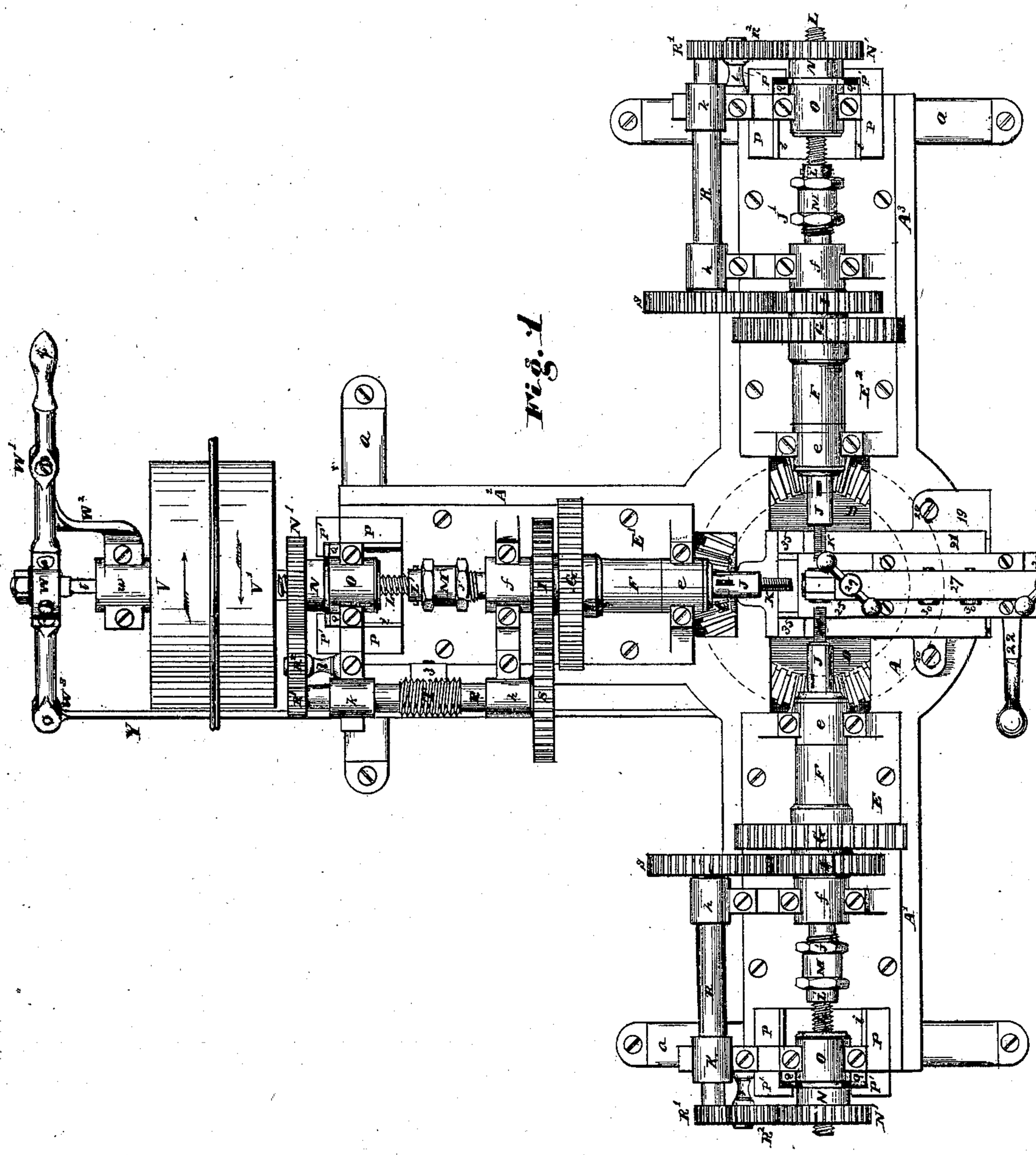
3 Sheets—Sheet 1.

C. B. LONG.

MACHINE FOR TAPPING GAS AND WATER FITTINGS.

No. 113,314. Patented Apr. 4, 1871.

Fig. 1.



Witnesses

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3 Sheets—Sheet 2.

MACHINE FOR TAPPING GAS AND WATER FITTINGS.

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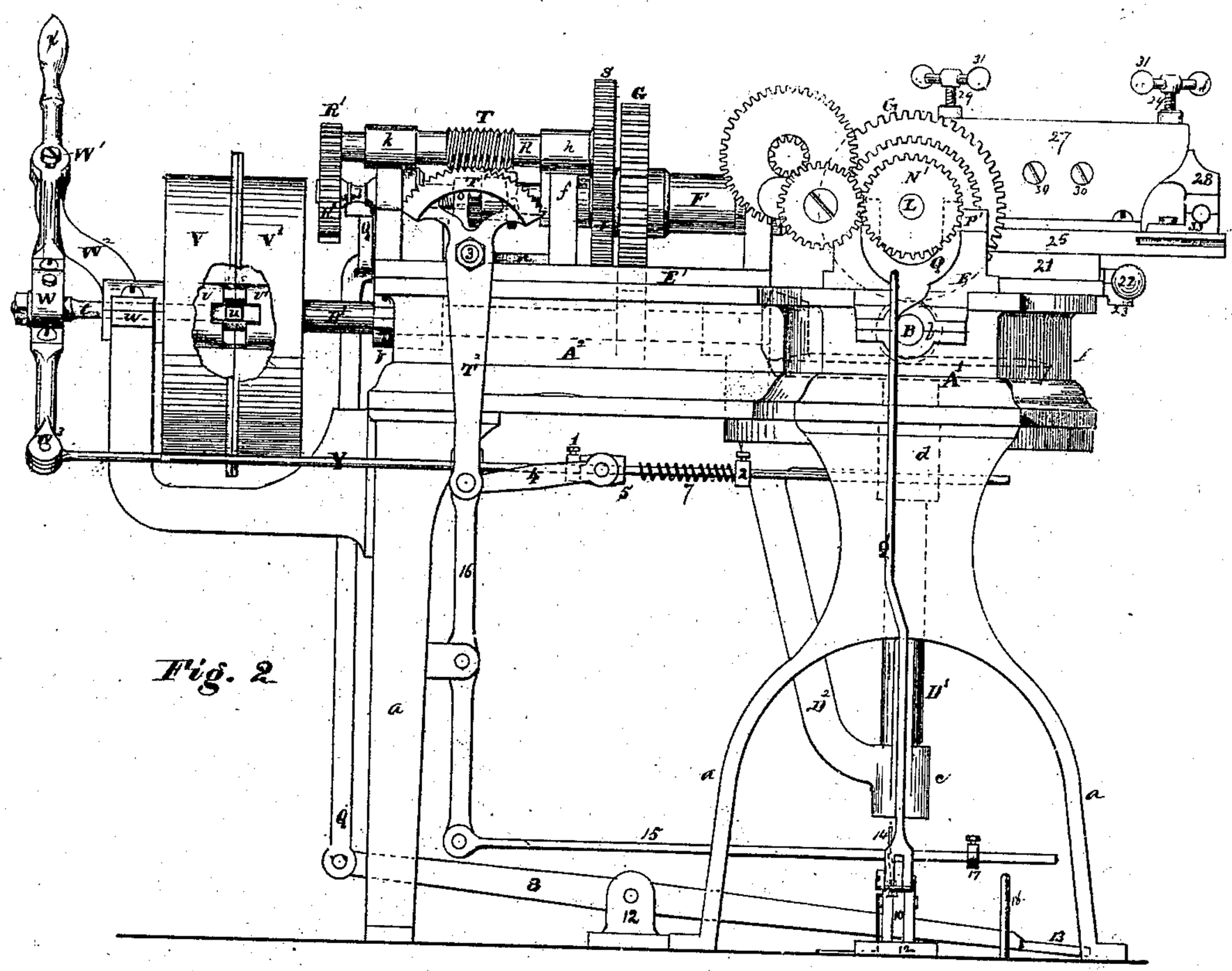

Fig. 2

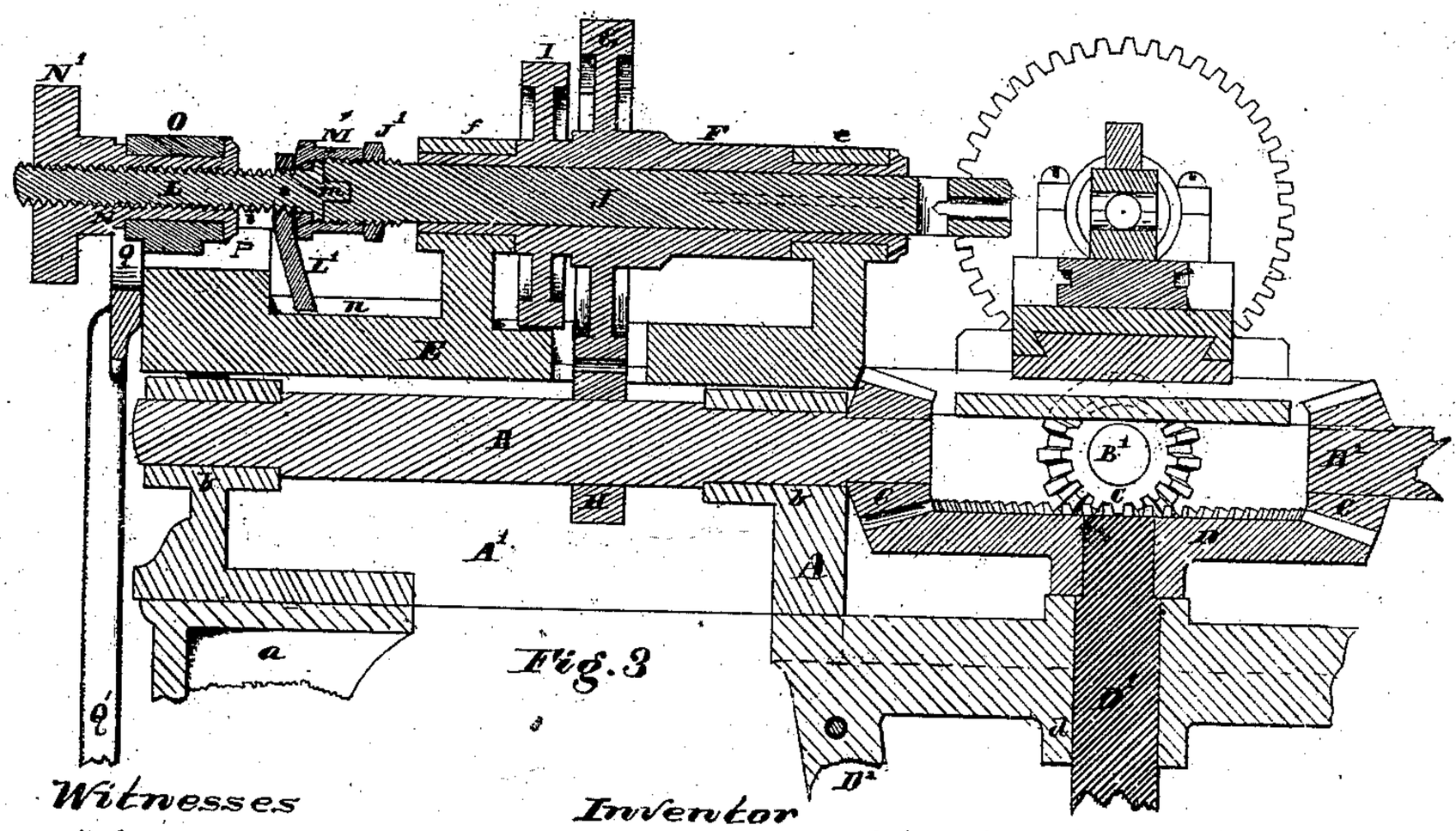

Fig. 3

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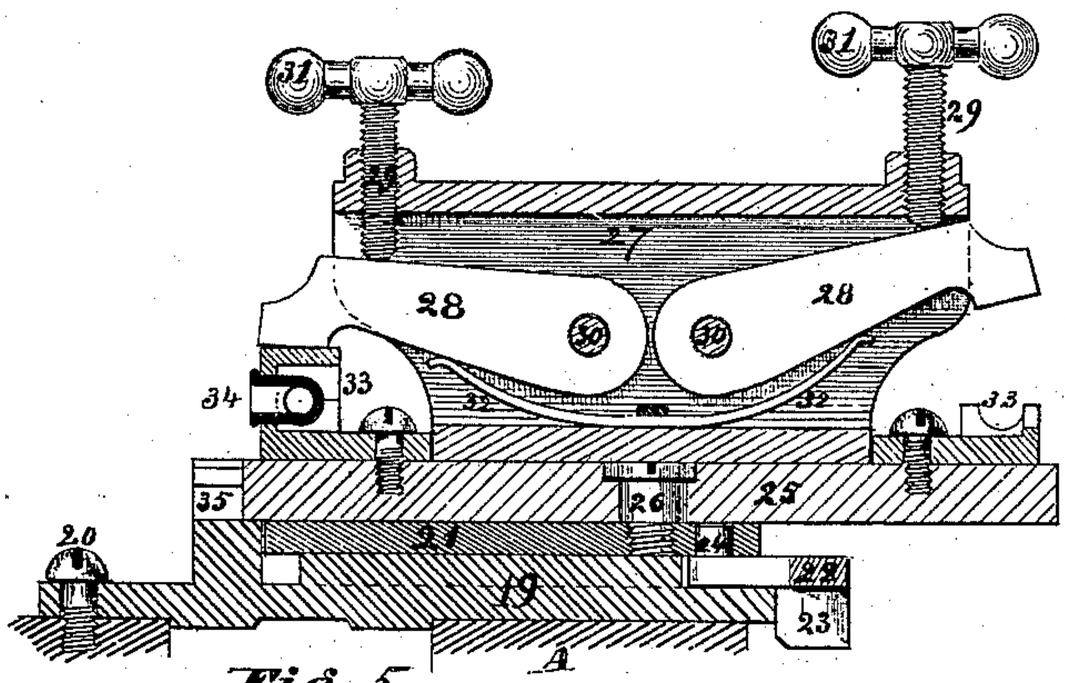

Fig. 5

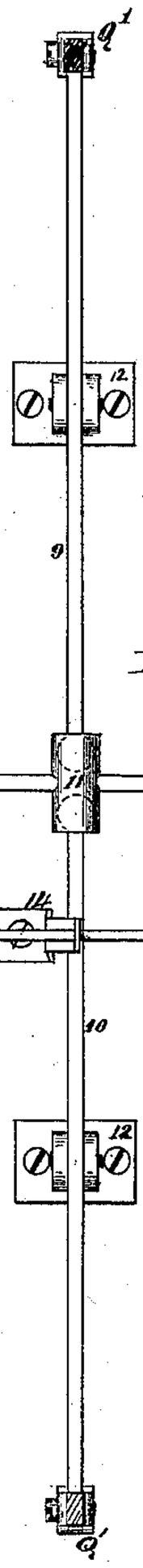

Fig. 4

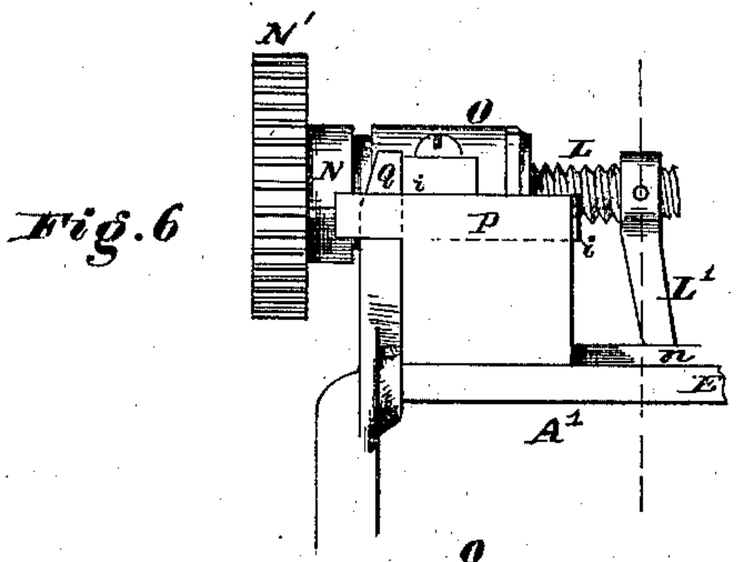

Fig. 6

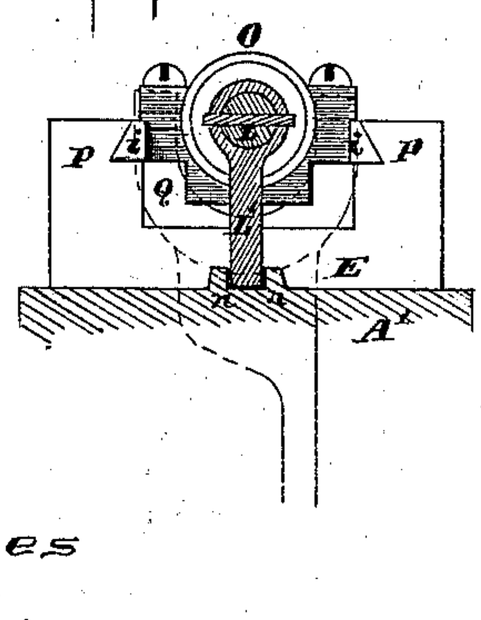

Fig. 7

Witnesses

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CHARLES B. LONG, OF WORCESTER, MASSACHUSETTS.

Letters Patent No. 113,314, dated April 4, 1871.

IMPROVEMENT IN MACHINES FOR TAPPING GAS AND WATER-FITTINGS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, CHARLES B. LONG, of the city and county of Worcester, and State of Massachusetts, have invented certain new and useful Improvements in Tapping-Machines for tapping steam, gas, and water-pipe fittings, and for other purposes; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing which forms a part of this specification, in which—

Figure 1 represents a plan view of my improved tapping machine.

Figure 2 represents a side view of the same.

Figure 3 represents a central vertical section of one of the tap-spindles and its operating devices.

Figure 4 represents a plan view of the levers for operating the thrust bearing forks.

Figure 5 represents a central vertical section of the fitting-holder or vise.

Figure 6 represents a side view of the thrust bearing and its support.

Figure 7 represents a transverse vertical section of the feed-screw, and end view of the thrust bearing.

To enable those skilled in the art to which my invention belongs to make and use the same, I will proceed to describe it more in detail.

The nature of my invention consists in the combinations set forth in the claims.

In the drawing—

The parts marked A indicate the main frame, which is, in this instance, made with three wings or divisions, A^1 A^2 A^3, that are arranged radially at right angles to each other around the circular central portion A, in the manner illustrated in figs. 1 and 2.

The frame is supported upon suitable standards or legs, *a*, set under the extremities of the several wings, as shown.

Horizontal operating-shafts, B B^1 B^2, are arranged within the wings A^1 A^2 A^3 of the frame, where they are supported, and turn in suitable bearings, *b b*.

Each shaft is provided with a bevel-gear, C, at its inner end, which meshes into a central bevel-gear, D, arranged in a horizontal position within the circular central part of the frame A.

The gear D is attached to the upper end of a vertical spindle D^1, which latter is supported in the proper position by the step and collar-bearings *c* and *d* upon the tri-braced hanger D^2 at the under side of the frame A. The gear D insures a uniform motion between all the operating-shafts, while, at the same time, power is transmitted through it to the wings of the machine.

Mounted upon the top of the several wings A^1 A^2 A^3 are head-blocks E E^1 E^2, which support the tap-spindles and their operating devices. The devices on each of the head-blocks being substantially the same, it will be necessary to explain but one, all being similarly lettered upon the drawing.

F indicates a hollow shaft, supported to turn in bearings *e f*, and connected for operation to the shaft B by spur-gears G and H.

Shaft F is also provided with another spur-gear, I, which drives the feeding devices.

The tap-spindle J is fitted to the interior of the hollow shaft F, the parts being furnished with a groove and spline, whereby the tap-spindle is allowed a longitudinal movement, independent of the hollow shaft F, but is, at the same time, caused to revolve therewith, for the purpose of working the tap K, which is arranged in the inner end of the spindle J, as shown.

A feeding-screw, L, is joined to the end of the tap-spindle J by means of a screw-cap M, which fits over the head of the feed-screw L and screws onto the end of the spindle J, where it is retained by a check-nut, J′, all of which is fully shown in fig. 3 of the drawing.

The feed-screw L is provided with a projecting center-pin, *m′*, which extends into an opening in the end of the tap-spindle J, and thereby retains the parts in the proper relative position as regards each other.

The feed-screw L is held from revolving by means of an arm, L′, rigidly secured to the screw L, near its inner end, and having its lower end arranged to travel between guides *n n* upon the body of the head-block.

The feed-screw is moved longitudinally, to cause the taps to advance or recede to or from the work, by means of a spur-gear, N′, the hub N of which is provided with a female screw-thread, and serves as a nut upon the feed-screw, moving it in or out, according to the direction in which the gear N′ is revolved.

The hub N of the gear N′ is supported by a movable bearing, O, which I call the thrust bearing, as it receives the pressure and thrust occasioned by moving up the taps K to the work.

The thrust bearing O is provided with beveled ear-pieces, *i*, which are fitted to slide in grooves formed upon guide-blocks P, whereby the bearing O is permitted to move back and forth for a short distance in a direction parallel with the axis of the screw L and tap-spindle J.

A fork, Q, is arranged at the outer end of the bearing O, the prongs of which project upward between the ear-pieces *i* of the bearing O, and a pair of angular lugs, P′, attached to the outer side of the guide-blocks P. The points of the fork Q are beveled off, as shown in fig. 6, so that, by raising the fork upward, the beveled ends passing between the angular lugs P′

and ear-pieces *i*, hold or press upon the thrust bearing O, while the taps K are commencing to operate.

When the fork Q is lowered the pressure is removed from the bearing O, so that there will be no strain upon the tap while it is being withdrawn from the fitting, after the thread has been formed therein.

The fork Q is operated by a lever device arranged beneath the machine, which device will be hereafter fully described.

The feeding device is operated by a back-shaft, R, arranged parallel to the feed-screw L, and supported in bearings *h* and *k* upon projecting arms of the head-block.

The gear N′ is connected for operation to a pinion, R^1, on the outer end of the back shaft R, by means of an intermediate gear, R^2, which latter is supported upon a suitable stud, *l*, projecting from the side of the arm of the bearing *k*, or from some other convenient portion of the machine.

The speed of the feeding devices may be changed by changing the gear N′ and pinion R^1 for others of greater or lesser diameter.

The back shaft R is provided at its inner end with a spur-gear, S, which meshes with the gear I upon the hollow shaft F, and by this means motion is transmitted to the various parts connected with the shaft R.

The tapping and feed devices upon each of the several head-blocks E E^1 E^2 are of the same construction and arrangement, except that to one of the back shafts R (in this instance the one upon the head E^1) is added a worm or screw, T, for actuating the mechanism of the shipper devices, which are arranged as hereafter described.

The outer end of the operating-shaft B^1 is prolonged beyond the end of the frame A^2 far enough to support the two driving-pulleys V V′, both of which are hung loosely upon the shaft B^1, in the position indicated in figs. 1 and 2.

The pulleys can be joined at will to the shaft B^1 for operation by means of a clutch device between their hubs *v v′*.

The end of the shaft B^1 is formed hollow, and it is slotted through for a short space at a position central to the hubs of the driving-pulleys.

A spindle, *t*, extends into the end of the shaft B^1, the inner end of which is furnished with a cross-head, *u*, that projects out through the slot in the shaft B^1, at the center between the hubs *v v′*. Notches are formed in the hubs *v v′* to receive the ends of the cross-head *u*, and either of the pulley-hubs may be locked to the shaft B^1 by moving the spindle *t* in or out far enough to cause the cross-head *u* to enter the notches on one of the hubs.

Both of the pulleys *v v′* may, when desired, be left free to turn loosely upon the shaft B^1 by moving the cross-head *u* to a position intermediate between the hubs *v v′*.

The end of the shaft B^1 is supported in a bearing, *w*, at the outside of the pulley V.

The spindle *t* is operated by means of a shipper-lever, W, which is pivoted to the end of the spindle *t*, and fulcrumed at W^1 upon an arm, W^2, which extends back from the main frame, as indicated in figs. 1 and 2. A longitudinal slot is formed through the lever W to receive the fulcrum-bolt W^1, and the lever is thereby permitted to conform to the direct line of motion required for the spindle *t*. The lever W is arranged in an oblique position, and its upper end is provided with a handle, *x*, by means of which the shipper device can be operated by hand, while its lower end W^3 is pivoted to the end of a rod, Y, by means of which the shipper is connected with devices for operating the lever W automatically.

The driving-pulleys V V′ are turned in opposite directions, one being driven with a crossed belt and the other with an open belt, and the working parts of the machine are driven forward or backward accordingly as the pulley V or V′ is locked to the shaft B^1. The arrows upon fig. 1 indicate the direction of motion of each of the pulleys.

The pulleys are provided with flanges at their inner edges to prevent the belts from running in contact with each other.

The shipper-rod Y is provided with two stop-collars, 1 and 2, and it is moved back and forth by the action of the worm or screw T upon the back shaft R, which screw meshes with and operates a toothed segment, T^1, pivoted at 3 to the side of the head-block E^1. An arm, T^2, extends downward from the segment T^1, the lower end of which is joined by links 4 to a slide, 5, upon the shipper-rod Y.

As the slide 5 is moved forward or backward along the rod Y it engages with the stop-collars 1 and 2, and thereby moves the rod Y and operates the shipper devices.

The collars 1 and 2 are secured to the rod Y by means of set-screws, and they may readily be adjusted thereon to different positions to change the action of the machine, making it run in one direction for a longer or shorter time, as desired.

A coiled-wire spring, 7, is arranged around the rod Y, between the slide 5 and the collar 2, for the purpose of throwing the shipper far enough to carry the cross-head *u* of the clutch past the center, from one hub *v* to the other hub *v′*, and thereby reverse the motion of the machine.

The forward end of the rod Y is in this instance passed through an opening in the hanger-frame D^2, whereby it is supported in the proper position.

The lever device for operating the forks Q is illustrated by fig. 4 of the drawing. It consists of a main lever, 8, to which are connected two side levers, 9 and 10, arranged at right angles to the main lever 8, and connected therewith by means of ball-joints, as shown at their junction 11.

The levers 8, 9, and 10 are each fulcrumed near their centers to the fulcrum-pieces 12, while their outer ends are pivoted to the lower ends of the shanks Q′ of the forks Q.

The front end of the main lever is provided with a treadle, 13, and the operator, by pressing down said treadle 13 with his foot, can with one movement throw up all of the forks Q to set forward the thrust-bearings O, as all of the levers act in concert.

The levers are held when down by means of a spring latch, 14, which locks over one of the levers, as indicated. This latch is automatically drawn back to release the lever at the proper moment by a rod, 15, the rear end of which is connected by means of a simple lever, 16, to the lower end of the arm T^2 of the shipper segment T^1, in the manner fully shown in fig. 2.

The rod 15 passes through the upper end of the latch 14, and it is provided with an adjustable collar, 17, which, coming in contact with the top of the latch 14, as the rod 15 is moved backward, releases the levers, which are thrown up by any suitable device of weight or springs, which devices being common it is not necessary to herein illustrate.

A loop, 18, is arranged over the main lever, to prevent it from rising too high when the levers are released.

The steam, gas, or water-pipe fittings, or other articles to be operated upon by the taps K, are secured in a peculiarly-constructed vise or holder, a central vertical section of which is shown by fig. 5 of the drawing.

A bed-plate, 19, is secured to the top of the frame A by the screws or bolts 20, which pass through slots in the plate 19, to permit a lateral adjustment of said plate.

To the upper side of the bed-plate 19 is fitted a sliding plate, 21, arranged with dovetailed ways in such a manner that it can be moved forward and backward by means of a bell-crank hand-lever, 22, fulcrumed at its knee to a projecting portion, 23, of the bed-plate 19, and provided at its inner end with a pin, 24, which works in a transverse slot in the slide-plate 21.

A swing-bar, 25, is pivoted at its center to the slide-plate 21, by a pintle-bolt, 26, and upon the top of said swing-bar is a supporting-frame, 27, in which are arranged the vise-jaw levers 28 and clamping-screws 29.

The levers 28 are pivoted at their inner ends upon screws or bolts 30, and the screws 29 are set in a vertical position, so as to screw down upon the outer ends of said levers, and cause them to hold the fittings.

The screws 29 are provided with ball-handles 31, whereby they can be conveniently and rapidly operated.

Springs 32 are arranged beneath the levers 28, as indicated, for the purpose of raising them when the screws 29 are run up.

At each end of the swing-bar 25 is arranged a holding-box, 33, constructed so as to fit closely around and embrace the several ends of the fitting 34, and, when the jaw-lever 28 is set down upon the top of the box 33, the fitting 34 is held firmly and securely in place.

The upper part of box 33 can be removed when the lever 28 is raised, as indicated at the right-hand end in fig. 5, for the purpose of exchanging the fittings.

A series of different-sized boxes is used to correspond with the different-sized fittings.

Studs 35 project up from the bed-plate 19, between which the end of the swing-bar is held when the parts are in working position.

The studs 35 are provided with flanges at their inner sides, which fit in the grooves formed on the sides of the swing-bar 25, and thereby prevent any vertical movement of the parts during the operation of tapping.

When the slide-plate 21 is moved out, by swinging forward the handle of the lever 22, the end of the swing-bar 25 is released from between the studs 35, and the position of the swing-bar 25 and parts connected therewith can be reversed. This enables the operator to change the fitting at one end during the operation of the machine upon the fitting at the other.

The machines may, when desired, be made with four sets of tapping mechanism, instead of three, in which case the fitting-holding devices would be arranged in a diagonal position between two of the wings.

The driving-pulleys and shipping mechanism may be arranged at the end of either of the shafts B, B^1, or B^2, as most convenient.

Upon large and heavy machines, where great power is required, the driving-pulleys may be arranged upon a side shaft, which shaft can be connected by a suitable pinion to a large gear fixed upon the shaft B^1, and the necessary power be thereby gained.

The operation of my improved tapping-machine is as follows:

The fitting to be tapped is secured within the box 33, in the manner explained, the bar 25 is swung around, and the slide-plate moved in, so as to bring the end of the bar between the studs 35. This sets the fitting 34 in the proper position to receive the taps K.

The operator then places his foot upon the treadle 13, and depresses the levers 8, 9, 10, which are caught and held down by the latch 14.

The levers 8, 9, 10 raise the forks Q, and their beveled points set forward the thrust-bearings O, to receive the pressure against the taps.

The operator next draws forward the handle of the shipper-lever W, which moves the cross-head *u* into the notch on the hub *v*, and locks the pulley V to the shaft B^1, thereby setting the machine in motion.

The taps K are fed forward into the fitting by the nut-gear N and feed-screw L, all of the taps advancing simultaneously.

The worm T, acting upon the segment T^1 and arm T^2, moves forward the slide 5 upon the rod Y, the spring 7 being compressed until it rests solidly against the collar 2, at which time the pressure, acting against the collar 2, moves forward the rod Y, and actuates the shipper-lever W, so as to release the cross-head *u* from the notch in the hub *v*, when the spring 7, suddenly being relieved, expands, and, by throwing forward the rod Y, carries the cross-head *u* past the center and into the notches upon the hub *v'*, thereby releasing the pulley V, and locking the pulley V' to the shaft B^1, which operation reverses the motion of the machine, so as to withdraw the taps from the fitting.

At the same instant that the shipper is operated to reverse the motion of the machine the rod 15, which is drawn back by the lever 16, removes the latch 14, and releases the levers 8, 9, 10, which, in rising, draw down the fork Q, and thereby relieve the pressure upon the thrust bearing O, leaving said bearings loose, so that there will be no strain upon the taps, during their backward movement, as they are led out by the feed-screws L, thus preventing them from tearing out or injuring the thread as they are withdrawn from the fittings.

The machine runs with the reverse motion until the taps K are at a proper distance out of the way, when the slide 5, coming in contact with the collar 1 upon the rod Y, moves back the shipper-lever far enough to release the cross-head *u* from the notches on the hub *v'* of the pulley V', which latter being unlocked from the shaft B^1, the motion of the machine is discontinued.

The operator then swings out the handle of lever 22, and thus moves out the slide-plate 21, so as to allow the reversing of the swing-bar 25, which brings to the front the finished fitting, and carries into position the next to be operated upon.

The operator removes the finished fitting from the box 33 at the outer end of the swing-bar 25 during the operation of tapping the fitting in the box at the inner end of said bar, the only time wasted by stopping the machine being just sufficient to permit of the reversing of the swing-bar and holders, which requires but a moment.

It will be observed that, the three operating-shafts B B^1 B^2 being geared to the horizontal gear D, and all other parts of the working mechanism connected by gear, the motions of all the parts are rendered positive and uniform, both in their forward and backward movement. This is important, and gives my machine great advantage over machines previously used for this purpose, since there is no liability of one tap failing to operate to the same extent as the others.

Having described my improved tapping-machine,

What I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. The combination, with the tapping-spindle J and feed-screw L, of the screw-cap M, lock-nut J', and center-pin *m*, substantially as and for the purposes set forth.

2. The combination, with the tapping mechanism and locking-clutch, of the shipping devices, consisting of the worm T, segment T^1, arm T^2, link

4, slide 5, collars 1 and 2, spring 7, rod Y, levers W W^1 W^3, and spindle *t*, substantially as and for the purposes set forth.

3. The combination, with the arm T^2 and levers 8, 9, 10, of the latch 14, rod 15, lever 16, and adjustable collar 17, substantially as and for the purposes set forth.

4. The combination of the rotary spindle J, pivoted to feed-screw L, arm L′, guides *n*, revolving nut N, gear-wheel N′, sliding bearing O, and fork Q, constructed and arranged to operate as described.

5. The combination of the swiveled frame 27, slide-plate 21, swing-bar 25, levers 28, clamp-screws 29, and holding-boxes 33, substantially as described.

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Witnesses:

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