

(No Model.)

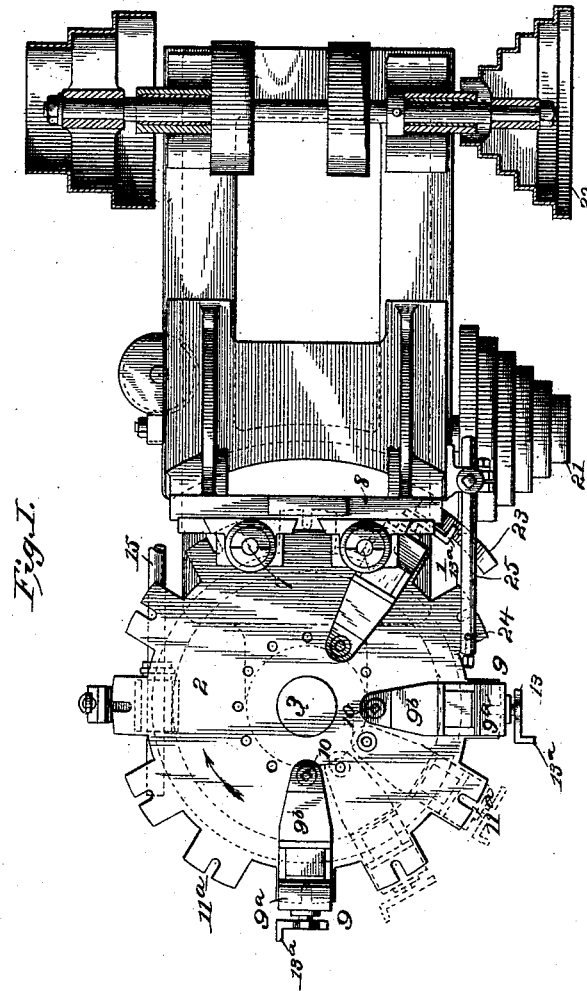
6 Sheets—Sheet 1.

H. R. TOWNE.

ROTATING AUTOMATIC MACHINE TOOL.

No. 489,398.

Patented Jan. 3, 1893.



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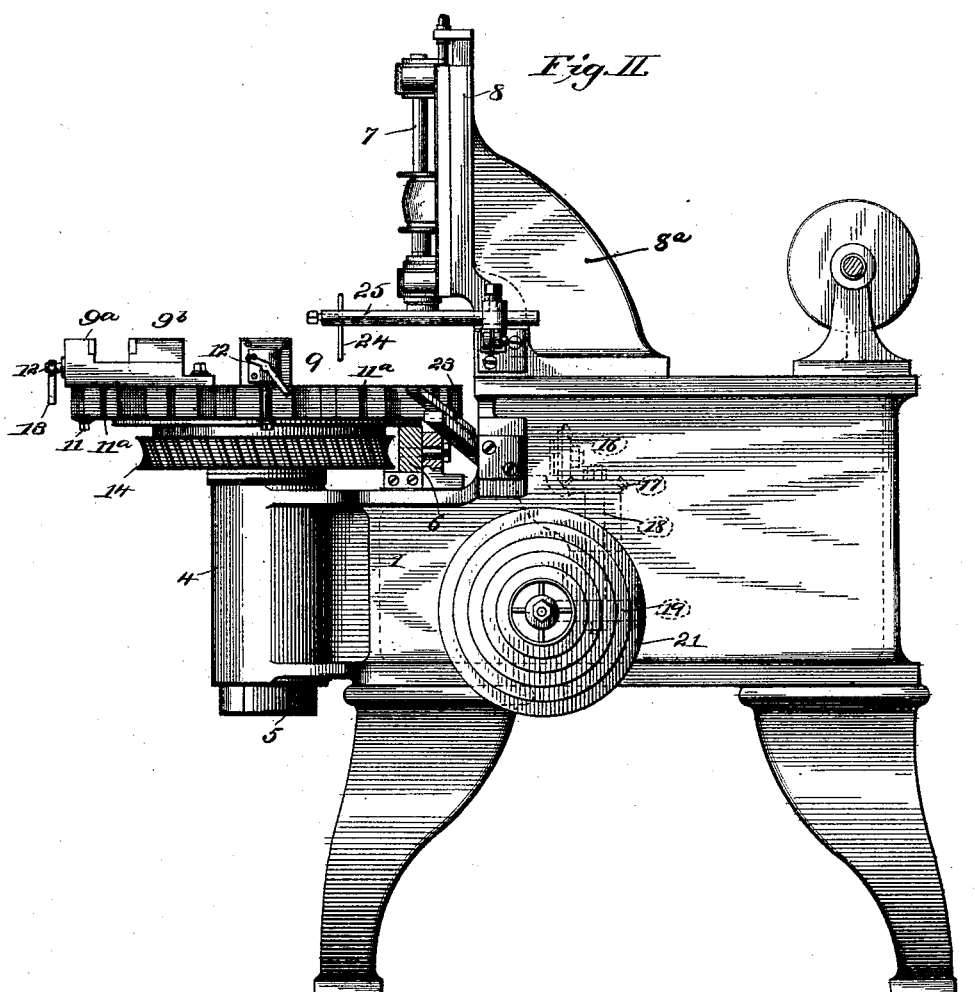
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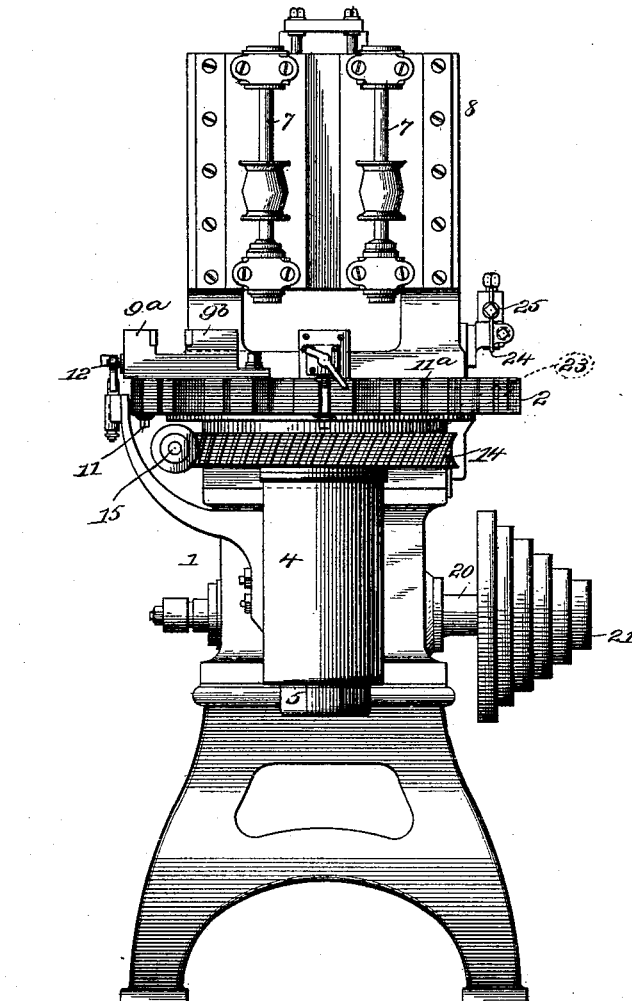
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Fig. III.



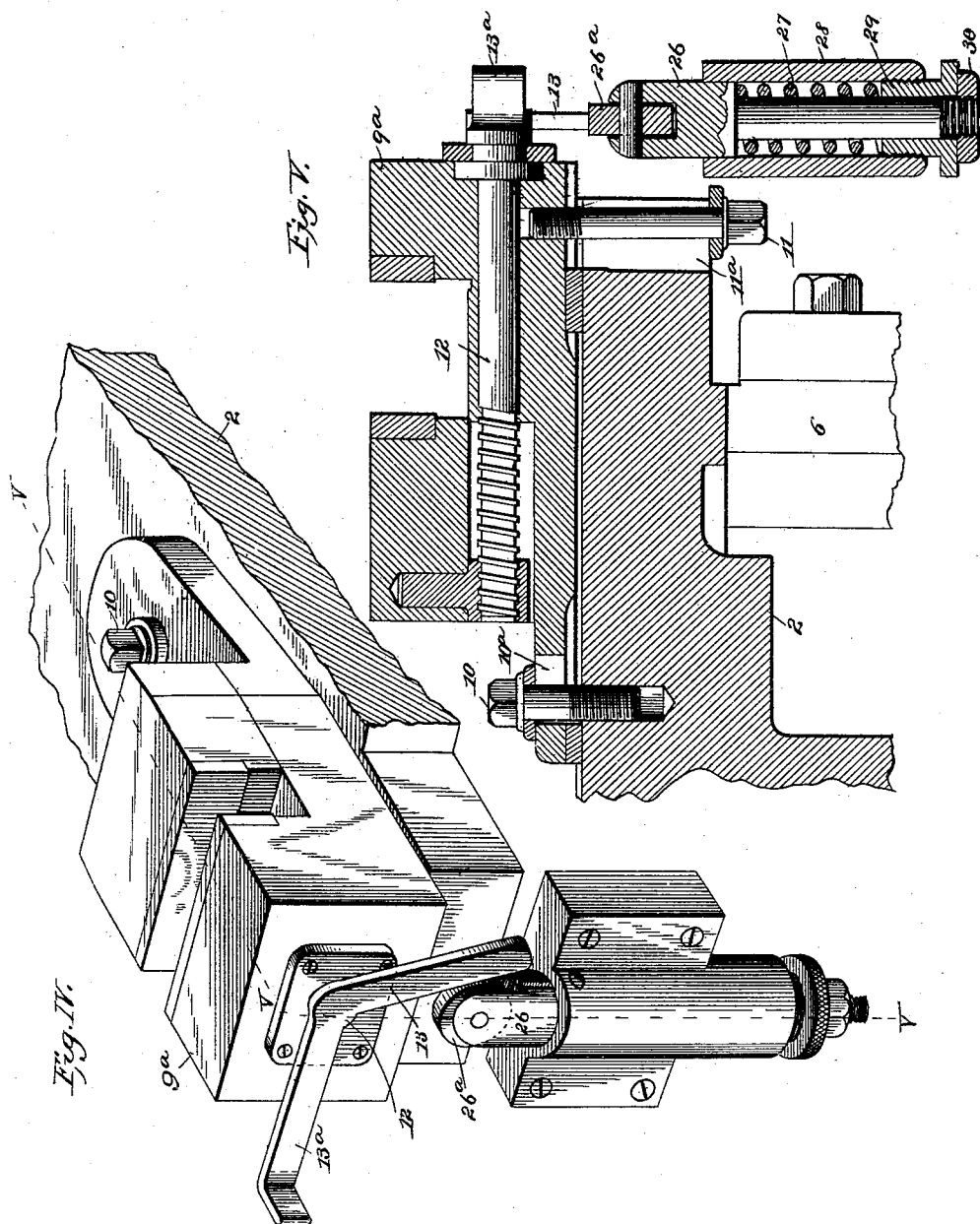
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Fig. VI.

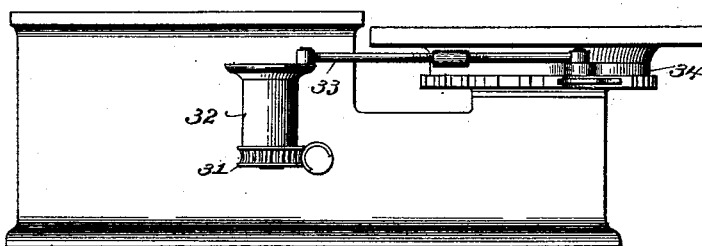
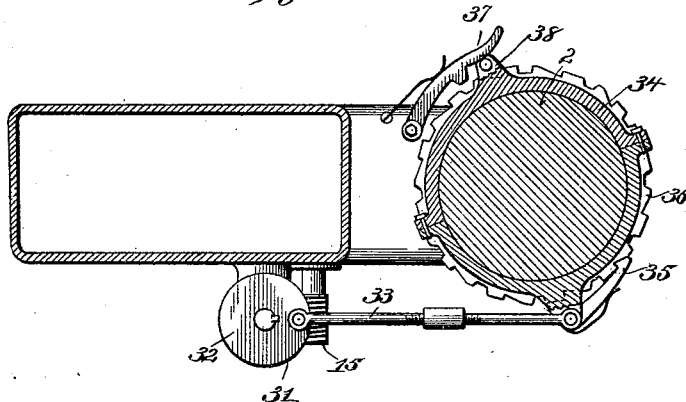


Fig. VII.



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6 Sheets—Sheet 6.

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Fig. VIII.

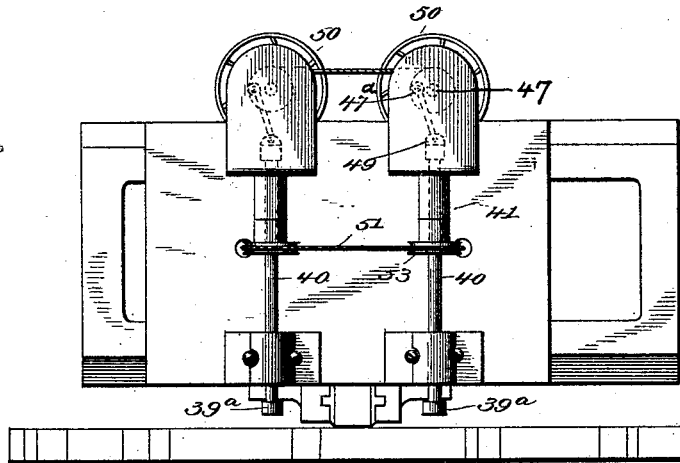


Fig. IX.

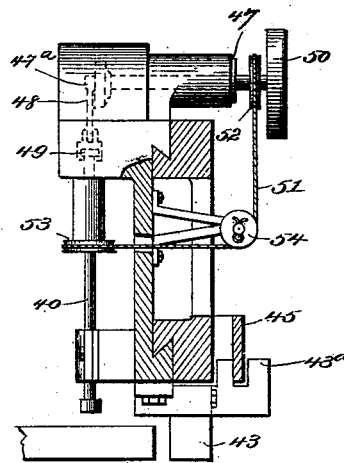
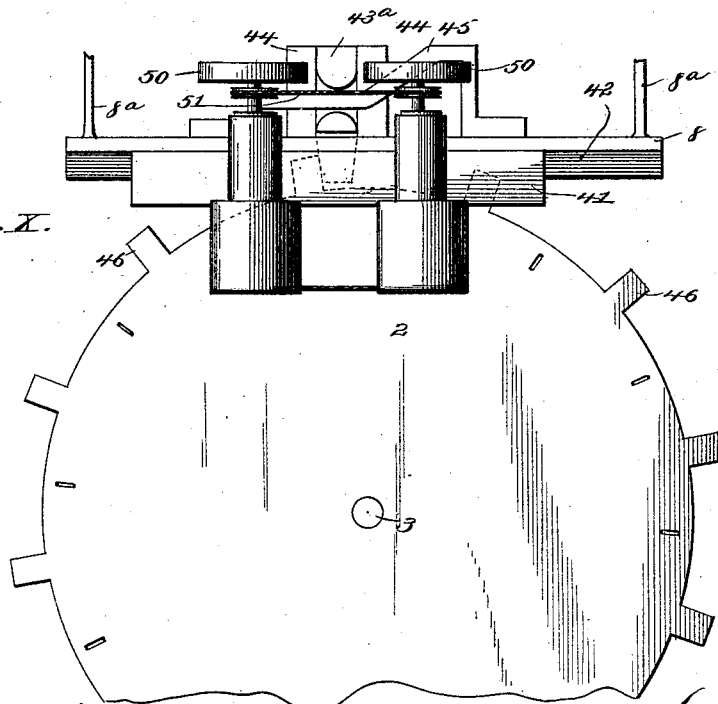


Fig. X.



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UNITED STATES PATENT OFFICE.

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ROTATING AUTOMATIC MACHINE-TOOL.

SPECIFICATION forming part of Letters Patent No. 489,398, dated January 3, 1893.

Application filed January 18, 1892. Serial No. 418,500. (No model.)

To all whom it may concern:

Be it known that I, HENRY R. TOWNE, a citizen of the United States, and a resident of Stamford, in the county of Fairfield and State
5 of Connecticut, have invented a certain new and useful Improvement in Rotating Automatic Machine-Tools, of which the following is a specification.

My improvement applies to various kinds
10 of machine tools in which the work to be treated has first to be fixed in a vise, or other holder, which, with the contained work must be moved up to the tool by which the desired operation is performed. Heretofore such movement has
15 been accomplished by hand and usually by a reciprocating motion, so that very often the time required to move the piece to be operated upon up to the tool and back again to its first position is greater than the time actually
20 consumed in performing the operation upon the piece. My invention does away with this very serious loss of time by confining the work of the operator to simply placing the pieces to be operated upon in their holders, all other
25 operations of the machine being automatic, and by this means I am able to effect considerable economy by largely increasing the amount of work which can be turned out by one operator and one machine.

30 My improved machine consists in general of a rotating table or platen, provided with a series of vises, or holders so placed relatively to the operating tool or tools, that when the table is revolved each piece of work to be
35 treated is successively and automatically brought under, and exposed to, the action of the operating tool or tools.

It is clear that various types of operating tools may be employed in my machine. I
40 show in the drawings tools for making what is called an end-milling cut, there being two cutters shown, one for the roughing and the other for the finishing cut. It is obvious that in case it should be desired to make a deeper
45 cut than could be conveniently accomplished by two cutters, more may be provided, and, also that the direction of the axis of the spindles which carry the cutting tools may be varied at will so as to reach any desired part of
50 the work to be operated upon.

Obviously many other kinds of operating

tools may be used, such as emery wheels, drills, reamers &c.

I show also in place of cutting tools riveting heads. These heads can be raised and
55 dropped by any means commonly employed for this purpose. The riveting mechanism *per se* and raising and lowering the riveting heads form no part of my invention, and for this class of operation it will be desirable
60 that the platen shall have an intermittent motion, which can be accomplished in various well known ways. I show for illustration a reciprocating pawl and ratchet mechanism
65 serving to impart an intermittent rotation to the platen, with periods of rest.

In those classes of tools which involve an interval of rest for the revolving table, such interval may be either absolute, as above referred to, or it may be relative as to the work
70 and the operating tool. In the latter case the motion of the table or platen is continuous, while the operating tool or tools are mounted on a movable frame capable of limited lateral
75 movement on the fixed head of the machine in a direction coincident with the motion of the platen, this motion being so regulated that the sliding head moves with the platen during the time while the operation is
80 being performed, the head being then returned to its first position ready to operate on the next piece of work and move with it while the operation is being accomplished and so on.

I provide means for automatically closing
85 the vise, and also automatically opening it. I accomplish these results by means of a two arm lever, one arm, which closes the vise, passing over a roller which is held in the path of the lever by a yielding piston. This piston
90 is supported by a spring, the tension of which can be adjusted so that any desired pressure can be brought upon the lever to lock the vise or holder. When the work is to be discharged the other arm of the lever
95 comes in contact with an inclined arm or other suitable bearing surface, so as to turn the screw in reverse direction and thus retract the vise-jaw and release the work after which it may be ejected automatically by a
100 suitable tappet.

In order that my invention may be clearly

understood, I will now describe it in detail with reference to the accompanying drawings in which:—

Figure I is a plan or top view of the machine. Fig. II is a side elevation of the same. Fig. III is a front view thereof. Fig. IV is a detail perspective view on a larger scale, of a suitable vise or work holder, and means for automatically closing said vise, so as to secure the work. Fig. V is a vertical section on the line V—V Fig. IV. Fig. VI is a side elevation of the base of the machine and the revolving bed or table showing means of imparting intermittent rotation to said table. Fig. VII is a horizontal section on the line VII—VII Fig. VI. Fig. VIII is a front elevation showing a pair of riveting heads and means for moving them in conjunction with the table while doing the work. Fig. IX is a vertical section of the same on the line IX—IX. Fig. X is a plan view thereof.

Upon a suitable supporting frame 1, a revolving table 2 is mounted by any suitable means. For illustration I have shown a central stud-shaft or axis 3, extending downward from the said table through a box or bearing 4 and secured by a nut 5. An anti-friction roller 6 beneath the revolving table affords a firm and unyielding support thereto directly beneath the cutting or other tools.

One or more milling tools or cutters or any tools suitable to effect the desired operation on the work, are mounted on the end of a shaft or shafts 7 having bearings in a standard 8 and rotated by suitable mechanism.

Work holders are shown at 9 in Fig. I mounted upon the revolving table 2 near its periphery. A greater or less number of these work holders may be used and they may be equidistantly arranged around the revolving table as indicated by dotted lines.

The construction of a suitable vise adapted for a work holder is shown in detail in Figs. IV and V. The fixed jaw 9^a of the vise is shown secured upon the table 2 by bolts 10, 11; the bolt 10 passing downward through a longitudinal slot 10^a in the heel of the fixed jaw or base of the vise, while the bolt 11 passes upward through a radial notch or slot 11^a in the table and is tapped into the base of the vise. The longitudinal slot 10^a and notch 11^a permit the adjustment of the vise in position upon a radial line as required to bring the work accurately to position relatively to the milling tool or other tool or cutter. The table 2 is rotated by means of a worm gear 14 fixed to its shaft 3 and a horizontal worm shaft 15 engaging therewith, operated by the beveled pinions 16, 17, the latter mounted upon a vertical shaft 18 rotated by a worm gear 19 from a horizontal shaft 20 upon one of a pair of cone pulleys 21, 22. The direction of rotation of the table 2 is indicated by an arrow in Fig. I.

The automatic device for closing the vises and securing the work is illustrated in Figs.

IV and V consisting of a two armed lever 13 13^a on the vise screw 12, the arm 13^a being nearly horizontal while the arm 13 projects obliquely downward. To automatically close the vise the downwardly projecting lever arm 13 is carried by the rotation of the table over a roller 26^a mounted in the top of a piston 26 which is supported by a spring 27 in a vertical box 28 fixed to the frame of the machine. The lower end of the spring 27 rests on the top of the screw follower 29 which affords adjustment to regulate the pressure which will be applied to the lever arm 13, so as to adapt the force applied to the moving jaw of the vise, to suit different articles or classes of work. The piston 26 is confined within the box by a nut 30 bearing against the bottom of the screw follower 29, which also may afford means for regulating the height of the pressure roller 26^a.

To effect the automatic release of the work after it has passed under the action of the tools an arm 23 is provided, inclined upward and suitably adjusted and set in the path of the horizontal lever arm 13^a of the vise-screw so that the continued revolution of the table will turn back the vise screw 12 and retract the jaw 9^b, thus releasing the work. The work can then be readily removed by hand or it can be thrown out by contact with an arm or tappet 24, projecting downward from the horizontal supporting arm 25 in position to pass between the jaws of the vise.

In operation suitable cutters or other tools being mounted in the ends of the spindles 7 and the work holding vises 9 being suitably adjusted relatively thereto upon the revolving table 2 the operator places the work in the holders as they pass in succession before him and the machine is then completely automatic, the continued revolution of the table carrying the work under the cutters or other tools (one or more) after which the vises are successively opened by contact of their horizontal lever arms 13^a with the bearing arm 23, releasing the work which is then thrown out by contact with the tappet arm 24.

Figs. VI and VII illustrate means of imparting intermittent instead of continuous rotation to the table when required for use with riveting tools or other tools which require to maintain a fixed rotation to the table while doing their work. In this illustration the worm shaft 15 gears with a worm wheel 31 on a vertical crank-shaft 32 connected by a rod 33 with a ring 34 mounted concentrically beneath the table 2 so as to receive a reciprocating rotary motion. The radial lug on the ring 34 also carries a pawl 35 pressed by a spring into engagement with the teeth 36 on the table 2. A dog 37 pressed by a spring into engagement with the teeth 36 holds the table against rotation but this dog is forced back by a pin 38 on the ring 34 so as to release the table during the proper period for its rotation. By thus providing an inter-

mittent rotation for the table the machine is adapted for the use of riveting tools on the shafts 7.

Figs. VIII, IX and X, illustrate the use of riveting tools on a laterally sliding head by which the tools are made to move in unison with the table, or nearly so, while doing their work, so as to operate in connection with a continuously rotating table. One or more such riveting tools may be employed. I have shown two riveting heads 39, 39^a mounted on spindles 40 carried by a slide 41 capable of horizontal movement on guides in a fixed cross head 42, on the standard 8 which is supported upon the bed of the machine, by the aid of brackets 8^a as shown in Figs. I and II. A carrier dog 43 is mounted in ways 44 fixed to the slide 41 so as to have a horizontal to and fro sliding movement in the slide 41 at right angles to the movement of the said slide 41 and said dog engages by ears 43^a with a guide bar 45, fixed to the stationary cross-head 42 and standard 8 inclined as shown in Fig. X so as to move the dog in and out as the slide 41 moves from side to side.

Projecting radially from the table 2 are lugs or tappets 46 which, as the table revolves engage with the carrier dog 43 so as to carry the tool slide 41 forward with the table as each piece of work comes in position under the riveting tool, thus keeping the tool in fixed relation to the work with sufficient accuracy until its operation is performed, at which time the retraction of the carrier dog 43 by the inclined guide bar 45 releases the slide 41 from the table and permits it to be retracted in readiness for the next operation.

As already stated, where the riveting or other tools are employed in pairs as here illustrated they may be adapted to act successively on the work, the first in a preliminary or roughing and the other in a finishing operation. At each back stroke the first or roughing tool 39 will be carried to a new piece of work while the same movement carries the finishing tool 39^a to work which the tool 39 has just left. With the construction here shown the movement of the tools is in a straight line while the work moves in a circle, but as the radius of the circle is large and the necessary movement of the tool quite short the slight lack of coincidence does not materially impair the accuracy and effect of the work.

I have shown in Figs. VIII and IX a suitable device for imparting the combined rotary, and reciprocating-vertical movement to the riveting tools. This consists of a horizontal shaft 47 mounted in a housing on the slide 41 directly above each of the spindles 40 and connected with the spindle by means of a crank pin 47^a, and a pitman 48 jointed to a socket head 49 in which the spindle 40 is swiveled, so as to permit its rotation while imparting vertical reciprocating movement

thereto. The horizontal shaft 47 is driven by a belt pulley 50 and rotation is communicated to the spindle 40 by a belt or cord 51 passing around pulleys 52, 53 on the shaft 47 and spindle 40 respectively and a guide-pulley 54 on a bracket 55 mounted on the slide 41.

The shanks or spindles and heads or frames carrying tools of any desired description may be vertical as herein shown, or may be inclined as required to suit the construction, form or position of the work to be operated upon and the particular cuts to be made or other work to be performed.

Having thus fully described my invention the following is what I claim as new therein and desire to secure by Letters Patent:

1. An automatic machine tool constructed with a revolving table carrying one or more vises constituting holders for the work to be operated on, a projecting arm on the vise screw a bearing surface in the path of said arm to effect the automatic closure of the vise, and a suitable tool or tools in the path of the work held by said vise caused to operate thereon by the rotation of the table, carrying the work held by the vises successively to the tools.

2. The combination of the revolving table 2, one or more vises carried thereby, a lever arm 13 on the vise screw 12 and the piston 26 and spring 27 applying yielding pressure to the said lever arm by the rotation of the table, as explained.

3. The combination with the vise screw 12 and lever arm 13, of the piston 26, spring 27 and screw follower 29 for graduating the pressure applied to the lever arm and vice screw as explained.

4. The combination of the revolving table 2, one or more holders 9, milling or other tool 7, releasing tappet 23, and discharging tappet 24, substantially as and for the purposes set forth.

5. The combination of the rotating table 2, carrying work holders, the reciprocating carriage 41 carrying the tool or tools, tappets 46 carried by the table and imparting intermittent movement to the carriage 41 and the radially sliding dog 43 engaged by the tappets 46 to move the carriage forward and retracted by the progressive movement of the carriage to permit the return of the latter, substantially as explained.

6. In an automatic machine tool the combination of a revolving table, one or more holders carried thereby, and a suitable tool partaking of the movement of the table during a portion of its rotation while operating on one piece of work and returned automatically to its original position in readiness for operating on the next, as explained.

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