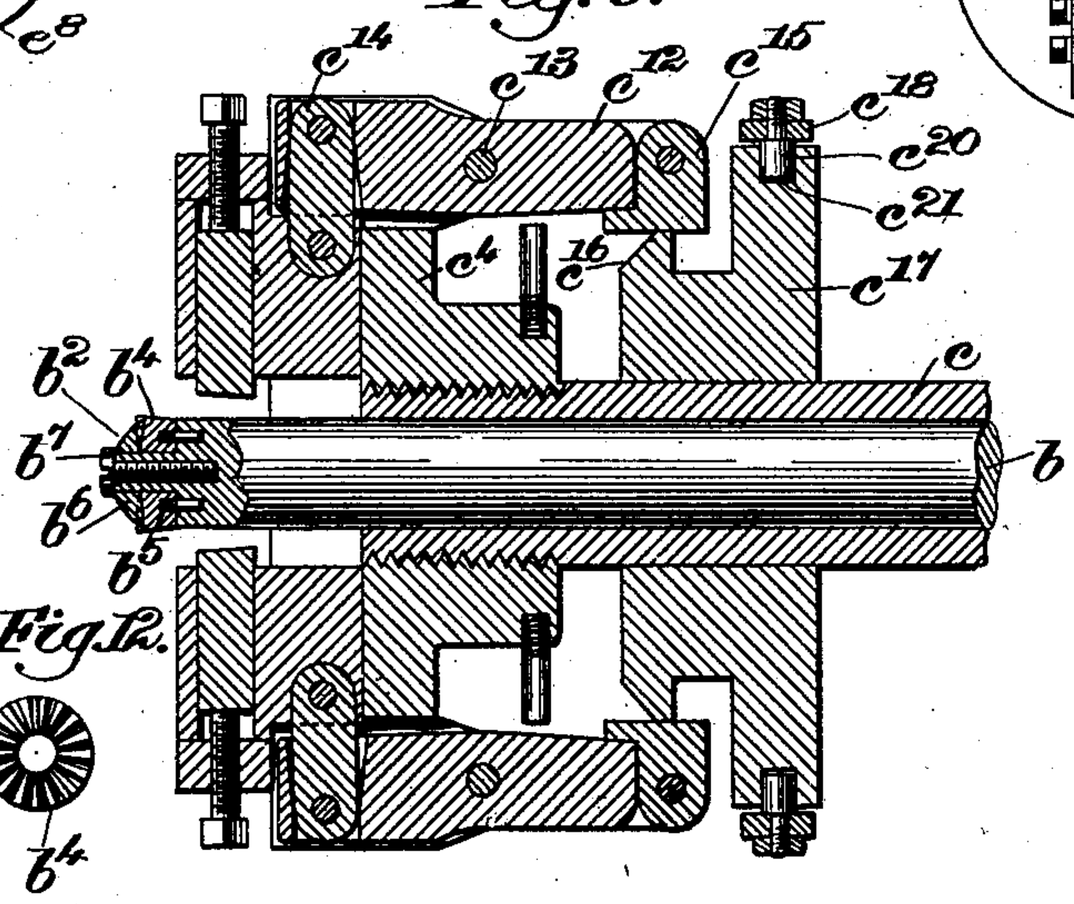
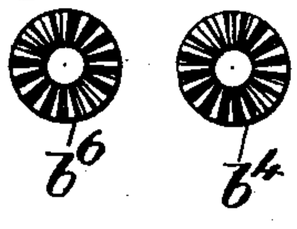


Fig. 11. Fig. 12.



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UNITED STATES PATENT OFFICE.

GEORGE J. O'DOHERTY, OF BOSTON, MASSACHUSETTS.

NIPPLE-THREADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 688,327, dated December 10, 1901.

Application filed April 30, 1897. Serial No. 634,574. (No model.)

To all whom it may concern:

Be it known that I, GEORGE J. O'DOHERTY, a subject of the Queen of Great Britain, residing at Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Nipple-Threading Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to improved mechanism for threading nipples or short sections of pipe, the object of my invention being to provide means whereby nipples may be automatically and rapidly threaded at both ends or at either end, as desired.

Heretofore it has usually been the practice to thread nipples slowly and laboriously by applying each individual nipple in the chuck of a thread-turning lathe, the nipples being held by the chuck while being threaded at one end and then reversed and held by the threaded end during the threading of the previously-held end. It has also been proposed to provide a double-ended machine—that is, one having opposite threading mechanisms—between the latter of which a more or less complicated holder was to be placed, which should firmly hold the nipple by its middle portion while the respective ends thereof were being threaded by the rest of the machine, and after the nipple was properly threaded and the threading mechanism had been removed therefrom the holder was to be swung or turned out of the way, so as to carry the finished nipple away. The mechanisms, however, above alluded to and all others of which I am aware have been dependent largely upon hand-levers and hand-control for the manipulation of each nipple as it was being threaded, no machine having ever been entirely automatic. Accordingly I have invented the herein-set-forth nipple-threading machine, which is entirely automatic, this feature being regarded as of prime importance in my invention, and it also is capable of threading a nipple to a greater or less extent at either end, as desired, and of making a close-threaded nipple.

A further object of my invention is to provide a machine which shall firmly grasp and immovably retain the nipple properly centered at its ends; also, to provide means whereby the threading of the nipple shall cease quickly when it is finished.

Further improvements and advantages thereof will be set forth in the following description in connection with the specific details of construction of the preferred embodiments of my invention, reference being had to the accompanying drawings.

In the drawings, Figure 1 is a top plan view of one embodiment of my invention. Fig. 2, in side elevation, illustrates a space-nipple threaded by my machine. Fig. 3 is a similar view showing a close nipple—*i. e.*, threaded from end to end. Fig. 4 is a front elevation of the mechanism shown in Fig. 1. Fig. 5 is a sectional detail taken on the line 5 5, Fig. 4. Fig. 6 is a rear elevation looking toward the top of Fig. 1. Fig. 7 is a front elevation of the centering-rod and thread-cutting head. Fig. 8 is an enlarged side elevation thereof, parts being broken away. Fig. 9 is a central horizontal section taken on the line 9 9, Fig. 8. Fig. 10 is a side elevation of one of the double cams. Figs. 11 and 12 are details of the centering device.

On a heavy base A, herein shown as extending from end to end of the machine, is mounted in suitable journal-bearings a main shaft a, having a driving-pulley a' at one end, driving-gears a^2 a^3, and worm-gears a^4 a^5, the latter being herein shown as adjacent the ends of the shaft. Parallel to the main shaft a are opposite centering-rods b b', on which are mounted tubular spindle-shafts c c', the latter being rotated by the driving-gears a^2 a^3 by means of gears c^2 c^3, fast on the hollow shafts c c', respectively, the former meshing directly with the gear a^2 and the latter being driven by the gear a^3 by an intermediate gear c^4 (see Fig. 6) in order that the shaft c' may be rotated in an opposite direction to the shaft c. The centering-rods b b' extend forward toward each other beyond the inner ends of the spindle-shafts when the latter are in their retracted position, terminating in gripping-knobs or centering-pieces b^2 b^3 (shown more in detail in Figs. 8 and 9) for properly centering and retaining in rigid and immovable position the nipple-blank to be threaded, and

the spindle-shafts have fixed thereto on their opposite inner ends adjacent these gripping-knobs two die-heads C C'.

The two die-heads being similar, it will be sufficient to describe one of them. A suitable disk or body c^4 is screwed rigidly on the end of its spindle-shaft and has in its face a plurality of slideways c^6, herein shown as four in number, (see Figs. 7 to 9,) in which are mounted die-carriers c^7, holding dies c^8 by set-screws c^9, the dies being adjustable in their carriers by means of screw-bolts c^{10}. The carriers are free to slide radially in their ways c^6, being reciprocated therein by means of levers c^{12}, pivoted at c^{13} and connected by means of links c^{14} to the carriers at their forward ends and preferably having pivoted riders c^{15} at their rear ends to be engaged by the beveled plate c^{16} of an actuator c^{17}, sliding on the spindle-shaft, and moved backward and forward by a yoke c^{18} of a rock-shaft c^{19}, said yoke having rolls c^{20} entering a peripheral groove c^{21} of the actuator. The levers c^{12} are moved outward by the actuator c^{17} and retracted in opposition thereto by suitable springs s.

The main shaft is herein shown as extending longitudinally of the machine, intermediately thereof, (see Fig. 1,) the centering-rods and spindle-shafts being in front of the main drive-shaft, and at the rear thereof I have mounted two sets of slide-rods d d' and d^2 d^3, the forner being connected at d^4 d^5, respectively, preferably by adjustable clamps d^6, to the rock-shafts c^{19} of the actuators for the die-heads, and the latter being connected by arms d^7 d^8 to the spindle-shafts, respectively, the said arms having straps d^9, operating between fixed collars d^{10} on the spindle-shafts, as shown more clearly in Fig. 4, and secured at their opposite ends to the rods d^2 d^3 by clamps d^{12} d^{13}, the former clamp being shown as provided with a hand adjustment in the form of a hand-screw d^{14}, having threaded engagement with the arm d^7 and carried by the rod d^2 in a bracket d^{15}, for a purpose to be presently described.

From the description thus far it will be evident that as the rods d d' move forward toward each other they cause the actuators c^{17} to engage and lift the outer ends of the levers c^{12}, thereby closing together the dies in the die-heads, and as the rods d^2 d^3 are moved forward toward each other they move forward correspondingly the spindle-shafts, and thereby the die-heads, the latter being continuously rotated by the main shaft a, so that as they are moved forward by the slide-rods d^2 d^3, at the same time rotating, they cut the threads of the nipple as required.

The two sets of slide-rods are respectively reciprocated by means of double-path cams E E', carried on transverse shafts e, provided with gears e', (shown in dotted lines in Fig. 6,) driven by the worm-wheels a^4 a^5, respectively, of the main shaft, the cam-grooves e^2 of the outer or rear faces of the cam-wheels E E' being shown in Fig. 6 and the opposite or inner face groove e^3 of one of them being shown in detail in Fig. 10. The shafts e on their inner ends carry cam-disks E^2 E^3, having face-cams e^4, (see Fig. 4,) which reciprocate the centering-rods b b' by means of slides F F', secured to the centering-rods and preferably sliding in dove-tailed ways f, as shown in detail in Fig. 5, rolls or pins e^5 being provided to travel in the cam-grooves e^4.

The centering-rods b b' simply reciprocate and do not rotate, and I prefer to make them relatively slightly yielding, a spring s' being shown adjacent the slide F' for this purpose, so that if the nipples being threaded should be slightly uneven in length neither the nipple nor the machine will be injured thereby, but the spring s' will simply permit the rod b' to yield as required to accommodate the longer nipple.

In order to prevent any injury to the nipple and yet to maintain the same rigidly and firmly clamped between the centering-rods, I provide the latter with hardened-steel gripping-knobs b^2 b^3 (shown in detail in Figs. 8, 9, 11, and 12) and each comprising a corrugated rest b^4, held firmly against the cut-away end of its centering-rods by means of pins b^5 and an oval or conical centering end b^6, the whole being held firmly in place by a stub-screw b^7, so that the corrugated periphery of the rest b^4 shall project beyond the adjacent end piece b^6 just sufficient to rest against the end of the nipple within the threading circumference thereof, thereby avoiding all tendency to spread the nipple, and yet not interfering in any way with the proper cutting of the threads thereon. The adjacent surfaces of the end piece b^6 and the rest b^4 are radially corrugated, as shown in Figs. 11 and 12, in order to interlock and maintain the parts absolutely rigid, so as to hold the nipples positively against any tendency thereof to turn under the action of the threading-dies.

P designates a pump of any suitable kind mounted on the bed of the machine in order to pump oil through a pipe p and deliver it at p' immediately above the nipple, as the latter is being threaded, in order to keep the parts cool, the oil falling into a tank T beneath the orifice p', from which it is continuously pumped over and over.

The operation of my invention is as follows: The several cams are so formed and proportioned that the centering-rods b b' are moved forward to grasp a nipple between their ends b^2 b^3, and immediately thereafter the slides d d' and d^2 d^3 are moved forward together until the die-heads are in proper position at the ends of the nipple, whereupon the slides d d' move forward a short distance ahead of the rods d^2 d^3, thereby sliding the actuators c^{17} into engagement with the die-head, so as to separate the levers c^{12} and close down the dies against the nipple into proper threading engagement to feed the predetermined gage to which the nipple is to be thread-

ed, the several slide-rods thence moving on together until the nipple has been threaded as desired. During the movement last described the centering-rods *b b'* are maintained in their rigid holding position by reason of the concentric path e^4 of their actuating-cams, as shown in Fig. 4. Instantly upon the completion of the threading of the nipple the slides *d d'* are drawn back quickly a short distance to permit the dies to be withdrawn from engagement with the nipple by their springs *s*, and this movement is at once succeeded by a complete retraction of both sets of slide-rods, so that the die-heads are simultaneously withdrawn from the nipple. As soon as the die-heads have moved back out of range with the nipple the centering-rods *b b'* are quickly released from the nipple by reason of the sharp deflection e^6 of the cam e^4, Fig. 4, the threaded nipple being at once and preferably automatically removed, (the detailed mechanism therefor being omitted for the sake of clearness,) and another nipple-blank is instantly placed in position to be immediately engaged by the rigid and non-rotating centering-rods. The threading operation is then repeated as before, and so on. The machine keeps on threading nipples, releasing and receiving the same in rapid succession without any intermission and without any attention. No hand-levers or stopping and starting mechanism for any of the parts are required, but the entire operation from beginning to end is automatic, rapid, and accurate, while at the same time provision is made, as stated, to accommodate irregular lengths or irregularly-cut nipple-blanks.

I have thus far described the usual operation of the machine for threading a nipple N, as shown in Fig. 2, where uniform threads are formed at the respective ends of the nipple; but my machine makes it readily feasible to thread the nipple farther at one end than at the other, or, if desired, to thread it for the entire length, as shown at N', Fig. 3. For this purpose I have provided the means of adjustment shown at d^{14} d^{15}, Fig. 1, and have also made the cam disk or wheel E adjustable on its shaft, as shown in Fig. 10, where e^7 designates a radial bolt carried by the cam-wheel and normally held by a spring e^8 in engagement with peripheral notches e^9 on a hub e^{10}, secured on the shaft *e*, this construction also being shown in Fig. 1. The cam-wheels E^2 E^3 are made similarly adjustable on their shafts *e* by similar means similarly lettered, as shown Fig. 1, in order that their time of releasing the nipple may vary to suit the time of threading of the new adjustment of the cam E, as presently described. Instead of adjusting the cams it is evident that other cams could be readily substituted, and the cam-paths can be varied as desired to suit different styles of nipples, &c. By this means it will be seen that the head C' will move forward, as before, but slightly sooner than the other head, and will then be retracted, and the head C having begun to move forward slightly after the head C' will therefore continue to move forward during the beginning of said retraction, according as it is adjusted forward relatively to its centering-rod *b*, and it will continue to cut threads after the opposite head C' has ceased and has begun to move back, the threads cut by the head C thereby being permitted to run over to and slightly overlap the threads previously cut by the head C', thereby making a close nipple, if desired. In other words, remembering that the amplitudes of movement of the two heads are the same in all cases and that for an open nipple they are adjusted relatively to their slide-rods *d d'* d^2 d^3, so as never to meet each other and to cease cutting threads near the ends of the blank, while for a close nipple they must be so adjusted as to be moved not only to meet each other, but to overlap their threads, the latter is accomplished by throwing them out of synchronism slightly, so that as they almost meet and touch each other one of the heads will stop and begin to move back, the other not stopping, however, but will continue on forward until it has overlapped the threads formed by the opposite head, and thereby made it certain that the threading of the nipple is continuous and uniform, and then, having followed the retreating head a short distance only, it also will be retracted. This slightly-out-of-time movement of the two heads is completed in very nearly the same period taken by the heads when they move in absolute unison.

In order to thread a nipple farther at one end than at the other, the cams are unaltered, but the centering-rods *b b'* are adjusted both to the right or the left, as the case may be, in their slides F F', so that although they still remain spaced apart as before to hold the nipple firmly and rigidly, yet they do not position the nipple between the die-heads as before, holding it, instead, farther toward one end of the machine, so that thereby more threading is done on one end thereof than on the other end.

While I have herein described the preferred embodiments of my invention, yet I wish it understood that I am not limited thereto, inasmuch as various changes in details of construction and in combinations and arrangement of parts may be resorted to without departing from the spirit and scope of my invention.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A nipple-threading machine, comprising opposite centering-rods to grasp and rigidly hold the nipple at its ends from the inside thereof while it is being threaded, means to reciprocate said rods toward and from the nipple, threading mechanism to cut threads on the nipple, and means to operate said mechanism, substantially as described.

2. A nipple-threading machine, comprising opposite centering-rods to grasp and rigidly hold the nipple at its ends while it is being threaded, means to reciprocate said rods toward and from the nipple, means to permit one of said rods to yield relatively to the other, to accommodate varying lengths of nipples, threading mechanism to cut threads on the nipple, and means to operate said mechanism, substantially as described.

3. A nipple-threading machine, comprising non-rotatable centering-rods, means to reciprocate them toward and from each other, hollow spindle-shafts mounted on said rods, means to rotate said shafts, die-heads and dies carried at the forward adjacent ends of said shafts and rotatable therewith, substantially as described.

4. A nipple-threading machine, comprising non-rotatable centering-rods, means to reciprocate them toward and from each other, hollow spindle-shafts mounted on said rods, means to rotate said shafts, die-heads and dies carried at the forward adjacent ends of said shafts and rotatable therewith, said dies being movable radially in said heads, actuators therefor, means to operate said actuators, and means to reciprocate said spindle-shafts, said several means coöperating to move forward said centering-rods and subsequently move forward said shafts and actuators, the latter being moved also relatively to the shaft, thereby to move the dies into cutting position, substantially as described.

5. In a nipple-threading machine, a longitudinal main shaft, centering-rods and spindle-shafts parallel thereto, thread-cutting dies, actuating mechanism therefor, and transverse shafts driven by said main shaft and provided with suitable cams, said cams including cams to reciprocate said centering-rods, and other cams to reciprocate said spindle-shafts, and die-actuating mechanisms and connecting devices therefor, substantially as described.

6. In a nipple-threading machine, the combination with means to hold the nipple rigidly so as to expose the entire exterior surface thereof while being threaded, of mechanism to thread said nipple over its entire surface while so held, as desired, substantially as described.

7. In a nipple-threading machine, the combination with means to hold the nipple-blank at its ends, of mechanism to thread said nipple externally at each end thereof, and means to vary the position of said blank relatively to the threading movement of said threading mechanism, substantially as described.

8. In a nipple-threading machine, a centering-rod having a gripping-knob at its end, said knob comprising a rest and a centering end, said rest extending peripherally beyond said end slightly to receive the end of the nipple endwise thereof, substantially as described.

9. In a nipple-threading machine, a centering-rod having a gripping-knob at its end, said knob comprising a rest and a centering end, said rest extending peripherally beyond said end slightly to receive the end of the nipple endwise thereof, said rest being corrugated, substantially as described.

10. In a nipple-threading machine, a centering-rod having a gripping-knob at its end, said knob comprising a rest and a centering end, said rest extending peripherally beyond said end slightly to receive the end of the nipple endwise thereof, said rest and said centering end being formed in separate pieces and radially grooved to interlock with each other on their adjacent opposing faces, substantially as described.

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

GEORGE J. O'DOHERTY.

Witnesses:

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