(No Model.) 3 Sheets—Sheet 1.

C. C. WALWORTH.

MACHINE FOR SCREW THREADING NIPPLES, &c.

No. 251,079. Patented Dec. 20, 1881.

Fig. 1.

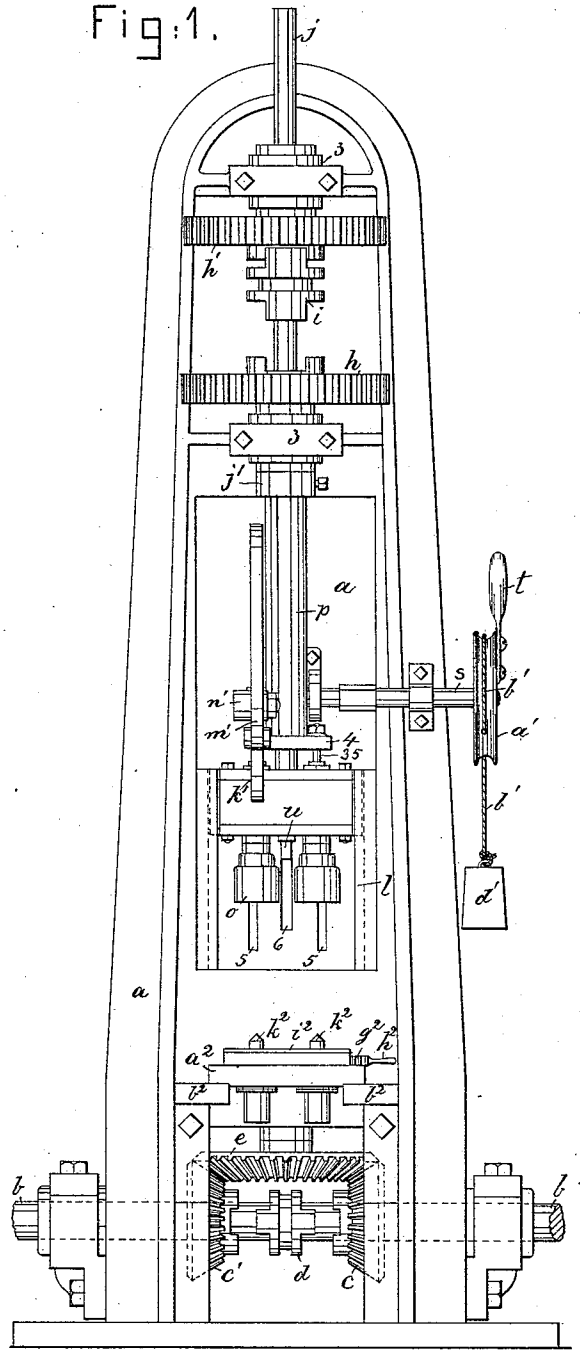
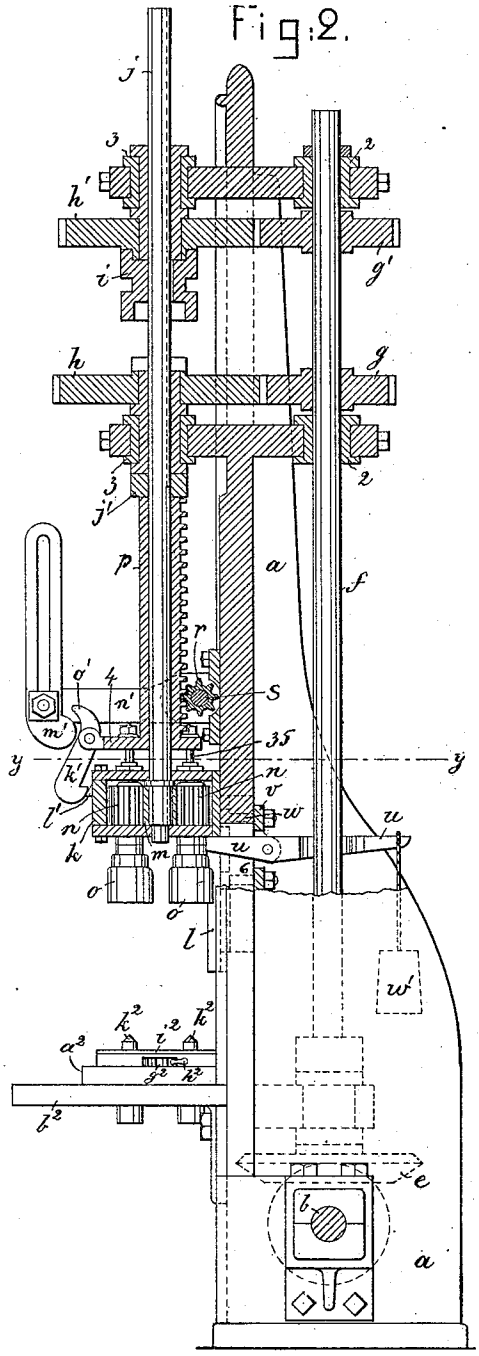


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

C. C. WALWORTH.

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Fig: 3.

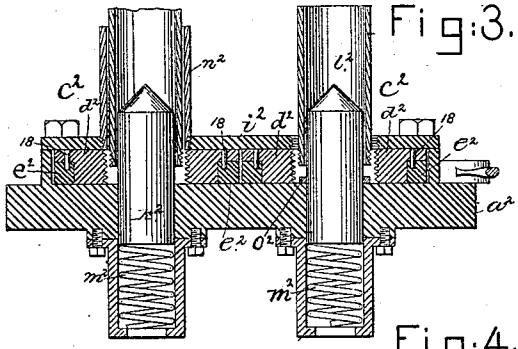

Fig: 4.

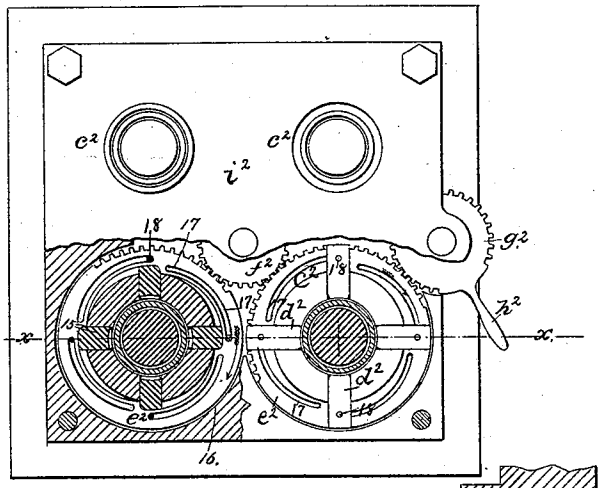

Fig: 6.

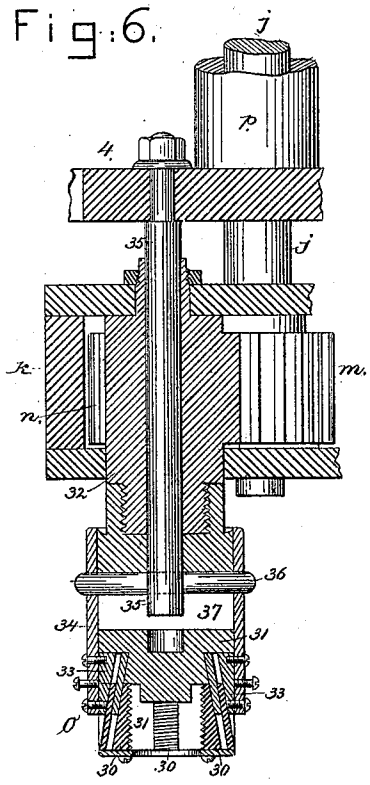

Fig: 5.

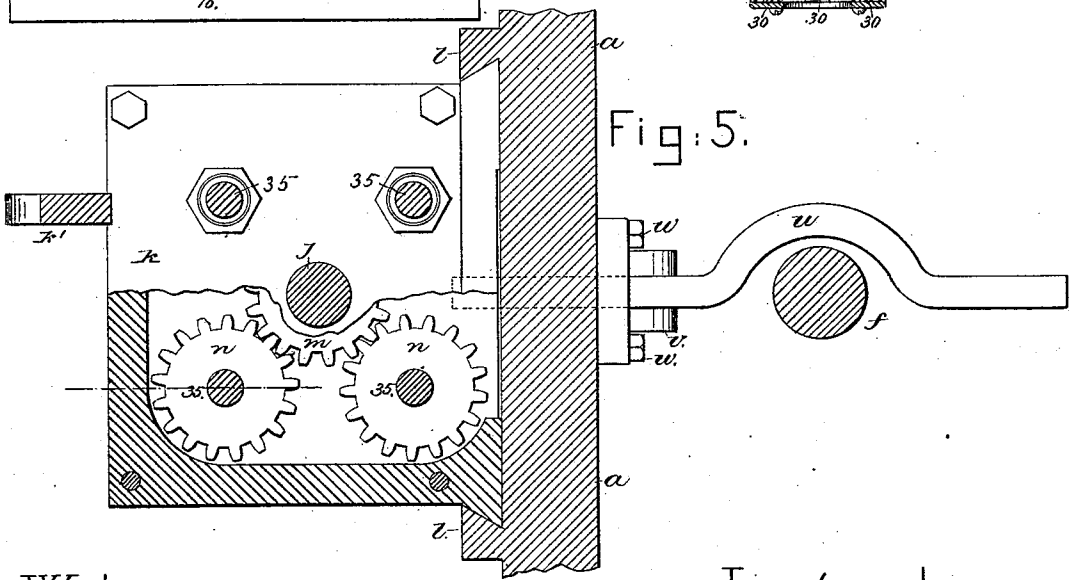

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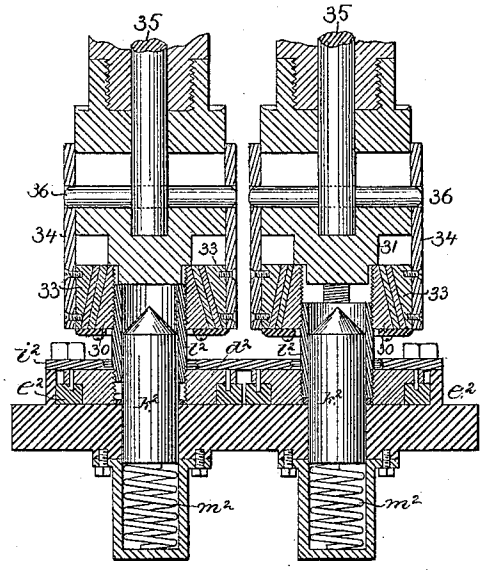
Fig. 7.



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Inventor:
Caleb C. Walworth.
by Crosby & Gregory
Atty's

UNITED STATES PATENT OFFICE.

CALEB C. WALWORTH, OF BOSTON, MASSACHUSETTS.

MACHINE FOR SCREW-THREADING NIPPLES, &c.

SPECIFICATION forming part of Letters Patent No. 251,079, dated December 20, 1881.

Application filed April 26, 1881. (No model.)

To all whom it may concern:

Be it known that I, CALEB C. WALWORTH, of Boston, county of Suffolk, State of Massachusetts, have invented a new and useful Improvement in Machines for Screw-Threading Nipples, &c., of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to a machine for cutting screw-threads, and is especially intended for threading nipples or other short tubular or cylindrical articles, of which a considerable number of uniform length require a screw-thread to be formed at each end.

The invention is shown embodied in a machine in which a number of dies operated simultaneously from a single shaft are brought to act upon corresponding ends of a set of nipples held in place by a set of receivers or holders upon a bed-plate provided with dies to cut the threads at the opposite ends of the nipples. The threads are, in practice, of the same "hand," and one set of dies is fixed, while the other rotates, they being adapted to cut to a certain depth and then be positively stopped from advancing farther upon the article being cut, so that as one die rotates its cutters engage the nipple and either cut the threads on it or cause it to rotate and be cut or threaded by the stationary die at the other end until one of the threads is wholly cut, when the corresponding die positively holds the nipple until the other thread is finished, the receivers merely retaining the articles in proper position to be acted upon by the dies, but permitting an independent rotary or longitudinal movement of the said articles. The dies are both made with movable cutters, as described in another application for a patent on a die, filed April 1, 1881, so that after the threads have been cut the cutters can be moved out of engagement therewith to allow the nipples to be removed from the dies without unscrewing, as has to be done when the ordinary dies are used, in which all the cutting-edges are formed or mounted in a single solid block. The cutters are mounted in suitable cutter-heads and moved into and out from engagement with the material to be cut by the longitudinal or axial movement of central cutter-operating rods, which are connected with and actuated by a tubular sleeve surrounding the main-die-operating shaft, and provided with rack-teeth meshing with a pinion mounted on a shaft on the frame-work, and provided with a suitable crank or handle to enable it to be operated to move the cutter-operating rods.

When the nipples or other articles to be threaded are placed on their holders on the bed-plate the operator turns the above-mentioned pinion, advancing the tubular rack-sleeve until the cutters are thrown in, the cutter-heads being maintained stationary meanwhile by a suitable retaining device, after which, by the further movement of the rack, the cutters and cutter-heads are positively thrown forward with it and pressed by the operator against the article to be threaded until the cutters have taken hold thereof, after which they will feed themselves forward in cutting the threads in the usual manner.

The pinion-shaft is provided with a pulley sustaining a retracting-weight tending to move the rack and connected cutter-operating rods in the direction to throw the cutters out of engagement with the threads, and a locking device or catch is provided which holds the said rods from being thus withdrawn while the threads are being cut. A disengaging device or trip operates to release this locking device automatically when the threads have been entirely cut, and the retracting-weight, being then allowed to operate, first raises the rack and connected cutter-operating rods, and thus disengages the cutters from the threads and then withdraws the dies from the articles that have been threaded, the forward motion of the driving-shaft continuing unchanged.

The bed-plate, with its dies and nipple-holders, is made movable to and from a position beneath the rotating dies to enable the said nipples to be more readily put in place and removed, and the bed-plate die-cutters are operated by annular cams surrounding the cutter-heads and suitably geared together to enable them all to be operated simultaneously.

Figure 1 is a front elevation of a screw-threading machine embodying my invention; Fig. 2, a side elevation thereof, the upper part being in section on a central vertical plane; Fig. 3, a vertical section, on line *x x*, Fig. 4, of a bed-plate and its dies and holders enlarged;

Fig. 4, a plan view thereof, a part of the top plate being broken away and one of the dies being shown in horizontal section, the dies being shown in Figs. 3 and 4 with their cutters thrown back to disengage the threads of the threaded nipple; Fig. 5, an enlarged sectional detail on line *y y*, Fig. 2, showing the carriage and its holding or retaining device in top view; Fig. 6, an enlarged view of one of the rotating dies and its cutter-operating mechanism in vertical section; and Fig. 7, a vertical section through the dies, showing them operating upon the nipples to be threaded.

The frame-work *a*, of suitable shape, sustains in suitable bearings in its lower portion the main shaft *b*, driven in any usual manner, it being arranged to drive several similar machines placed side by side and carrying two bevel-gears, *c c'*, loose thereon, each having a hub formed as the portion of a clutch to be engaged by a movable clutch, *d*, splined upon the shaft *b* to rotate therewith, but adapted to have an independent longitudinal movement thereon to enable it to be brought into engagement with either of the said beveled gears *c* or *c'*, according as it is desired to run the machine in one direction or the other to cut right or left handed screws. The gears *c c'* mesh with a bevel-gear, *e*, fixed upon a vertical shaft, *f*, running in suitable bearings, 2, at the rear of the machine, and having keyed thereon gears *g g'*, of different diameters, meshing with gears *h h'*, mounted in suitable bearings, 3, at the front of the machine, and each provided with a clutch-hub to be engaged by the clutch *i*, splined to move longitudinally on the die-operating shaft *j*, passing loosely through the said gears *h h'* to rotate independently thereof, the said clutch *i* being engaged with one or the other of the gears *h h'*, according as it is desired to run the shaft *j* and dies at a higher or lower rate of speed.

The die-operating shaft *j*, at its lower end, enters the die-carriage *k*, mounted to slide vertically in suitable guides, *l*, on the frame-work *a*, and the said shaft *j* is provided with a pinion, *m*, (see Figs. 5 and 6,) centrally located among and meshing with a set of four equal pinions, *n*, by which the rotating dies *o* are driven in the same direction with uniform speed. These dies, one of which is clearly shown in Fig. 6, are of substantially the same construction with the one shown in my other application, hereinbefore referred to, the cutters 30 being situated in radial slots in the cutter-head 31, screwed upon the spindle 32 of the pinion *n*, the said cutters being moved radially by the longitudinal or axial movement of the cutter-operating wedges 33, actuated by the sleeve 34 and rod 35, connected therewith by the pin 36 passing through the slot 37 in the cutter-head.

The cutter-operating rods 35, for the dies *o*, are all operated simultaneously by the tubular cutter-operating sleeve *p* surrounding the shaft *j*, and provided with rack-teeth, as shown in Fig. 2, which mesh with a pinion, *r*, mounted on a shaft, *s*, provided with a handle, *t*, to enable the operator to rotate it to move the cutter-operating sleeve *p* and rods 35 connected therewith, the said rods passing through and being free to rotate in bearings in a flange, 4, at the lower end of the said sleeve *p*, which has an independent longitudinal movement on the shaft *j*, limited by the engagement of the pins 36 with the cutter-heads 31 at the ends of the slots 37, so that after the said pins have arrived at the ends of the said slots the cutter-heads are positively engaged thereby, and, together with the carriage *k* and shaft *j*, accompany the sleeve *p* in its further movement, caused by the pinion *r*.

The sleeve *p*, rods 35, sleeves 34, and wedges 33 constitute the cutter-operating devices for the rotating dies.

The shaft *s* of the pinion *r* is also provided with a pulley, *a'*, having a cord, *b'*, fixed thereto and supporting a weight, *d'*, which tends to turn the said shaft in the direction to raise the sleeve *p* and throw the cutters radially outward to disengage the article after the threads have been cut thereon, these devices thus forming a retractor for the cutter-operating devices and cutter.

In order to prevent the carriage from descending by its own weight when the operator by turning the pinion *r* lowers the sleeve *p* to throw the cutters radially inward into operative position, a carriage-holding device is employed, consisting in this instance of a lever, *u*, pivoted in a bearing, *v*, secured to the frame-work *a* at any desired height by bolts *w* passing through slots 5 in the frame *a*. One arm of the lever *u* extends through a slot, 6, in the frame-work *a*, just beyond the lower edge of the carriage *k*, and its other arm is provided with a counterbalancing-weight, *w'*, sufficient to balance the weight of the die-carriage *k* and dies and their operating shaft *j*, and hold them stationary until positively engaged by the cutter operating mechanism, after the cutters have been thrown in at the end of its independent downward movement, after which, in the further rotation of the pinion *r* by the operator, the die-carriage, dies, shaft *j*, and sleeve *p* all descend together, the lever *u* turning on its pivots and the weight *w'* yielding.

A locking device or catch, *k'*, pivoted upon the flange 4 of the sleeve *p*, engages a projection, *l'*, on the carriage *k*, and locks the said sleeve and carriage together after the former has been moved down to throw the cutters inward, thus positively retaining the said cutters in their operative position and causing the dies to feed forward properly to cut the threads until the said locking device is released. This is automatically accomplished after the screw-threads have been cut by the releasing or unlocking device *m'*, fastened in the proper position upon a bracket or arm, *n'*, fixed upon the frame *a*, the said unlocking device engaging the projecting end *o'* of the catch *k'* in its downward movement, caused by the dies advancing on the articles being threaded in

the usual manner. As soon as the catch k' is thus tripped after the threads have been cut for the proper distance, the sleeve p, being no longer positively held, is at once raised by the action of the weight d', so that the cutters are thus thrown radially outward and disengage the threaded article, thus leaving the dies free to rise or be withdrawn therefrom by the action of the weight d' when the pin 36 reaches the upper end of the slot 37, and by the additional action of the weight w' and lever u.

The upward movement of the carriage and shaft j is limited by the collar j', fixed upon the said shaft by a set-screw coming in contact with the hub of the gear h. The said collar is adjustable in position on the shaft j, and the unlocking device m' and the lever u are adjustable in position on the frame-work in order to enable them to be properly placed to permit articles of different length to be threaded.

The articles while being acted upon by the dies o are supported upon a bed-plate, a^2, mounted to slide in guides on a bracket, b^2, fixed upon the frame a and containing a set of dies, c^2, (see Figs. 3 and 4,) provided with cutters d^2, movable in radial slots 15 and operated by cam-rings e^2, mounted in an annular groove, 16, in the said bed-plate a^2. These cam-rings e^2 are provided with external teeth meshing with a central pinion, f^2, by which they are all caused to move simultaneously when operated by the toothed gear g^2 meshing with the teeth of one of the said cam-rings and provided with a suitable handle, h^2. The internal surfaces of these cam-rings bear upon the rear sides of the cutters d^2, the part of the surface that acts upon each cutter being a cylindrical surface eccentric to the die, so that as the said cam-rings are rotated in the direction of the arrows, Fig. 4, the said cutters will be moved radially inward. The cam-rings e^2 are also provided with grooves 17, parallel to their surfaces that act on the cutters, which have pins 18 entering the said grooves, by which the said cutters are caused to move radially outward when the cam-rings are moved back in the direction reverse to the arrow.

The cutters and their operating cam-rings are held in place in the bed-plate a^2 by the cap or covering-plate i^2, which also furnishes bearings for the pinions f^2 g^2.

The plate a^2 is provided with a set of holders, k^2, placed centrally in the dies c^2, to receive nipples or similar short tubular articles, l^2, as shown in Fig. 3, and hold them in proper position to be acted upon by the dies o c^2 when the bed-plate a^2 is slid back to the frame a, as shown in Fig. 2, where it is stopped with the axes of the said dies in line with one another. The holders k^2 are free to slide longitudinally through the plate a^2 and rest upon springs m^2, which enable them to yield longitudinally if engaged by the cutter-heads of the dies o, as will happen in threading very short tubes. When threading long cylinders their holders may be made as tubes n^2, (see Fig. 3,) attached to the cap i^2 of the die-bed a^2, the said tubes giving a longer bearing on the cylinders to be cut and holding them steadily.

In case the tubular holders or receivers n^2 are used, the holders k^2 may be removed or remain in place, as desired.

In threading articles at both ends it is necessary that the article should be positively stopped from further entering either die, and held thereby after the said die has cut the thread for a sufficient length, so that the other die will then be forced to cut its thread. The article is thus stopped and held by arriving at the end of the cutters and coming in engagement with the cutter-head or with the bed-plate. If desired to cut to a less depth, suitable washers, o^2, (see Fig. 3,) may be placed in the dies, which will engage and stop the article being threaded.

The releasing device m' is properly placed to trip the catch k' just before the articles being threaded engage the bottoms of the dies at both ends.

If desired to thread articles only at one end, the cutters of the dies c^2 in the bed-plate may be replaced by holding-jaws; or other suitable devices might be employed to securely clamp the said articles while being threaded by the dies o, the other parts of the apparatus operating as before.

In operation the lever u and collar j' will be placed in proper position to bring the dies, when in the position shown in Figs. 1 and 2, just above the edges of the articles to be threaded when in place on or in the holders k^2 or n^2, and the releasing device m' will be adjusted to trip the catch k' when the carriage k has traveled the distance it is desired that the threads shall be cut. The bed a^2 is then moved forward, and the handle h^2 turned to throw the cutters d^2 radially inward into operative position, moving the cam-rings e^2 in the direction of the arrow, Fig. 4. The nippers or cylinders are then placed on the holders k^2 or in the holders n^2, as the case may be, their lower edges resting on the upper edges of the said cutters d^2, after which the bed a^2 is moved back to the position shown in Fig. 2, bringing the articles in line with the dies o. Then the shaft s and pinion r are turned by means of the handle t in the direction to lower the sleeve p, which moves the rods 35 downward through the spindles 32 and cutter-heads 31 of the dies, throwing their cutters radially inward into operative position, the carriage k being at this time prevented from moving downward by the lever u until the pin 36 has traversed the length of the slot 37, when the catch k' engages the projection l', locking the sleeve p. The die-carriage k and dies o, with their cutters thus locked in operative position, will then be pressed by the further movement of the handle t down upon the tops of the articles resting on the edges of the cutters d^2 of the dies c^2 in the bed-plate a^2 until the said cutters have taken hold of and begun to cut the said articles, when the handle t may be released, and the dies will feed down upon the articles in the usual manner, being drawn forward by the

threads of the cutters. Each article will be held by one of the dies *o* or c^2, while the other is cutting at its other end, until it has wholly entered the said cutting-die and come into engagement with the cutter-head, bed-plate, or washer o^2 placed therein, when the said die will hold it until the thread is cut at the other end by the other die, and just as the threads at both ends are completed the releasing device m' disengages the locking device k' from the projection l' and permits the sleeve *p* and connected cutter-operating rods 35 to be moved upward by the weight d', thereby throwing the cutters 30 radially out of engagement with the threads that have been cut by them, and when the pin 36 has traversed the slot 37 the sleeve *p* in its further movement will raise the carriage *k* and shaft *j*, withdrawing the dies *o* from the threaded article, their upward movement being limited by the engagement of the collar j' with the hub of the gear *h*. In Fig. 7 one of the nipples is shown as having its thread wholly finished by the lower die, which thus holds it while the thread is being finished by the upper die; but the other nipple has had its upper thread first finished, and is being carried by the upper die into the lower die. In practice both threads will be finished about the same time, as after one die has advanced a thread or two farther than the other its increased friction will hold the nipple until the other has acted about an equal amount. The bed-plate *a* will then be drawn forward again to permit access to the articles that have been threaded, when the handle h^2 will be turned to the position shown in Fig. 4, withdrawing the cutters d^2, so that the articles l^2 can be removed, as shown in Fig. 3, after which the handle h^2 will be moved back, fresh articles placed upon the holders, and the operation repeated as before described.

I claim—

1. In a machine for forming screw-threads on both ends of nipples or other similar articles, a bed-plate provided with a set of receivers or holders to receive the articles to be threaded, and dies to operate on one end thereof, combined with a set of co-operating rotating dies to act on the other end of the said articles, whereby they are threaded at both ends by a single continuous movement of the rotating dies, substantially as described.

2. In a machine for threading nipples and similar articles, a bed-plate and set of receivers and dies thereon, combined with a die-operating shaft and series of dies rotated thereby, the cutters of both sets of dies being made movable, whereby one set of dies can be withdrawn from the threaded article and the latter removed from the other set without stopping or changing the rotary movement of the die-operating shaft, substantially as described.

3. The die-carriage and dies therein, provided with movable cutters, combined with the cutter-operating devices having a limited movement independent of that of the said carriage, and the locking device, whereby the said carriage and cutter-operating devices are positively connected together and the cutters thus retained in operative position while the threads are being cut, substantially as described.

4. The dies provided with movable cutters, and the cutter-operating device and retractor therefor, the said device having a limited movement independent of the said dies, combined with the locking device or catch for the said cutter-operating device, whereby it is fixed relative to the said dies, and the releasing device or trip therefor to permit the cutters to be first automatically disengaged and the dies thereafter withdrawn from the threaded article by the said retractor as soon as the thread is cut, substantially as described.

5. The die-operating shaft and carriage and rotating dies fed forward thereby, and mechanism to automatically disengage and withdraw the said dies when the threads are cut, combined with the bed-plate and sliding bed thereon, provided with dies fixed therein having radially-movable cutters and means to operate them, substantially as and for the purpose described.

6. The longitudinally-movable die-operating shaft and die-carriage connected therewith, combined with the cutter-operating sleeve provided with rack-teeth loose on the said shaft and having limited independent longitudinal movement thereon to actuate the cutters, and the pinion meshing with the said rack-teeth and hand-lever to operate it, substantially as described.

7. The die-operating shaft and carriage, and cutter-operating sleeve longitudinally movable on the said shaft for a definite distance, and adapted thereafter to positively engage the said shaft, combined with the yielding holding device for the said carriage, whereby the said sleeve, when moved longitudinally, first moves independently of the said shaft and carriage to operate the cutters, and thereafter positively moves the said shaft and carriage with it, the holding device then yieiding, substantially as described.

8. The die-operating shaft and carriage provided with a projection, combined with the cutter-operating sleeve and locking-pawl connected therewith to engage the said projection, and the trip or releasing device for the said pawl adjustably connected with the frame-work, substantially as and for the purpose set forth.

9. The set of stationary cutter-heads provided with radial slots and the cutters movable therein, combined with the toothed annular cutter-operating cams surrounding the said cutter-heads and cutters, and the intermediate pinion meshing therewith, whereby all the said cams may be operated simultaneously to impart a radial movement to the cutters in their slots, substantially as described.

10. The bed and fixed dies thereon and corresponding movable dies, combined with the yielding nipple-receiving cylinders concentric with the said fixed dies, to retain the nipple placed thereon in position to be operated upon by the fixed and movable dies, and adapted to

yield longitudinally as the said movable die advances in cutting the thread, substantially as and for the purpose described.

11. The die-operating shaft and carriage and the cutter-operating rack and locking device therefor, combined with the pinion engaging the said rack and its operating-weight and the automatically releasing or disengaging device, whereby the cutter-operating rack is automatically released and operated to disengage the cutters from the threaded article and withdraw the die-carriage as soon as the threads are cut, substantially as described.

12. The die-operating shaft and carriage and the cutter-operating device movable for a definite distance independently of the said carriage and adapted to positively engage the said carriage and shaft at the end of the said independent movement, combined with the carriage-holding device to retain the said carriage stationary while the cutters are being operated by the said independent movement of the cutter-operating device, the said holding device being adjustably connected with the frame-work to enable the apparatus to be employed for cutting articles of different length, substantially as described.

13. The die-carriage and cutter-operating device having a limited independent movement and adapted at the end thereof to be positively connected with the said carriage, combined with the carriage-holding device consisting of a lever engaging the said carriage with one arm, and having its other arm weighted to counterbalance the said carriage and prevent it from moving with the cutter-operating device until positively engaged thereby, substantially as described.

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

CALEB C. WALWORTH.

Witnesses:
JOS. P. LIVERMORE;
L. F. CONNOR.