(No Model.) 4 Sheets—Sheet 1.

E. F. SPAULDING.

MACHINE FOR TAPPING WATER AND GAS FITTINGS.

No. 265,169. Patented Sept. 26, 1882.

Fig. 7.

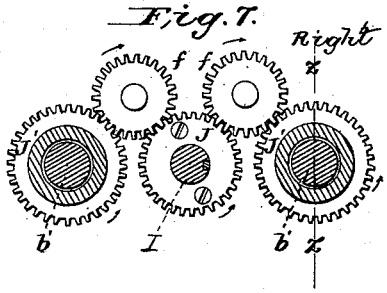


Fig. 6.

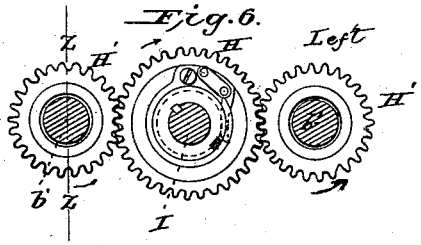


Fig. 5.

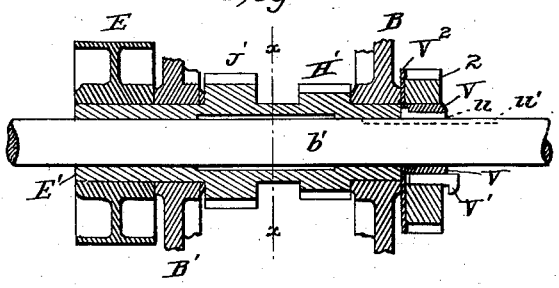


Fig. 1.

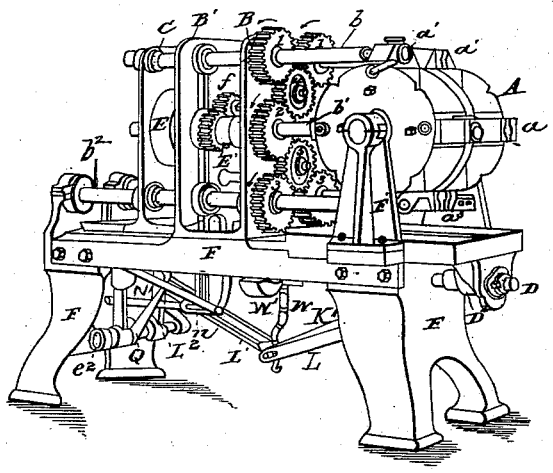
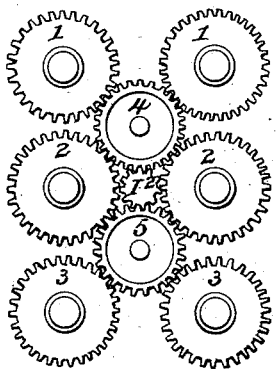


Fig. 9.



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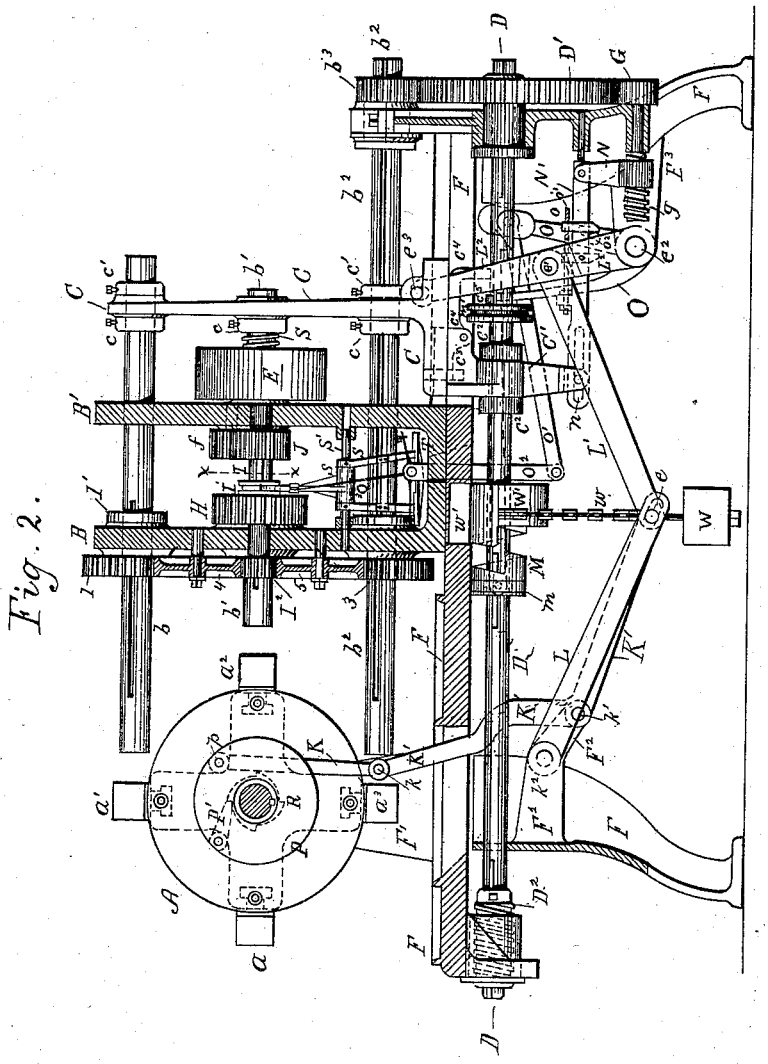
E. F. SPAULDING.

MACHINE FOR TAPPING WATER AND GAS FITTINGS.

No. 265,169. Patented Sept. 26, 1882.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

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MACHINE FOR TAPPING WATER AND GAS FITTINGS.

No. 265,169. Patented Sept. 26, 1882.

Fig. 3.

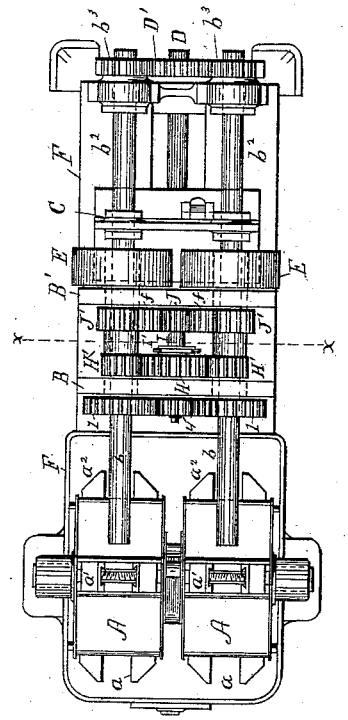
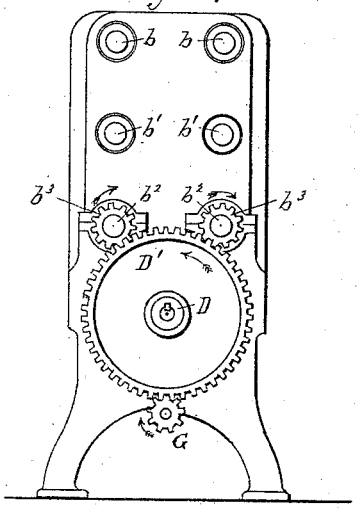


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

E. F. SPAULDING.

MACHINE FOR TAPPING WATER AND GAS FITTINGS.

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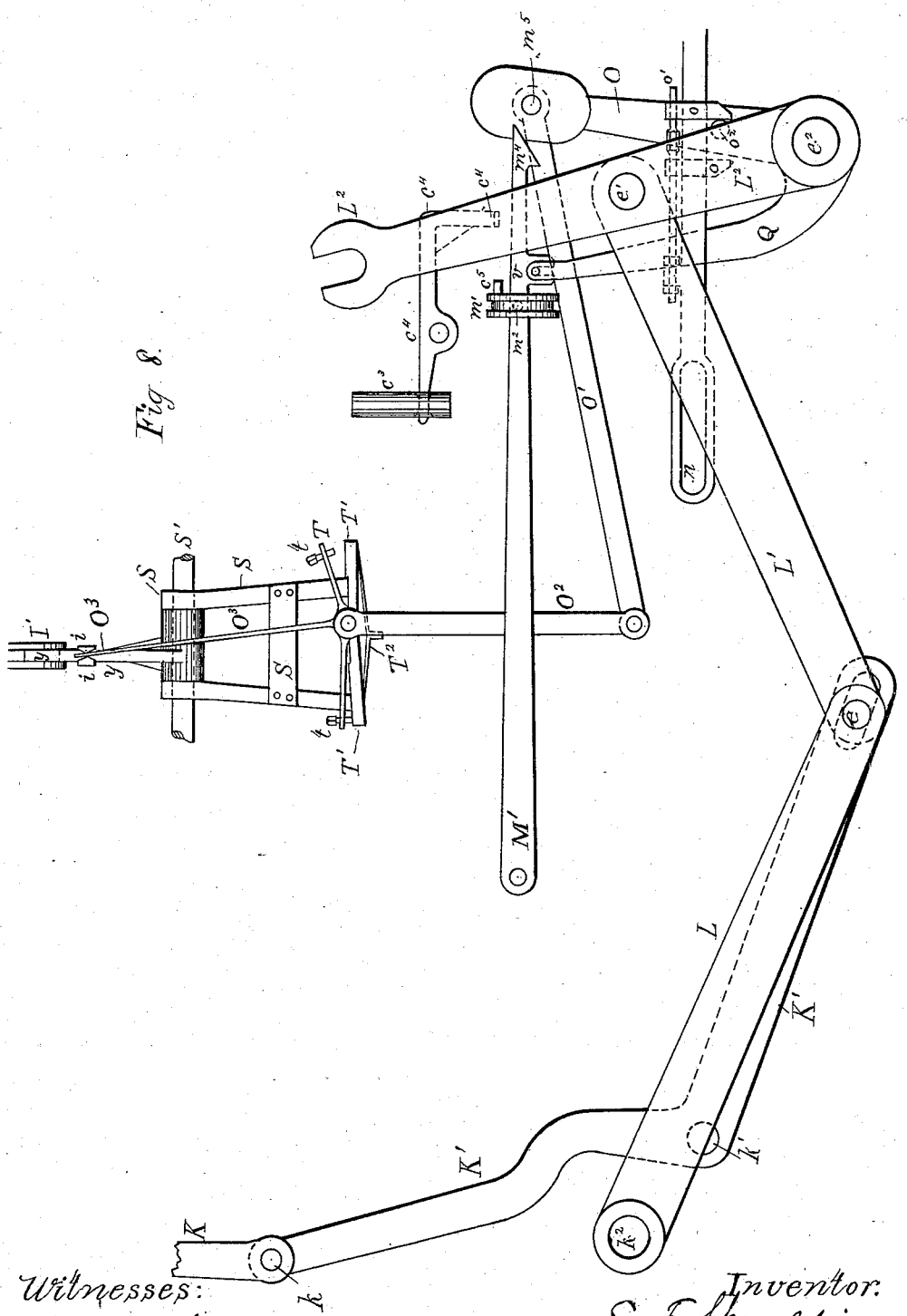
Fig. 8.



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N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ELIJAH F. SPAULDING, OF ERIE, PENNSYLVANIA, ASSIGNOR TO THE JARECKI MANUFACTURING COMPANY, (LIMITED,) OF SAME PLACE.

MACHINE FOR TAPPING WATER AND GAS FITTINGS.

SPECIFICATION forming part of Letters Patent No. 265,169, dated September 26, 1882.

Application filed April 5, 1882. (No model.)

To all whom it may concern:

Be it known that I, ELIJAH F. SPAULDING, a citizen of the United States, and a resident of Erie, in the county of Erie and State of Pennsylvania, have invented new and useful Improvements in Screw Cutting or Tapping Machinery; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings and the letters or figures of reference marked thereon.

My invention relates to the construction of that class of screw-cutting machines designed for screw-threading pipe-fittings, and particularly to such as have a series of taps for operating upon several fittings simultaneously.

The features of my machine which are found in other devices for the same purpose are as follows: a series of chucks or vises for holding the fittings mounted upon a revolving frame-work, and so arranged as to present the various openings or "ways" of the fittings successively to the various taps of the series; a series of tap-spindles mounted in a moving frame or carriage, and so arranged as to present a series of taps to the series of fittings held in the chuck-arms of the rotating frame; mechanism for operating said tap-spindles simultaneously either for entering the taps or withdrawing them; shifting mechanism and clutches for changing the direction of motion of the tapping mechanism; and, finally, mechanism for feeding forward or drawing back the carriage carrying the tap-spindles. In my machine the mechanism by which these various features are obtained differs from other machines, and therein lies the subject of my invention, as will hereinafter more fully appear.

My invention is illustrated in the accompanying drawings, which form a part of this specification, of which there are four sheets, containing nine figures, as follows:

Figure 1 is a perspective view. Fig. 2 is a central vertical longitudinal section, the centrally-located shaft D and devices thereon being in elevation. Fig. 3 is a top plan view. (See *f*, Sheet 3.) Fig. 4 is an elevation of the end not seen in Fig. 1. Figs. 5, 6, and 7 are details of construction of part of the driving mechanism, and are as follows: Fig. 5 is a vertical longitudinal section on the line *z z* in Figs. 6 and 7. Fig. 6 is a section on the line *x x* in Figs. 2 and 5, the parts shown being on the right of said line in Fig. 5 and the left of it in Fig. 2. Fig. 7 is a like view to Fig. 6, the direction of vision being in the opposite direction. Fig. 8 is an enlarged view of the levers seen in Fig. 2, which form part of the reversing mechanism. Fig. 9 is a view of the spindle-driving gears, which are arranged in front of the frame B.

The construction of my machine is as follows:

F is a frame on which the various parts are mounted, and is of ordinary construction.

A is the chuck-frame, and is mounted on standards F′. The machine has two series of chucks and two series of taps and spindles. There are four chucks in each series and three taps and spindles. The chucks of each series are arranged at right angles to each other radially in the frame A. The series of taps and spindles are arranged vertically. This arrangement of these several parts and the construction and operation of the chucks form no part of this invention, not being novel.

B B′ is a frame-work or standards mounted on the general frame F, and sustains the gearing for operating the tap-spindles.

C is a movable carriage or standard, in which the tap-spindles are mounted, and by which the lower and upper spindles of each series are advanced and receded. (The middle spindles only have to move a very slight distance back after the tap leaves the fitting, and this slight movement is effected by springs *s* on the same. The movement of these middle spindles while doing their work is, however, effected by the carriage C.) The spindles of each series are lettered *b b′ b²*.

The machine is driven by two band-pulleys, E E, mounted on sleeves E′ E′, which contain the middle spindles, *b′*. On these sleeves are also gears H′ and J′, which convey the movement to the spindle-actuating mechanism.

The mechanism for feeding forward and withdrawing the taps consists of the shaft D, operated by the pinion D′, which gears into the pinions b^3 b^3 on the spindles b^2 b^2, the lead-screw D^2, collar C′, levers L L′ L^2, drum W′, and chain *w*.

The mechanism for changing the direction of motion of the spindles consists of the clutching-collar I′ on the shaft I, the yoke Y, shift-

ing frame S, pinion G, screw *g*, nut N, sliding bar N′, adjustable tappet-jaws *o o*, lever O, connecting-bar O′, lever O^2, spring O^3, cross-head T, catch-bar T′, and spring T^2.

The mechanism for rotating the chuck-frame consists of the angle-lever K′, connecting-rod K, pawl-carrying plate P, pawl P′, and ratchet R.

I will now proceed to describe more minutely the construction and operation of the above-named mechanisms, beginning with the driving mechanism.

The two belt-pulleys are mounted on sleeves E′. Fig. 5 shows one of these sleeves in section. They are journaled in the frame-work B B′, and extend far enough back of B′ to receive the pulleys E. Upon these sleeves, between the standards B B′, are two pinions, J′ and H′. Lying between these sleeves is a shaft, I, on which are mounted two clutch-pinions, J and H, between which is the sliding clutch-collar I′. (See Figs. 2 and 3.) The form of clutch used is not essential and will not be described. One is shown, however, on pinion H in Fig. 6. When not clutched these pinions H and J run loose upon the shaft. The pinion H gears directly with the driving-pinions H′ H′, while the pinion J receives its motion through intermediate gears, *f f*. Consequently the pinion J moves in the opposite direction from the pinion H, and hence the shaft I will move in one direction when clutched by the pinion J and in the opposite direction when cluched by the pinion H. All the spindles are operated from the shaft I, and hence their direction of motion is regulated by the movement of the clutching-collar I′.

On the front side of the standard B is a pinion, I^2, (see Figs. 9 and 2,) which is keyed on the shaft I. This pinion I^2 gears with pinions 4 4, which are mounted on studs on the standard B, and from these 4 4 the spindle-pinions 1 2 3 are driven. This arrangement of gearing is clearly shown in Fig. 9. The spindle-pinions are all mounted upon the spindles by a spline-and groove arrangement, so that the spindles can move forward and back as operated by the feeding and drawing mechanism. As the middle spindles, *b′ b′*, move only a short distance, I use the following construction to avoid grooving the spindle farther than necessary: The pinion Q is mounted on a collar, V, by the key V′ and a key, U, in the collar V, and groove U′ serves as a spline. This device can be unshipped without drawing out the spindle. It is shown in Fig. 5. The spindles are connected with the carriage C by means of collars *c c′*, which are held in place by set-screws. In order to permit the chuck-frame to revolve, the upper and lower spindles have to be drawn back some distance after the taps clear the fitting; but the middle spindle only has to move a very slight distance, which movement is effected by the spring *s*, and therefore there is no collar *c′* on the end of that spindle. The carriage C, when advancing the taps into and when drawing them from the fitting, is moved by the lead-screw D^2 on the shaft D by means of the yoke or collar C′, which is connected with the carriage C by a pin, c^3. When it comes time for the upper and lower spindles to move back the extra distance, so as to clear the chucks as they revolve, the pin c^3 is drawn down, and the carriage C is moved back rapidly by the lever L^2. The mechanism for drawing down this pin c^3, and thereby disengaging the carriage from the yoke C′, is as follows: The pin c^3 is attached to one end of the lever c^4, which is turned down at its other end so as to form a foot. On the shaft D is a sliding collar, *m′*, on the side of which is a pin, c^5, a bar, M′, lying parallel with the shaft D, connected at one end to a collar, *m*, on said shaft, and the other end resting on the end of an arm or lever, Q. This bar has on its end a hook, m^4, which, when the machine is moving in one direction, engages with the pin m^5 on the lever O, and by this connection is drawn along, when the machine is reversed until lifted off the pin by its supporting-arm Q. For instance, the machine is represented in Fig. 2 as at the point where the taps first enter their work in the fittings. In this figure the rod M′ is shown in dotted lines as it is beyond the shaft D; but in Fig. 8 it is shown in full lines. As the machine operates the pin m^5 is moving toward the hook m^4 on the bar M′, with which it engages before the machine reverses. When the reverse motion takes place it draws the bar M′ back with it until the lever Q, on which it rests and which moves with it, lifts it off the pin m^5. This bar M′ has on its side a pin, m^2, which lies in a groove in the sliding collar *m′*, and thus the collar is moved along with the bar M′. The movement of these parts is effected from the screw *g* and nut N, which also regulate or operate the shifting mechanism. When the collar *m′* is drawn along so the pin c^5 is under the foot of lever c^4 it will lift that lever and withdraw the pin c^3 and free the carriage C from the yoke C′, and leave it free to be moved back by mechanism which operates more quickly than the lead-screw, which moves the carriage when the taps are in the fittings. The mechanism for thus moving the carriage C when the taps are not in the fittings is as follows: On the shaft D is a loose drum, W′, which is kept from moving laterally by being partly within a recess, *w′*, in the bed-plate of the frame. One side of this drum is provided with one of the parts of a ratchet-clutch, and to it is connected a chain, which winds upon it. On the shaft D, in front of the drum W′, is placed the other part of the ratchet-clutch, (see M,) which is mounted thereon by a spline-and-groove arrangement, so as to slide while it revolves with the shaft. In front of this part of the clutch M is the loose collar *m*, to which the rod M′ is attached. Now, it will be seen that as the rod M′ is moved, as above described, it will draw the two parts of the clutch together, and when this occurs the drum W′ will revolve and wind up the chain *w*, and

as this chain is connected with the toggle-levers L L′ they are drawn up, and when so drawn up they throw back the lever L^2, which is connected with the carriage C, and thereby moves it back rapidly. As soon as the hook on rod M′ is disengaged from the lever O the rod M′ is free to move back, and as the motion of the machine is reversed immediately after this disengagement the clutch M is thrown from the drum W′ by reason of the form of the faces of the two parts, which form is that of an inclined spiral plane. As soon as the clutch M W′ is thus disengaged the weight W draws down the toggles L L′, and thus, through lever L^2, draws back the carriage.

It should be here remarked that while the pin c^5 is under the foot of the lever c^4 the machine reverses, and the lever is thus kept up until the carriage has been moved back and forward by the lever L^2, and when the lever c^4 is released from the pin c^5 the pin c^3 again enters its place in the carriage C and connects it with the yoke C′.

The mechanism for revolving the chuck-frame is as follows: On its shaft is a ratchet, R, (see Fig. 2,) and by its side is a pawl-carrying plate or disk, P, which is concentric with the ratchet, and is free to revolve upon the shaft of the chuck-frame. To this plate is pivoted a pawl, which engages with the ratchet, and a pitman-rod, K, which is connected with the elbow-lever K′, and the movement of this lever upon its fulcrum k' will cause a rocking movement of the plate P, and the movement, which is effected as hereinafter set forth, is sufficient to move the plate P a quarter-turn. The operation of these devices is as follows: During the time the carriage is drawn back and forward by the lever L^2 the chuck-frame revolves a quarter-turn. This movement is effected as follows: The lower end of the lever K′ is connected to the pivot-pin l, which joins the levers L and L′. The lever K′ at this point is slotted, as shown by dotted lines in Figs. 2 and 8, and as the toggles go up this lever is raised with them and a quarter-turn of the pawl-carrying plate P is effected, and thereby the pawl moves the chuck-frame forward a quarter-turn. When the toggles L L′ are drawn down by the weight and carry down with them the lever K′ the plate P is moved in the opposite direction and carries the pawl back into a new notch in the ratchet R. The shifting mechanism—that is to say, the devices by which the clutch-collar I′ is moved so as to clutch the shaft I with first one pinion, H, and then the other, J, and thereby change the direction of motion—is as follows: Keeping in view the statement made above—viz., that the position of the parts as shown in Figs. 2 and 8 is that which they occupy when the taps are beginning to enter the fittings—it will be seen that the machine has to run until the threads in the fittings are finished, and hence varies according to the size of the fittings. The parts which move the shifter take their movements from the nut N on the screw g, which is revolved by the pinion G, as has been before stated. As the nut N moves forward it moves the bar N′, on which are the tappet-jaws o o. These jaws are made adjustable by a screw-rod, o', and by this adjustment is regulated the space of time between the shifts, which, as before stated, must vary according to the size of the fitting, or, in other words, the distance the taps have to work and also the pitch of the thread, which regulates the speed with which the taps move forward or back in the fitting at a given speed of rotation. As the bar N′ moves forward one of the jaws o carries with it the pin o^2, which is a part of the lever O, and therefore that lever is carried along. By means of the connecting-rod O′ the lever O^2 is also moved. The upper end of this lever O^2 is a strong whip-spring, O^3, the end of which is grasped by two lugs, i i, on the stem of the yoke Y. On the lever O^2, at or near its pivot, are two arms, T T, forming a cross-head, and on the ends of these arms are adjusting-screws t t.

Pivoted on the pivot of the lever O^2 are two catch-bars, T′ T′, which rest respectively on the ends of a T-spring, T^2. On the lower end of the yoke-stem Y is a frame, S, which has hangers S′, which fit loosely in openings in the standards B B′. This frame can shift from side to side of the space between the standards B B′, and when it does it carries the yoke Y and clutch-collar I′ with it. The lower ends of this frame set upon the catch-bars T′ T′ and engage with the catch on the one or the other, as the case may be. The movement is as follows: As the lever O^2 is swung forward by the movement of the lever O and rod O′ the whip-spring O^3 becomes bent. It cannot move the parts to which it connects, because of the frame S being held by the catch-bar T′; but as the movement of the lever O^2 goes on the arm T is brought to bear upon the catch-bar T′ and depresses it far enough to loosen the catch. As soon as this occurs the spring O^3 throws the frame S over quickly and of course, as quickly carries the clutch-collar I′ over and clutches the pinion J, and thereby reverses the motion of the machine almost instantly. The return shift is effected in precisely the same manner.

I have shown the lead screw D^2 as being on the shaft D. When a machine is thus constructed all the taps must have the same pitch of screw-thread. In some sizes of fittings the ways are not threaded with the same pitch. For tapping such fittings the machine would have to be provided with lead-screws on the spindles. This can be done in my machine as well as any other, and will not affect any of the other parts of the machine.

The peculiar form of clutch used on the pinions H and J, and shown in Fig. 6, forms no part of this invention, but is the subject of a separate application for a patent.

It should have been stated, perhaps, in a former part of this specification that the collar V, on which the pinion Q is keyed, has a flange, V^2, on its back, which passes back of

the cogs of the pinions which gear with pinion Q, and thereby the said pinion Q is prevented from sliding laterally on the spindle b' except as the spindle is moved by the carriage. The other spindle-pinions, 1 and 3, are so held by being collared on the standard B. (See 1′ in Fig. 2.)

The operation of my machine as a whole is as follows: Starting with the position of parts as shown in Fig. 2, the taps are now just beginning their work in the fittings held in the chucks a' a^2 a^3, which are what are called "T-fittings" or "three-way fittings." Each of the taps of a series operates upon a different way of the fitting from that of its companion taps; but this arrangement is not novel. The machine now being in motion, the lead-screw D^2 is slowly drawing the carriage forward and feeding the taps to their work. At the same time the screw g is advancing the nut N, and through its connections is moving the lever O^2 and drawing the whip-spring O^3 to a high tension. When the lever O^2 has been moved so as to cause the arm T to loosen the catch T′ the whip-spring throws the clutch-collar I′ over and sets the backing-gear J in operation, and by the time the taps have backed out of the fitting the lever O, by its connection with the bar M′, and through its backward movement, has drawn the clutch M into contact with the drum W′ and the pin c^5 on the collar m' under the foot of lever c^4, and the pin c^3 is drawn out of the carriage, the drum W′ revolves and draws up the toggles, the carriage C runs back quickly and draws the upper and lower spindles back so the chuck-frame can revolve, which it does at the same time the carriage is moving back, for the lever K′, which moves the ratchet, and the lever L^2, which moves the carriage, both receive their motion from the movement of the chain. In the meantime the whip-spring O^3 was being bent by the movement of the lever O, rod O′, and lever O^2, and is ready to throw the shifting device back, and the time has come for the escapement of the frame S to occur to allow the spring to act. The escapement taking place, the machine at once reverses, and this allows the clutch M to free itself from the drum W′, and thus allow it to move by the weight W, which rushes down and carries the toggles with it. This downward movement of the toggles draws back the carriage and throws back the pawl P′ into a new notch, which brings all the parts into the position, as shown in Fig. 2 again.

What I claim as new is as follows:

1. In a screw-cutting machine, the combination, with the revolving fitting chuck-frame having a ratchet thereon, of the pawl-carrying plate P, pawl p', connecting-rod K, elbow-lever K′, chain W, and drum W′, substantially as and for the purposes mentioned.

2. In a screw-cutting machine having a series of chucks mounted on a revolving frame, and a series of taps and tap-spindles for operating upon fittings held in said chucks, the combination therewith of a carriage, C, yoke C′, shaft D, and lead-screw D^2, substantially as set forth.

3. In a machine for cutting screw-threads in pipe-fittings, a revolving chuck-frame, A, with a series of chucks, a a' a^2 a^3, thereon, in combination with the tap-spindles b b' b^2, the carriage C, lever L^2, and toggles L L′, substantially as and for the purposes set forth.

4. In a machine for cutting screw-threads in pipe-fittings, a revolving chuck-frame, A, with a series of chucks, a a' a^2 a^3, thereon, in combination with the tap-spindles b b' b^2, the carriage C, lever L^2, toggles L L′, lever K′, rod K, pawl-carrier P, and pawl and ratchet P′ R, said lever K′ being connected to and moving with the toggles, whereby the said chuck-frame is revolved at the same time that the carriage is drawn back, as set forth.

5. In a machine for cutting screw-threads in pipe-fittings, the combination, with the carriage C, which carries the tap-spindles, of a yoke, C′, upon the lead-shaft, the connecting-pin c^3, lever c^4, pin c^5, collar m', bar M′, pin m^2, collar m, and clutch M, substantially as and for the purposes set forth.

6. In a machine for cutting screw-threads in pipe-fittings, the combination, with the tap-spindle carriage and the devices by which it is moved from the lead-screw and made detachable therefrom, substantially as shown, of the levers L^2 L′ L, drum W′, clutch M, rod M′, and lever O, substantially as shown.

7. In a machine for cutting screw-threads in pipe-fittings, a reversing apparatus consisting of the following elements: a shifting frame bearing a yoke which engages with the clutch-collar, a swinging lever having one end formed into a whip-spring and connected with said shifting parts, spring catch-bars which engage with said shifting parts, and a cross-head on said swinging lever for disengaging said catch-bars, substantially as shown.

8. In a machine for cutting screw-threads in pipe-fittings, the combination, with the shifting apparatus, of the following elements: the screw g, nut N, rod N′, adjustable tappet-jaws o o, pin o^2, lever O, and means, substantially as shown, for connecting said lever O with the said shifting apparatus.

In testimony that I claim the foregoing I have hereunto set my hand this 17th day of February, 1882.

ELIJAH F. SPAULDING.

Witnesses:
JNO. K. HALLOCK,
W. S. BROWN.