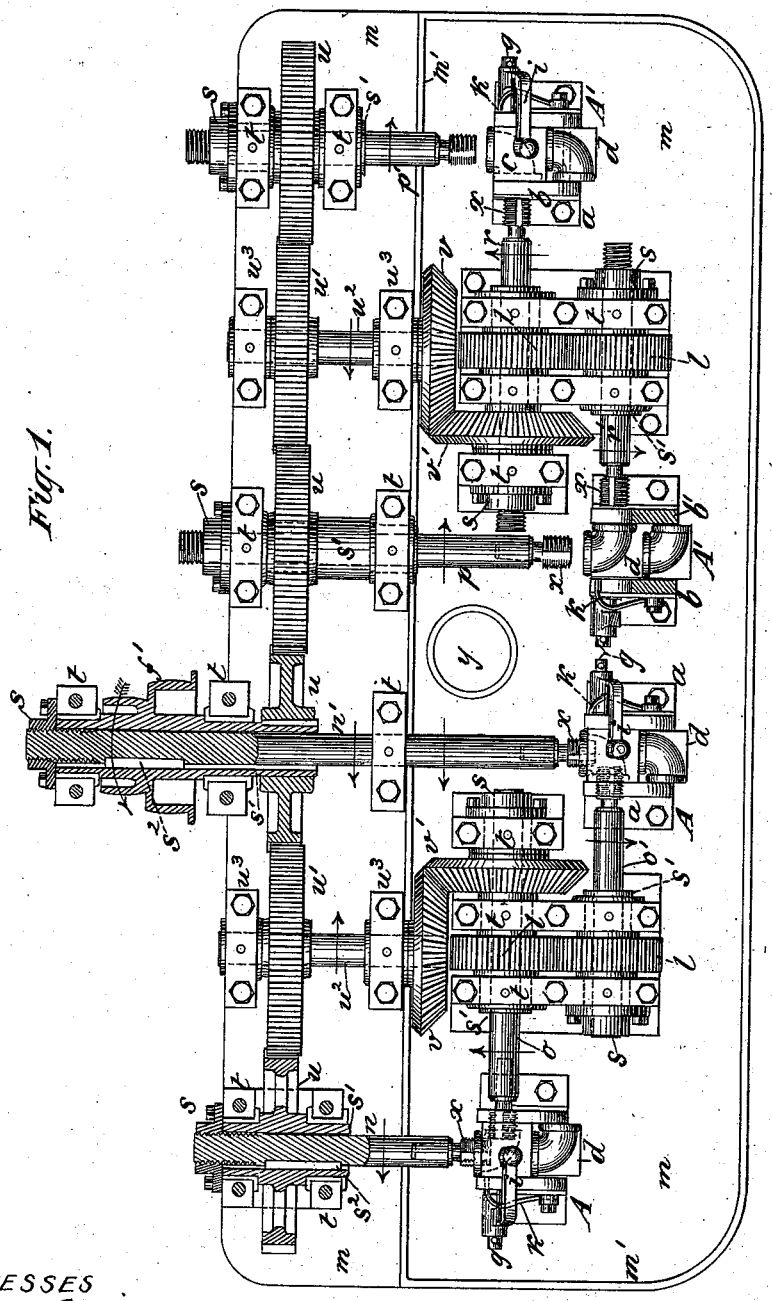
(No Model.) 3 Sheets—Sheet 1.

T. F. HAMMER.

MACHINE FOR TAPPING PIPE ELBOWS.

No. 382,606. Patented May 8, 1888.

Fig. 1.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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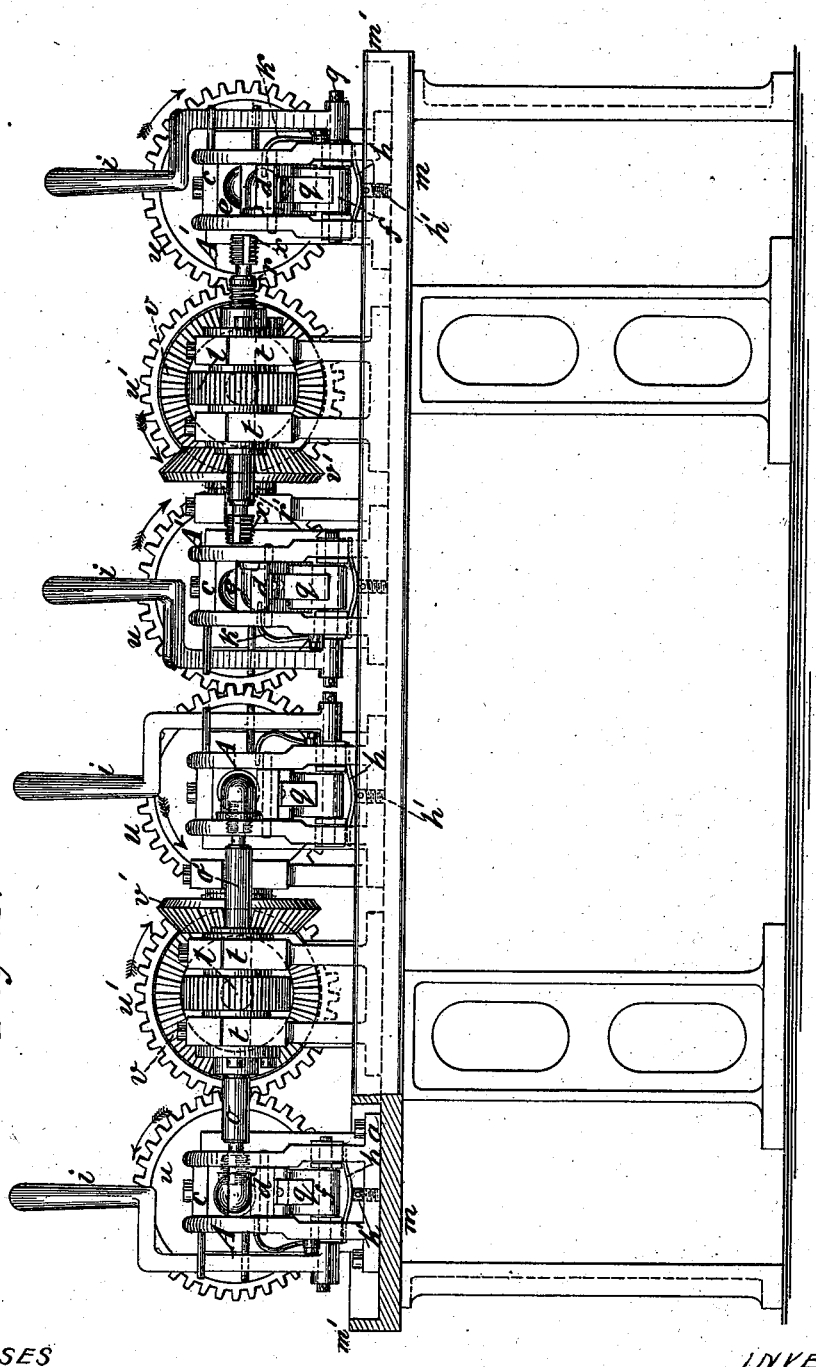

Fig. 2.

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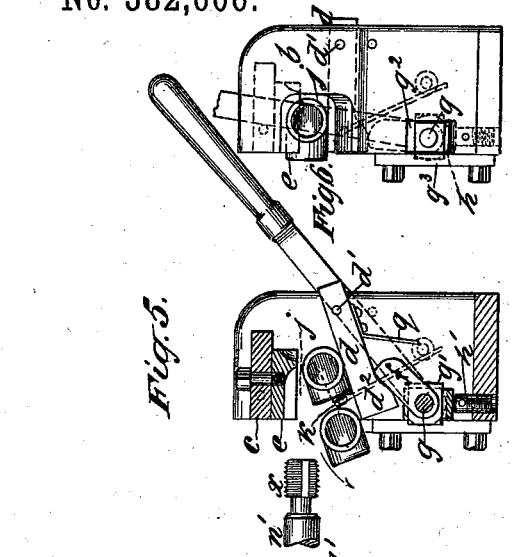
Fig. 6.

Fig. 5.


Fig. 9.

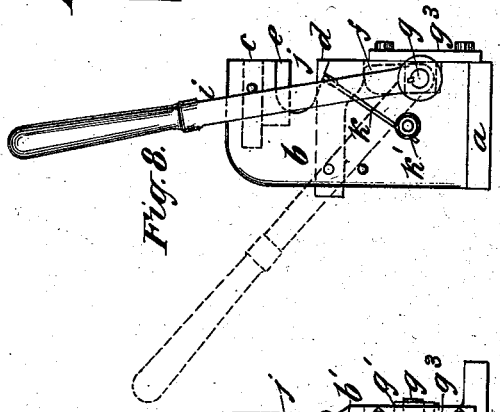
Fig. 8.

Fig. 4.

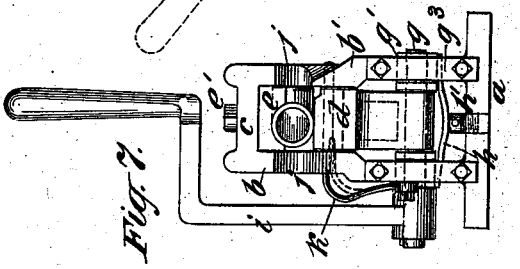
Fig. 7.

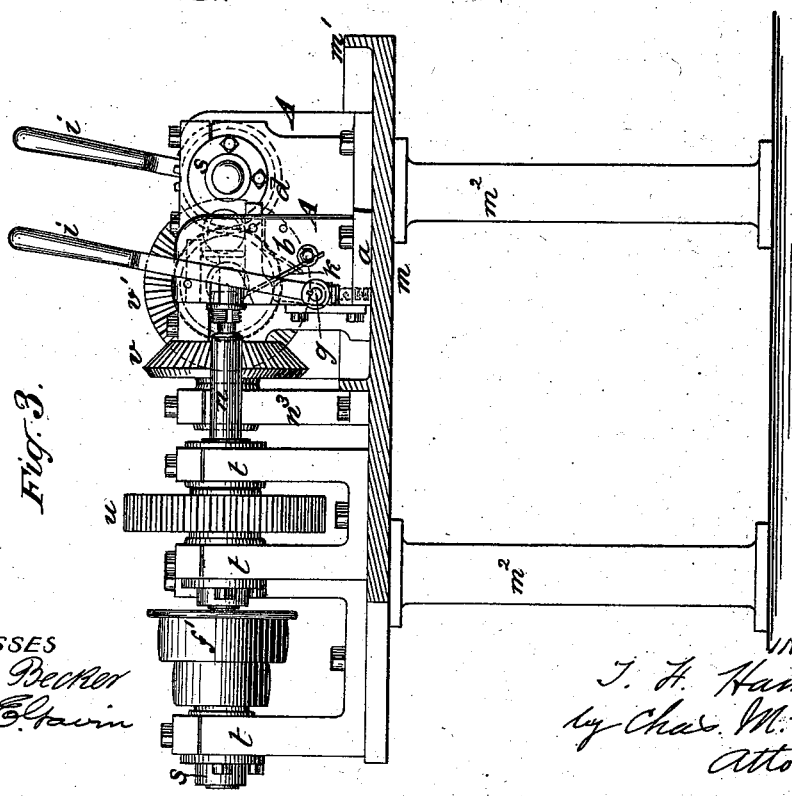
Fig. 3.

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UNITED STATES PATENT OFFICE.

THORVALD F. HAMMER, OF BRANFORD, CONNECTICUT.

MACHINE FOR TAPPING PIPE-ELBOWS.

SPECIFICATION forming part of Letters Patent No. 382,606, dated May 8, 1888.

Application filed October 10, 1887. Serial No. 251,868. (No model.)

To all whom it may concern:

Be it known that I, THORVALD F. HAMMER, of Branford, New Haven county, Connecticut, have invented certain new and useful Improvements in Boring and Screw-Cutting Machines, of which the following is a specification.

The object of my invention is to provide a machine with a multiple set of spindles and chucks for boring, reaming, or tapping a number of pieces of work arranged in two groups, upon one of which one set of spindles will be advancing while the other set of spindles is retreating from the other group of pieces, so as to produce a machine of great working capacity, to which the work can be fed easily and rapidly without waste of time.

My present machine has been more especially designed and adapted for tapping elbow-pipe fittings; but it may be used for any other class of work for which it may be found adapted. This machine is organized to act upon four elbows at the same time, one set of taps entering two elbows while the other set of taps is retreating from the other two elbows, and the tap-spindles are therefore arranged in two groups, each group consisting of two pairs of spindles set at right angles, so that two spindles of each group converge to a right angle at two corners of the group, where chucks are fixed to hold the two elbows on which the two pairs of converging spindles act.

My invention therefore consists, partly, in this arrangement of spindles and chucks, and in the special form and arrangement of gearing connecting the spindles, whereby a very capacious machine is produced with simple direct gearing. A prominent feature of my invention, however, lies in the construction of the chucks, which are so contrived as to not only hold the work very firmly during the tapping, but, by a simple and instant manipulation at the moment when the taps are withdrawn, the chuck-jaws are made to release and eject the tapped elbow, while a succeeding blank elbow is immediately advanced into position and clamped in place during the short idle motion of the taps at the moment of reversal, whereby the feeding of the machine is rendered very sure, simple, and rapid, as hereinafter fully set forth.

In the drawings annexed, Figure 1 presents a plan view of my improved machine, partly in section. Fig. 2 is a front elevation thereof; and Fig. 3, an end elevation, partly in section. Fig. 4 is a vertical section of the improved chuck or vise, shown in the holding position with the tap entering the clamped elbow. Fig. 5 is a similar section shown in the released position, where the tap is withdrawn, the tapped elbow ejected, and the succeeding blank fed forward ready to be clamped. Fig. 6 gives a side elevation of the chuck after the said blank has been raised and clamped ready for the next action of the tap. Fig. 7 is a front elevation of the chuck in the clamped position, and Fig. 8 is a side elevation of the same from the side opposite to that shown in Fig. 6. Fig. 9 is a detail of the chuck.

Referring to Figs. 4, 5, 6, 7, and 8, I will first describe the improved chuck or vise therein shown, which forms such an important element of my improved machine. The frame or body of this chuck, as seen best in Figs. 4, 7, and 8, consists of a base-plate, *a*, from which two upright standards or side plates, *b b'*, arise, joined by a cross bar or plate, *c*, at the top, the whole being preferably cast in one piece, as illustrated. The top cross-plate, *c*, may be practically considered the fixed jaw of the chuck, while below the same is pivoted the movable jaw *d*, which is a strong rectangular plate fitting loosely between the side plates, as seen in Figs. 4 and 7, and extending the full width of the same, as shown.

To the under side of the cross-plate or fixed jaw *c* is fixed a socket-plate, *e*, preferably of hardened steel, having a recess or socket therein corresponding exactly in form and size to the elbow or other article to be held, as will be understood from Figs. 4, 5, and 9, and this socket-plate fits snugly between the side plates, *b b'*, abuts against the jaw *c*, and is held securely thereto by the stud *e'*, as shown in Figs. 4, 5, and 7. The top or clamping face of the movable jaw *d* is, however, perfectly flat and smooth, and therefore bears upon the elbow tangentially only, as seen in Fig. 7. Notches or openings *j* are made through the side plates between the jaws to expose the fittings to the action of the taps, as best shown in Figs. 7, 8, and 5. The movable jaw is pivoted at its rear end to the side plates by the pivot-pin *d'*, while

at the front end of the jaw, on the under side, is a cam-face or incline, d^2, which engages with the tip of a toggle-cam, f, which is fixed to a rock-shaft, g, the ends of which are journaled in boxes g', which slide in slots g^2 in the side plates, and are held in place by the covers g^3. The boxes g' rest on the ends of a very strong plate-spring, h, the arched center of which rests on the tip of an adjustable "capstan-screw," h', which screws into the base-plate a, as fully shown in Figs. 4 and 7.

On the projecting end of the rock-shaft is fixed the manipulating-lever i, the upper end of which is cranked laterally, so that the operating-handle of the lever comes centrally over the chuck, as fully shown in Fig. 7. It will therefore be seen that when this lever is moved or swung backwardly at about an angle of forty-five degrees, as seen in Fig. 5, the cam f will be moved or inclined under the movable jaw, thus allowing the latter to fall into an inclined position, in which its upper flat face will assume a freely-sliding angle, so that an elbow resting or placed on its top face at its pivotal end will slide freely forward under the socket-plate e until stopped by a small spring stop pin or wire, k. This stop-spring is fastened on the outside of the side plate under the head of a stud, k', as seen in Figs. 7 and 8, and is made of stout spring-wire in a bow or hook shape, the hooked or free end of which projects through a small notch in the side plate b and rests against the side or edge of the jaw d when the jaw is up in its clamping position, as will be understood from Figs. 4, 7, and 8. When, however, the jaw is depressed to release the tapped fitting, as seen in Fig. 5, the tip of the stop k will spring in over the jaw a slight distance in advance of the succeeding blank elbow, (see dotted lines in Fig. 7,) which blank in sliding down the inclined jaw will be arrested by the stop, and thus retained on the inclined jaw in a position under the socket-plate e, as seen in Fig. 5, and also on the right in Fig. 2. By reference again to Fig. 5, it will be understood that at about the moment that the blank elbow slides against the stop-spring k the tapped fitting will be fully ejected, or will have fallen clear out of the jaws. At this moment, therefore, the operator can now instantly move the lever i up to its clamping position, which will wedge the toggle-cam straight under the movable jaw d, and thus raise it from its inclined to its level position, springing the pin k out of the way, as seen in Figs. 6, 7, and 8, at the same time that the fitting is forced against the socket-plate, and it will be seen that as the lower jaw is level, and hence bears tangentially only on the elbow, while the socket-jaw conforms exactly to the contour of the elbow, the fitting will be forced to accurately center itself in the chuck in perfect register with the tap, and at the same instant will be clamped in true position in a most firm manner without requiring any thought or care on the part of the operator. It may now be noted that this clamping action of the chuck, although it is instantly effected and is exceedingly secure, is not absolutely rigid, but is slightly elastic, owing to the powerful spring h, on which the boxes of the cam-shaft g rest, as already described, and shown in Figs. 4, 5, and 7. This spring will therefore allow for slight differences in the thickness of the castings or elbows, which may vary in a range of about one sixty-fourth of an inch, and the spring will therefore enable all elbows, notwithstanding any slight variation, to be clamped with almost a uniform force, which may be made more or less firm, according to the adjustment of the screw h', as will be readily comprehended from the drawings. It will therefore be noted that as soon as the blank fitting has been clamped between the closed jaws, as in Figs. 6 and 4, and while the tap is advancing into the same, as seen in Fig. 4, a second blank may be placed on the level back of the jaw d, just behind the clamped fitting, ready to be fed forward without any loss of time, when the jaw is again dumped to release the tapped fitting, as seen in Fig. 5. It will therefore be seen that this form of chuck not only allows the operator to easily feed the blanks to the chucks during certain intervals, but enables him to instantly release or eject the tapped fitting and feed forward and clamp a succeeding blank fitting by one quick back-and-forth motion of the hand-lever i just at the moment when the tap is withdrawn and while the reversal of the screw motion occurs. Consequently very little clearance or lost motion in the stroke of the taps is required, and a great saving of time and rapidity of work is thus effected. Contrary, too, to what might be expected, I find that the grasp of this chuck on the fittings is really more firm and certain than the grasp of the usual screw-jaw chuck, which superiority seems to be due to the fact that in my improved chuck the wedging together of the jaws occurs directly at the very end of the jaws where the fitting is held and where the top enters, instead of some distance back thereof, as in the screwed-jaw chuck. Consequently in my improved chuck the jaws come together more positively and with less chance of yield or play. It will be also seen that the clamping action is brought about by a combination of lever, toggle, and wedge action, which is very powerful and certain, and is yet very easy for the operator, owing to the great leverage in his favor.

It will be noted on reference to Figs. 4 and 5 that a tongue, q, projects from the under side of the jaw d, with which the cam f will engage on the downstroke in case the jaw should become stuck in its level position, and thus insures the positive depression of the jaw at each depression of the cam-lever i.

Now, on reference to Figs. 1 and 2, it will be seen that the improved chucks are arranged at four points in the machine, as shown at A A A′ A′—that is, four chucks being used, one

at each of the four converging points of the different series or pairs of spindles. The chucks and spindles are all mounted on top of the bed or table *m* of the machine, which is of an elongated rectangular form, the front portion of the table, on which the chucks are mounted and where the spindles converge, having a raised rim, *m'*, forming a trough to catch the lubricating-liquid discharged on the taps in the usual way. The spindles are arranged in two main groups, *n n'* and *o o'* being the left group, and *p p'* and *r r'* forming the right group. Each group consists of two spindles such as *n n'* or *p p'*, arranged transversely of the table and parallel with each other, and two spindles such as *o o'* or *r r'*, arranged at right angles to the former and longitudinally of the table, as fully shown in Fig. 1, the chucks A A' being arranged at the converging points of the spindles in each group, as illustrated.

Each spindle has a screw engagement at one end with a fixed nut, *s*, and is fitted with a tap or other tool, *x*, at the opposite end, and has also a rotative engagement with a driving-sleeve or hollow shaft, *s'*, by means of a sliding feather, s^2, engaging with a groove, as fully shown in Fig. 1. The sleeves *s'* are all mounted in bearings *t*, as shown in Fig. 1, so as to freely revolve therein, but are restrained by shoulders from endwise motion, as usual in machines of this class. Upon the sleeves of the transverse spindles are fixed gear-wheels *u*, which mesh with intermediate gear-wheels, *u'*, which are fixed on shafts u^2, which turn in the bearings u^3.

On the front end of the intermediate shaft, u^2, of each group is fixed a miter-wheel, *v*, which meshes with a miter-wheel, *v'*, fixed on the sleeve of the adjacent longitudinal spindle *o* or *r*, as fully shown in Figs. 1, 2, and 3. Upon the sleeve of each of the longitudinal spindles *o o'* and *r r'* are fixed spur-wheels *l*, which mesh directly together, as seen in Figs. 1 and 3. As the spindles are thus all geared together in one train, the power may be applied to revolve any one of the spindles, and thus drive the entire train.

I prefer to apply the power to the central spindle, *n'*, the sleeve of which is therefore shown provided with a cone-pulley, *f'*, to which the driving-belt is applied. To this driving-belt an alternate reverse rotary motion is imparted by any suitable means, so as to screw the spindles forward and back alternately in a stroke of regular length, as usual in machines of this class. I have not, however, shown this belt-reversing mechanism, as it forms no part of my present invention, and may be of any of the various constructions now in use.

Referring to Figs. 1, 2, and 3, it may therefore be now seen that the described arrangement of gearing in this machine is very simple and direct, and consists altogether of direct spur-gearing, with only one pair of miter-gears in each group, which produces the described motion of the spindles in a very perfect manner. Thus, on reference to Fig. 1, it will be seen that the intermediate gears, *u'*, cause the spindles *n n'* or *p p'* to revolve in the same direction, while the direct gearing *l l* of the spindles *o o'* causes said spindles to revolve in opposite directions; but as the taps are fitted on the opposite ends of said spindles the spindles *o o'* advance or retreat to or from the chucks simultaneously with the spindles *n n'*. The spindles of each group will therefore always advance or retreat simultaneously from their chucks; and it will be again seen on reference to Figs. 1 and 2 that as the gear *u* of the spindle *n'* of the left group meshes directly with the corresponding gear of the adjacent spindle *p* of the right group at the middle of the machine, consequently the right group will always act reverse to the left group, so that the right group will be retreating while the left group is advancing, and vice versa, as fully illustrated in Fig. 1; hence when the taps are entering the fittings on the left they will be leaving the fittings on the right, as shown in Fig. 1. When the taps are fully withdrawn, as seen on the right in Fig. 1, and just before or after the reverse motion takes place, the operator will manipulate each chuck, as before described, so as to eject the tapped fitting and feed up and clamp the succeeding blank fitting in front of the advancing taps, and it is obvious that by means of the improved chucks described the operator will be thus enabled to remove the finished work and present the blank to the spindles in a most rapid and sure manner, which will enable the clearance or idle motion in the stroke of the taps to be reduced to the lowest point, and therefore render the machine very rapid and capacious in its daily output of work. As soon as the blanks have been fed up and clamped, and while the taps are entering the same, the operator will have an ample interval of time between the next action of the chucks and reversal of the spindles, during which he can leisurely place blank fittings on the end of the dumping-jaws of the chucks, as before described, and shown in Fig. 1, ready to be fed in at the next action, so that the operator can thus shift alternately from one group to the other, and will have ample time for easily performing all operations necessary on the four chucks, thereby enabling one man to produce in one day with this machine a much larger quantity of work than has been heretofore possible.

The fittings which fall from the chucks at the ends of the machine will be guided by small chutes (not shown) over the ends of the table into receptacles placed on the floor to receive them, while the fittings falling from the central chucks will be guided by similar chutes to the central well-hole, *y*, and into a receptacle placed below the same.

Any suitable means for imparting a rotary and reciprocating motion to the tap-spindles besides the simple screw and nut and sleeve and feather devices shown may of course be

used, as my invention is in no way confined to these details.

It will be seen on reference to Fig. 1 that my machine may be considered double in consisting of the two groups of spindles and chucks, and might be divided at the middle into two machines or half machines of like construction which would yet embody most all the features of my invention; but it is obvious that the two groups geared together as shown form a much more perfect and capacious machine, which one operator can attend as readily as he could one half of such a machine, and yet produce twice the work in the same time, which is of course a most important advantage.

It will of course be understood that drills, reamers, or other tools may be substituted for the taps *x*, according to the nature of the work to be done, and where elbows are to be provided with male screws dies will of course be fitted to the ends of the spindles instead of taps. On reference to Fig. 1, it will be noted that left-hand threads may be tapped by shifting the miter-wheels *v'* from one end of the spindle *o r* to the other, and changing the threads on the spindles and nuts from right to left.

On reference to Figs. 4 and 5 it will be readily understood that I do not limit myself to the special mechanical devices there shown for actuating the movable or dumping jaw *d* of the chuck, and while these special devices are simple and effective and form part of my invention, yet any other suitable operating or actuating devices may be used without departing from the essential features of my invention.

It will be seen on reference to Fig. 4 that the pivot-point *d'* of the jaw *d* is below the level of the clamped elbow; but, if desired, this pivot-point may be raised so as to be about central with the elbow, or in line with the axis thereof, or above that point, so as to cause the arc of motion of the jaw in dumping to retreat more rapidly than otherwise.

On reference to Figs. 1 and 2 it will be understood that A A may represent any suitable kind of vises or chucks besides the particular novel ones shown, for it will be readily understood that the novel arrangement of spindles and gearing shown is not confined to those special chucks.

What I claim as my invention is—

1. In a duplex boring or screw-cutting machine, the combination of a group of rotary and reciprocating spindles, consisting of a pair, *n n'*, and a pair, *o o'*, arranged at right angles to the former, and converging at their tool-fitted ends at two corners, with two chucks, A A, placed at said corners, with a similarly-arranged group of spindles, such as *p p'* and *r r'*, and chucks A' A', arranged adjacent to the former group, with connecting-gearing between the spindles of each group and between the two groups, substantially as herein set forth, whereby the four spindles of one group revolve in one direction, while the four spindles of the other group revolve in the other direction, substantially as herein shown and described.

2. In a boring or screw-cutting machine, the combination of a pair of rotary and reciprocating spindles, such as *n n'*, and a second pair, such as *o o'*, arranged at right angles to the former, with directly-meshing spur-gears *l l* on the spindles *o o'*, spur-gears *u u* on the spindles *n n'*, and intermediate spur-gear, *u'*, meshing on opposite sides with the gears *u u*, a bevel or miter gear, *v*, driven by the intermediate wheel, *u'*, and a miter-wheel, *v'*, meshing therewith and driving the spindle *o*, substantially as herein shown and described.

3. In a boring or screw-cutting machine, the combination, with the rotary and reciprocating spindles *n n'* and *o o'*, arranged in one group, with the spindles *p p'* and *r r'*, arranged in an adjacent group, and chucks A A A' A', arranged at the convergence of the spindles in the respective groups, of the spur-gears *l l* on the spindles *o o'* and *r r'*, meshing directly together, the miter-wheels *v' v'* on the spindles *o r*, the spur-wheels *u* on the spindles *n n'* and *p p'*, the wheel *u* of the spindle *n'*, meshing directly with the wheel *u* of the spindle *p*, with the intermediate spur-wheels, *u' u'*, meshing between the wheels *u u* of the spindles *n n'* and *p p'*, and the miter or bevel wheels *v* on the axis of the wheels *u'*, meshing with the miter-wheels *v* of the spindles *o r*, arranged and operating substantially as herein shown and described.

4. A self-discharging chuck constructed with an upper fixed jaw and an underlying movable dumping or gravitating jaw hinged or swung at a point below and back of the upper fixed jaw, whereby it may be thrown down into an inclined position to dump the finished work, and thrown up into a parallel position to clamp the succeeding article, with a suitable operating device connected with the said dumping-jaw to raise and lower the same, substantially as herein set forth.

5. In a chuck or vise, the combination, with a sustaining-frame having a fixed jaw and a conforming socket on said jaw, of a movable dumping-jaw having a flat or level face adapted to be dumped or depressed at a sliding angle or incline, and to receive the blank at the top of the incline, with a movable stop projecting between the jaws near the end of the inclined jaw in the path of the descending blank, to arrest the sliding blank under the fixed jaw, and an operating device for raising or lowering said movable jaw, substantially as herein set forth.

6. In a vise or chuck, the combination, with the sustaining-frame having a fixed jaw, of the underlying pivoted inclining or dumping jaw *d*, pivoted at a point back of or beyond the fixed jaw, leaving a free throat or passage between the pivotal end of the movable jaw and the fixed jaw to admit a blank, and an operating device for raising the movable jaw into

a parallel or dropping it into an inclined position, substantially as and for the purpose herein shown and described.

7. In a chuck or vise, the combination, with the cheeks or standards *b b'*, of the fixed jaw *c*, the conforming socket *e*, movable dumping-jaw *d*, pivoted at the end remote from the socket, and a manipulating-lever operatively connected with the jaw *d* to raise or lower the same, substantially as shown and described.

8. The combination, in a vise or chuck, with the sustaining-frame and a fixed jaw thereon, of a dumping-jaw underlying the same and a yielding stop arranged to project in the path of the jaw when depressed and in front of the succeeding blank sliding down the dumping-jaw to arrest the same under the fixed jaw, with a manipulating device connected to the movable jaw, adapted to raise the same, remove the stop, and clamp the arrested blank between the two jaws, and vice versa, substantially as herein shown and described.

9. The combination, with the sustaining cheeks or standards *b b'*, of the fixed jaw *c*, having conforming socket *e*, the dumping-jaw *d*, stop *k*, and a manipulating device operatively connected to the jaw to raise or lower the same, substantially as herein set forth.

10. In a vise or chuck, the combination, with the sustaining-frame having the fixed jaw, of the movable dumping-jaw *d*, toggle-cam *f*, rock-shaft *g*, and operating-lever *i*, substantially as shown and described.

11. In a chuck or vise, the combination, with the fixed and movable jaws, of the cam *f*, rock-shaft *g*, and lever *i*, and elastic or yielding supports on which said rock-shaft is mounted, substantially as and for the purpose set forth.

12. In a chuck or vise, the combination, with the fixed and movable jaws, of the rock-shaft *g*, an operating-lever extending from said rock-shaft, and a cam or projection extending from said rock-shaft to engage the movable jaw, with the spring *h*, supporting the bearings of the rock-shaft, substantially as set forth.

13. The combination, in a chuck or vise, with the fixed and movable jaws, of the rock-shaft *g*, lever *i*, and cam *f*, with the spring *h*, supporting the bearings of the rock-shaft, and screw *h'*, for adjusting said spring.

14. The combination, in a chuck or vise, with a sustaining-frame and a fixed jaw thereon, of the pivoted or movable dumping-jaw *d*, the rock-shaft *g*, lever *i*, cam *f*, boxes *g'*, supporting spring *h*, and adjusting device *h'*, substantially as and for the purpose set forth.

15. In a vise or chuck, the combination, with the frame and fixed jaw, of the movable jaw *d*, cam *f*, and tongue *q*, with an operating-lever, *i*, connected to the cam *f*, substantially as and for the purpose set forth.

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Witnesses:
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