No. 649,175. Patented May 8, 1900.

J. C. POTTER & J. JOHNSTON.

SHAPING MACHINE.

(Application filed Dec. 15, 1898.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

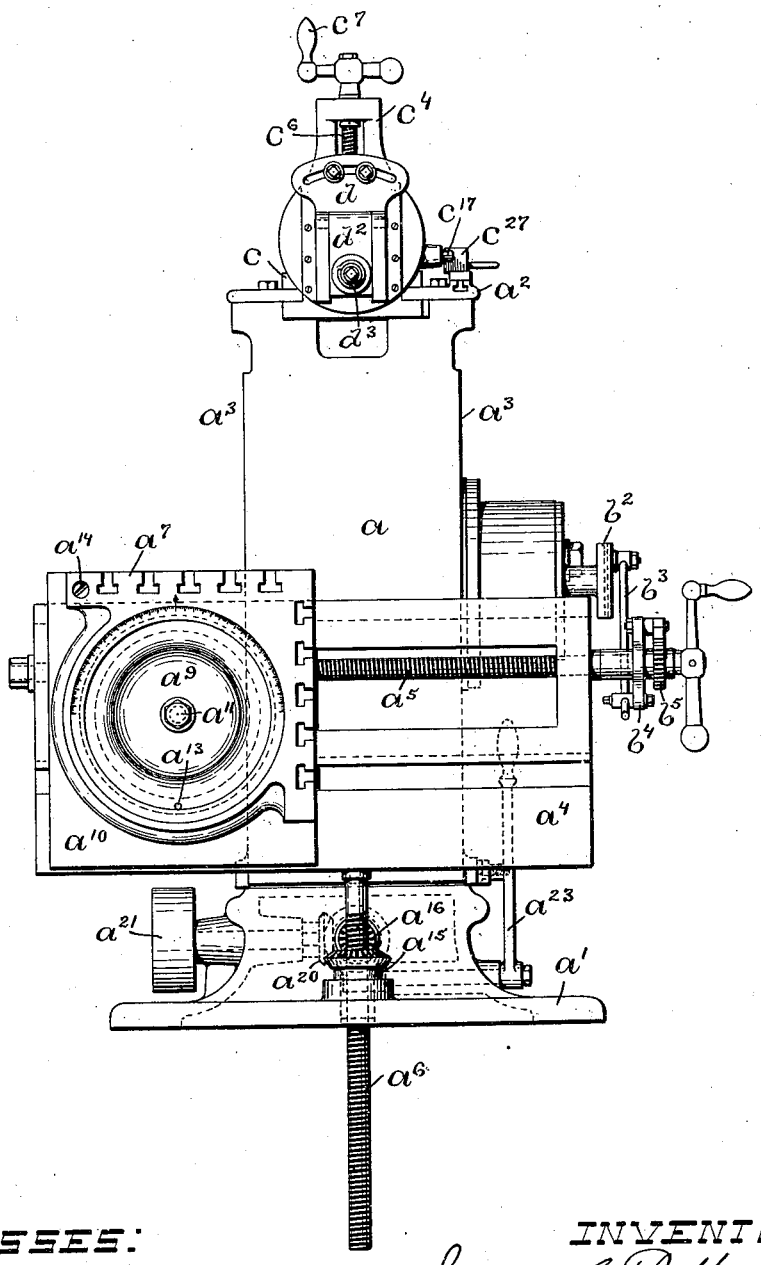

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Fig. 2.

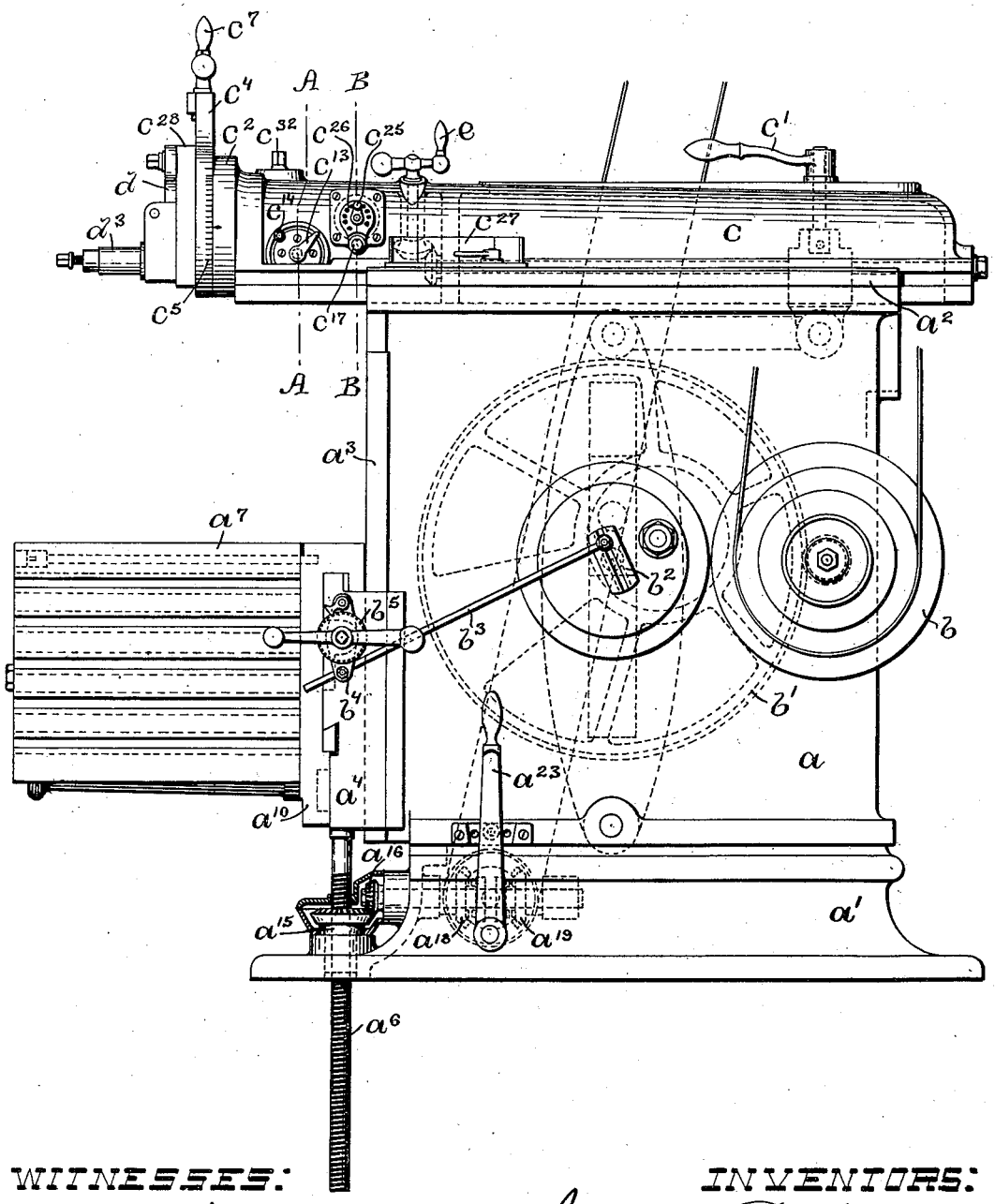

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Fig. 3.

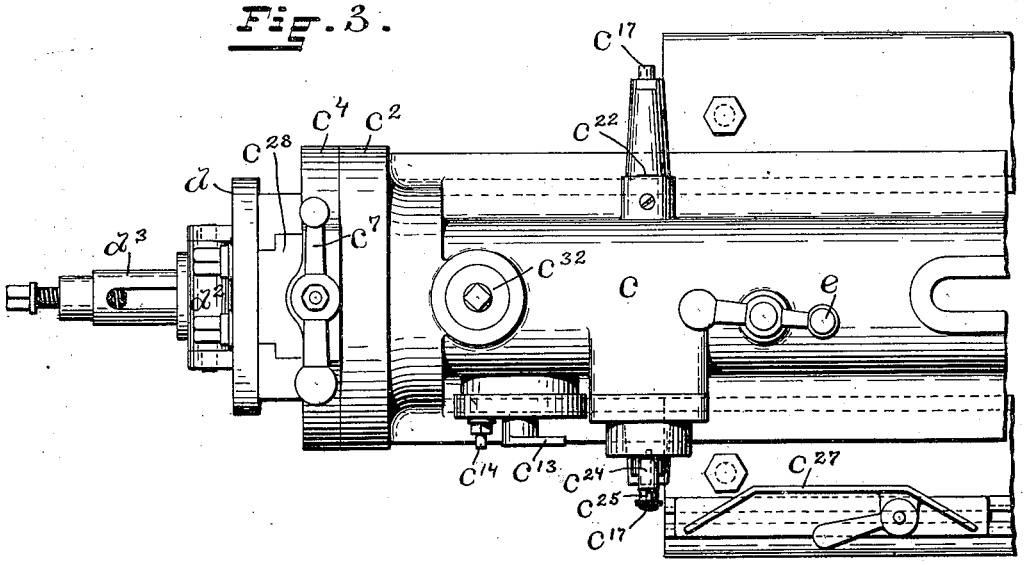

Fig. 5.

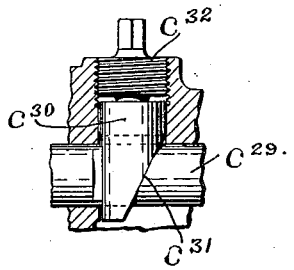

Fig. 6.

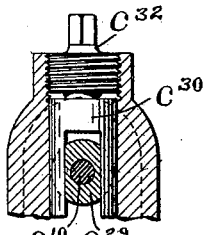

Fig. 4.

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Fig. 7.

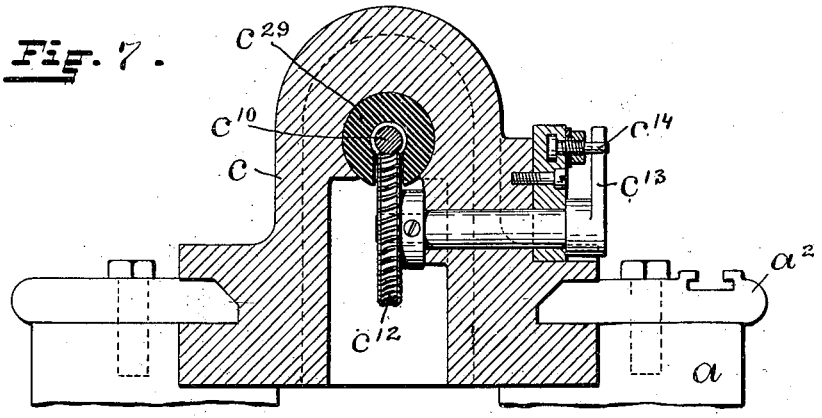

Fig. 8.

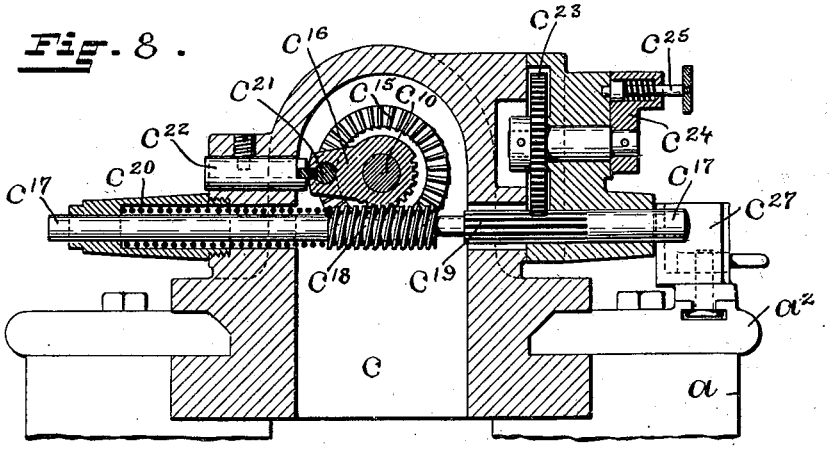

Fig. 10.

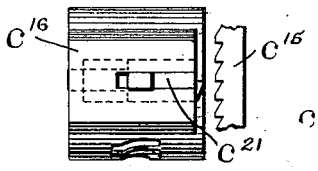

Fig. 9.

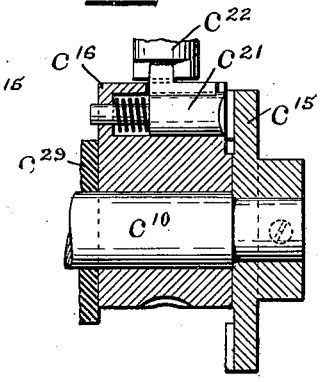

Fig. 11.

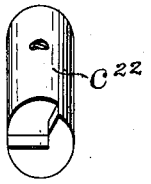

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Fig. 12.

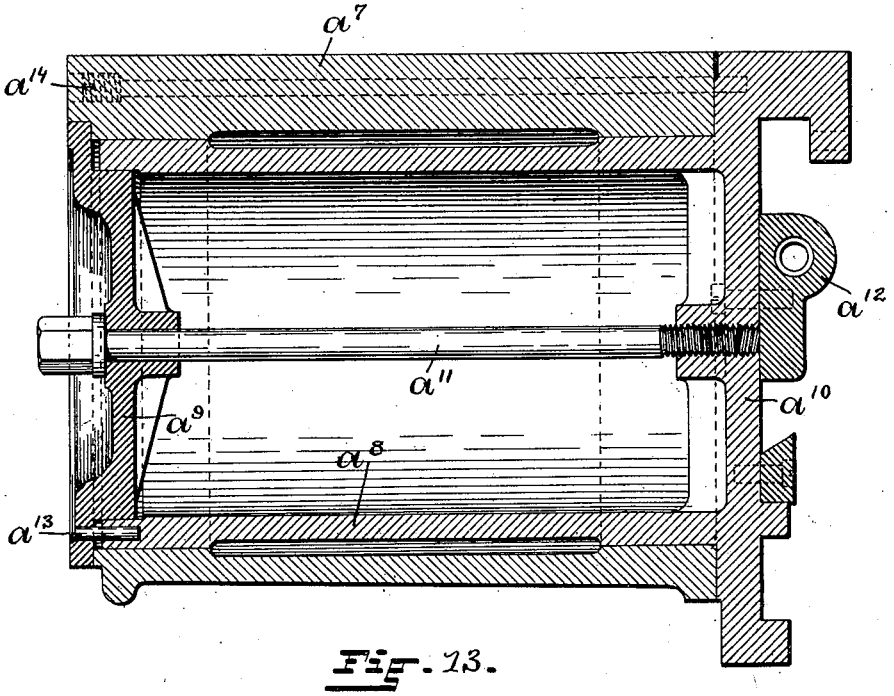
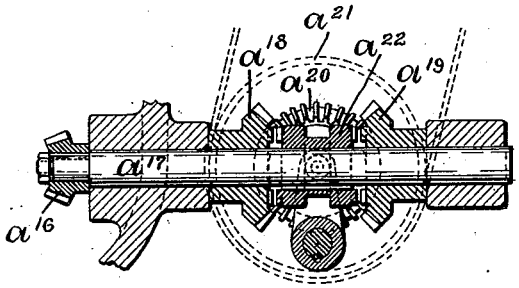


Fig. 13.



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Attys.

UNITED STATES PATENT OFFICE.

JAMES CHARLES POTTER AND JOHN JOHNSTON, OF PAWTUCKET, RHODE ISLAND, ASSIGNORS TO THE POTTER & JOHNSTON COMPANY, OF SAME PLACE.

SHAPING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 649,175, dated May 8, 1900.

Application filed December 15, 1898. Serial No. 699,328. (No model.)

To all whom it may concern:

Be it known that we, JAMES CHARLES POTTER and JOHN JOHNSTON, of Pawtucket, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Shaping-Machines; and we hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to an improvement in the class of metal-working machines in which the cutting-tool is made to reciprocate over the work to cut and shape the same while the work is held in a fixed position.

The object of this invention is to make the operation of the machine in cutting and shaping the work to the desired form more automatic and secure greater accuracy and uniformity in the work.

The invention consists in the peculiar and novel construction and the arrangement of the parts whereby the work is adjusted and the operation of the cutter controlled, as will be more fully set forth hereinafter.

Figure 1 is a front view of our improved machine. Fig. 2 is a side view of the same. Fig. 3 is a plan or top view, on an enlarged scale, of the head of the reciprocating tool-carriage. Fig. 4 is a vertical sectional view of the head. Fig. 5 is a longitudinal sectional view of the device for clamping the head-arbor, and Fig. 6 is a transverse section of the same. Fig. 7 is a transverse section of the tool-carriage on the line A A of Fig. 2, showing the mechanism for arresting the feed of the cutter. Fig. 8 is a transverse section of the reciprocating tool-carriage on the line B B of Fig. 2, showing the mechanism for automatically regulating the feed of the cutting-tool. Fig. 9 is a sectional view of the pawl and ratchet automatically operating the feed-spindle. Fig. 10 is a detail view of the pawl and ratchet. Fig. 11 is a perspective view of the cam-pin shown in Fig. 8. Fig. 12 is a sectional view of the rotatable work-bed. Fig. 13 is a sectional view of the work-bed-adjusting mechanism.

Similar marks of reference indicate corresponding parts in all the figures.

In the drawings, a indicates a strong, preferably hollow, box of rectangular form having the base a', at its upper end the ways a^2, and at one of its vertical sides the ways a^3, forming the standard or support of the machine. The carriage a^4 is secured to and slides on the vertical ways a^3. It is provided with ways and with the leading-screw a^5. The screw-post a^6 supports the carriage a^4 from below. The work-holder a^7 has two faces at right angles to each other, grooved for the insertion of clamps to secure the work. The work-holder a^7 is supported on the cylindrical trunnion a^8, on which the work-holder may be turned and adjusted. The head a^9 serves to clamp and hold the work-holder in the adjusted position. This head a^9 is secured to the base a^{10} of the cylindrical trunnion by the screw-rod a^{11}, and the base a^{10} is provided with ways sliding in the ways of the carriage a^4 and with the nut a^{12}, which engages with the leading-screw a^5. The head a^9 is held against rotation preferably by a pin a^{13}, as is shown in Fig. 12, and the work-holder may be secured by a rod a^{14}, screw-threaded at one end and extending through the work-holder into a hole in the base a^{10}, as is indicated in broken lines in Fig. 12. A portion or the whole of the circumference of the head a^9 may be graduated and a zero-mark placed on the end of the work-holder near the index, as shown in Fig. 1, so that the work-holder may be accurately adjusted to any desired position and the beds of the same inclined to any desired angle.

The vertical adjustment of the carriage a^4, and with it of the work-holder and the work, we prefer to do by power, and to this end the nut a^{15}, engaging with the screw-post a^6 and resting on an annular rim formed in or resting on the base a', is provided with a bevel-gear, the pinion of which engages with the beveled pinion a^{16}, secured to the end of the shaft a^{17}. The bevel-gears a^{18} and a^{19} are loose on the shaft a^{17} and are in engagement with the bevel-gear a^{20}, secured to one end of the shaft and to the other end of which the pulley a^{21} is secured. The double clutch a^{22} is connected by a spline to the shaft a^{17}, so as to rotate with the same, and may be connected with either the bevel-gears a^{18} or a^{19}. The hand-lever a^{23} is connected with the double clutch a^{22} by means of a rock-shaft and

an arm, so that by moving the hand-lever between the two stops (shown in Fig. 2) the clutch may be connected with one or the other of the bevel-gears a^{18} and a^{19}, and power being applied to the pulley a^{21} by means of a belt (indicated in broken lines in Fig. 2) the nut a^{15} may be turned to raise the carriage a^4 or lower the same.

Power is applied to the machine through the cone-pulley b, driven by means of a belt. On the shaft of this cone-pulley is a pinion-gear which engages with a large gear b', on which is a crank-pin secured to an eccentric disk carried by the larger gear b', so that the crank-pin can be adjusted with reference to the axis of rotation of the larger gear. The crank-pin engages with a slot in an arm pivotally secured at its lower end to the standard and connected at its upper end with the reciprocating tool-carriage c, as is indicated in broken lines in Fig. 2. On the end of the shaft forming the axial support of the larger gear b' is secured the slide b^2, in which is adjustably secured one end of the connecting-rod b^3, which is secured adjustably near the other end of the pawl-lever b^4, the pawl of which engages with the gear secured to the leading-screw a^5 and operates the leading-screw to feed the work laterally at each stroke of the tool in the usual manner. The reciprocating mechanism is secured adjustably to the reciprocating tool-carriage by means of the clamping-lever c' in the manner usual with this class of machines.

The end of the reciprocating tool-carriage c, to which the tool-holder is secured, is provided with the annular flange c^2, surrounding a socket in which the boss c^3 of the tool-frame c^4 is pivotally supported and on which the tool-frame may be turned to any desired angle. The peripheral surface of the tool-frame c^4 is provided with the graduations c^5, and the corresponding surface of the annular flange c^2 with a zero-mark. The tool-frame c^4 supports the screw-spindle c^6, the upper end of which is provided with the hand-crank c^7, by which the screw-spindle is turned. The lower end of the screw-spindle c^6 has the bevel-gear c^8 secured to it, and this bevel-gear c^8 engages with the bevel-gear c^9 on the spindle c^{10}, part of which is screw-threaded to form the worm c^{11}, engaging with the worm-wheel c^{12}, to the outer end of the shaft of which the lever c^{13} is secured. The stop c^{14} is adjustably secured in an annular groove formed in the outer face of the journal-bearing of the shaft of the worm-wheel c^{12}, as shown in Fig. 7. When the lever c^{13} reaches the stop c^{14}, its movement is arrested. On the inner end of the spindle c^{10} the ratchet-wheel c^{15} is secured. The pawl-arm c^{16} is loose on the spindle c^{10}. It has a segmental gear which engages with the screw-thread on the transversely-extending spindle c^{17}. All of this mechanism is shown on an enlarged scale in Fig. 8.

The spindle c^{17} extends transversely to the reciprocating tool-carriage and is supported in a sliding bearing. It is provided with the screw c^{18} and the long pinion c^{19}. The coiled spring c^{20} surrounds the spindle c^{17}. It bears at one end on the bearing of the spindle and at the other end on the end of the screw c^{18}. The gear portion of the pawl-arm c^{16} engages with the screw portion of the spindle. On the opposite end of the pawl-arm c^{16} the spring-pressed pawl c^{21} is provided with a projection extending through a slot, and this projection when it encounters the cam at the end of the pin c^{22} draws the spring-pressed pawl c^{21} backward and disengages the same from the ratchet-wheel c^{15}, so that the spindle c^{10} is free to turn. The gear c^{23} engages with the pinion c^{19} on the spindle c^{17}. The gear c^{23} is secured to a shaft supported in a bearing which has at its outer end the arm c^{24} secured to it. This arm is provided with the stop-pin c^{25}, which engages with the graduated holes in the index c^{26}. (Shown in Fig. 2.) The end of the spindle c^{17} coöperates with the cam-plate c^{27}, beveled at the opposite ends and adjustably secured to the ways a^2.

When in operation, the spindle c^{17} is pushed inward, when the end encounters the inclined cam of the cam-plate c^{27}, compressing the coiled spring c^{20} and moving the pawl-arm c^{16} upward, thereby releasing the pawl c^{21} and causing it to engage with the ratchet-wheel c^{15}. As soon as the end of the spindle c^{17} passes the cam-plate c^{27} in the return movement the coiled spring c^{20} forces the spindle outward, and the screw c^{18}, acting as a rack on the geared portion of the pawl-arm c^{16}, turns the same, and as the pawl c^{21} is now engaged with the ratchet-wheel c^{15}, secured to the spindle c^{10}, the spindle c^{10} is turned and through the same the screw-spindle c^6, which, being engaged by screw-thread engagement with the tool-slide c^{28}, feeds the tool forward for the next cut. To adjust the feed of the tool, the spindle c^{17} is adjusted with reference to the cam-plate c^{27} by moving the arm c^{24} and placing the stop-pin c^{25} into the desired hole in the index c^{26}, and thereby turning, through the gear c^{23}, the spindle c^{17} and the screw-thread c^{18} on the geared portion of the pawl-arm c^{16}.

The sleeve c^{29} forms the journal-bearing for the spindle c^{10}. It is supported in the head of the reciprocating tool-carriage c with a sliding fit. The forward end extends through the recessed trunnion of the tool-frame c^4 and is provided with a shoulder. The trunnion of the tool-frame c^4 may turn on or with the sleeve when it is adjusted. To secure the face of the tool-frame c^4 to the face of the annular flange c^2, the forked cam c^{30} is forced against the inclines c^{31}, formed on the sleeve c^{29}, to draw the sleeve and the trunnion of the tool-frame inward by the screw-threaded follower c^{32}.

On the tool-slide c^{28} the tool-plate d is pivotally secured by the stud d' at the lower end. The base d^2 of the tool-post d^3 is pivotally se-

cured at its upper end to the tool-plate *d*. The upper part of the tool-plate *d* has a segmental slot and is secured adjustably to the tool-slide c^{28}.

The crank *e* is secured to a shaft connected by bevel-gears to the screw-spindle *e'*, which connects with the clamp by which the reciprocating tool-carriage is connected with the operative mechanism in the usual manner, as is indicated in Fig. 2.

By the construction of the machine, as herein shown and described, the tool when adjusted to the desired depth of cut is automatically fed at each reciprocation of the tool-carriage, and when the desired depth is reached the feed of the tool is automatically arrested, and as the pawl in the automatic tool-controlling mechanism is drawn away from the ratchet-wheel after each feed of the tool the tool may be adjusted by hand in the usual manner through the hand-crank c^7, operating the screw-spindle c^6. All the parts adapted for adjustment are provided with graduated indexes, so that they may be adjusted to any previously-ascertained position, and duplicates of work may be produced successively or duplicates may be produced by the adjustment of the parts used in the production of similar work at a previous time.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a shaping-machine, the combination with the standard, the vertical ways on the standard, and the carriage provided with the leading-screw, of a cylindrical trunnion supported at one end on the carriage and connected with the leading-screw, and a cylinder inclosing a trunnion having a flat bed provided with clamping-grooves, whereby the work may be secured to the bed and adjusted on the trunnion, as described.

2. In a machine of the nature described, a work-support consisting of a cylindrical trunnion secured at one end to a part of the machine and a cylinder inclosing a trunnion having a flat bed provided with clamping-grooves; whereby the work may be secured to the bed and adjusted on the trunnion, as described.

3. In a machine of the nature herein described, a work-support consisting of a cylindrical trunnion secured at one end to a part of the machine, and a cylinder inclosing a trunnion having a flat bed provided with clamping-grooves; whereby the work may be secured to the bed and adjusted to the desired angle on the trunnion, as described.

4. In a shaping-machine, a work-support consisting of a cylindrical trunnion supported at one end on a part of the machine, a cylinder inclosing the trunnion and rotatably supported on the same, a work holder or bed on the cylinder, a clamping device, and a graduated index; whereby the work-support may be adjusted to the required angle and secured to the trunnion, as described.

5. In a shaping-machine, the combination with the standard, the extended base of the standard, and the vertical ways on the standard, of a carriage sliding on the vertical ways and provided with horizontal ways, a trunnion supported at one end on the carriage, a cylinder inclosing the trunnion and rotatably supported on the same, a work-holding bed on the cylinder, a screw-post extending from the carriage through the base of the standard, a nut provided with a beveled gear in screw-thread engagement with the screw-post and supported on the base, and mechanism, substantially as described, whereby the nut is operated to raise or lower the work-holder, as described.

6. In a shaping-machine, the combination with the reciprocating tool-carriage, the tool-slide, and the screw-spindle by which the cut of the tool is adjusted, of a spindle provided with a worm, bevel-gears connecting the spindle with the screw-spindle, a worm-gear engaging with the worm on the spindle, an arm on the shaft of the worm-gear, and an adjustable stop, whereby the cut of the tool is limited to a predetermined point, as described.

7. In a shaping-machine, the combination with the reciprocating tool-carriage, an annular flange on the tool-carriage, the tool-frame, and a projecting boss on the tool-frame, of a sleeve having a projecting, annular shoulder bearing on the boss of the tool-frame, an index on the marginal surface of the tool-frame, a zero-mark on the marginal surface of the annular surface of the annular flange on the end of the reciprocating tool-carriage, and a locking-wedge bearing on the inclined surfaces on the sleeve; whereby the tool-frame may be adjusted to the desired angle and secured by the locking-wedge, as described.

8. In a shaping-machine, the combination with the reciprocating tool-carriage *c*, the annular flange c^2, the tool-frame c^4, and the recessed boss c^3 on the tool-frame c^4, of the sleeve c^{29}, the inclines c^{31} on the sleeve, the forked cam c^{30}, and the screw-threaded follower c^{32}, whereby the tool-frame may be turned and adjusted to the desired angle and held in the adjusted position by drawing the annular face of the tool-frame against the face of the annular flange on the end of the reciprocating tool-carriage, as described.

9. In a shaping-machine, the combination with the reciprocating tool-carriage, the tool-frame, the tool-slide, and the screw-spindle in the tool-frame, said screw-spindle being in screw-threaded engagement with the tool-slide, of a spring-pressed spindle extending transversely to the reciprocating tool-carriage, a cam-plate adjustably secured to the ways at one side of the reciprocating tool-carriage, and mechanism, substantially as described, for transmitting the movement of the transversely, spring-pressed spindle to the screw-spindle in the tool-frame, whereby the reciprocation of the tool-carriage causes the cam to slide the transversely, spring-pressed

spindle in its supports and operate the screw-spindle in the tool-frame to advance the tool automatically for each successive cut, as described.

10. In a shaping-machine, the combination with the reciprocating tool-carriage and a cam-plate secured to a fixed part of the machine on one side of the tool-carriage, of a spring-pressed spindle, the screw-spindle in the tool-frame, and mechanism intermediate the spring-pressed spindle and the screw-spindle, whereby the screw-spindle is automatically operated at each reciprocation of the tool-carriage, as described.

11. In a shaping-machine, the combination with the reciprocating tool-carriage, a cam-plate secured to a fixed part of the machine, a spindle coöperating with the cam-plate, the screw-spindle controlling the feeding of the tool, and mechanism intermediate the spindle coöperating with the cam-plate and the screw-spindle, of a pinion, and a screw-thread on the spindle coöperating with the cam-plate, a gear engaging with the pinion on the spindle, an arm on the shaft of the gear, and an adjustable stop, whereby the relation of the spindle to the cam may be adjusted and the depth of each cut of the tool regulated, as described.

12. In a shaping-machine, the combination with the reciprocating tool-carriage c, the cam-plate c^{27}, and the screw-spindle c^6 controlling the feed of the tool, of a spring-pressed spindle c^{17}, the screw-thread c^{18} on the spindle, the spindle c^{10}, gears connecting the spindle c^{10} with the screw-spindle c^6, the pawl-arm c^{16} having a gear-section engaging with the screw c^{18}, and the ratchet-wheel c^{15} secured to the spindle c^{10}, whereby, at each reciprocation of the tool-carriage, the screw-spindle is automatically operated to feed the tool, as described.

13. In a shaping-machine, the combination with the reciprocating tool-carriage c, the cam-plate c^{27}, and the spindle c^{17}, of the pinion c^{19} on the spindle, the gear c^{23}, engaging with the spindle, the shaft of the gear c^{23}, the arm c^{24} on the shaft, the stop-pin c^{25} on the arm, and the index c^{26}, whereby the spindle c^{17} is securely held in the adjusted position to automatically feed the tool to the desired depth of cut, as described.

14. In an automatic, tool-feeding device of a shaping-machine, the combination with the reciprocating tool-carriage, a cam-plate adjustably secured to a fixed part on one side of the carriage, and the spring-pressed, partially-screw-threaded spindle c^{17}, of the pawl-arm c^{16} provided with a gear engaging with the screw-thread of the spindle, the spring-pressed pawl c^{21} in the pawl-arm, the pin c^{22} provided with the cam at its end, and the ratchet-wheel c^{15} secured to the spindle c^{10}, whereby the pawl is withdrawn from the ratchet-wheel and the tool may be adjusted by hand, as described.

15. In a shaping-machine, the combination of the following instrumentalities: a vertically, horizontally, and rotatably adjustable work-support, a reciprocating tool-carriage, a tool-frame having a screw-spindle for adjusting the tool pivotally supported on the reciprocating tool-carriage, a clamping-sleeve for securing the tool-frame to the reciprocating tool-carriage, and mechanism for operating the reciprocating tool-carriage, whereby the work and the tool may be adjusted to the desired angle and shaped, as described.

16. In a shaping-machine, the combination of the following instrumentalities: a work-support having capacity for vertical, horizontal and rotatable adjustment, a reciprocating tool-carriage, a tool-frame having a graduated index rotatably supported at the end of the reciprocating tool-carriage, a clamping device for securing the tool-frame in the adjusted position, a screw-spindle for adjusting the tool, a cam-plate, mechanism controlled by the cam-plate for automatically operating the screw-spindle, an automatic stop for limiting the feed of the tool, an index and arm controlling the feed of the tool at each reciprocation of the tool-carriage, and mechanism, substantially as described, for actuating the operative elements of the machine; whereby the machine is automatically controlled to produce duplicates of the work for which it is adjusted, as described.

In witness whereof we have hereunto set our hands.

JAMES CHARLES POTTER.
JOHN JOHNSTON.

Witnesses:
B. M. SIMMS,
J. A. MILLER, Jr.