B. M. W. HANSON & F. C. ALLEN.

SHAPER.

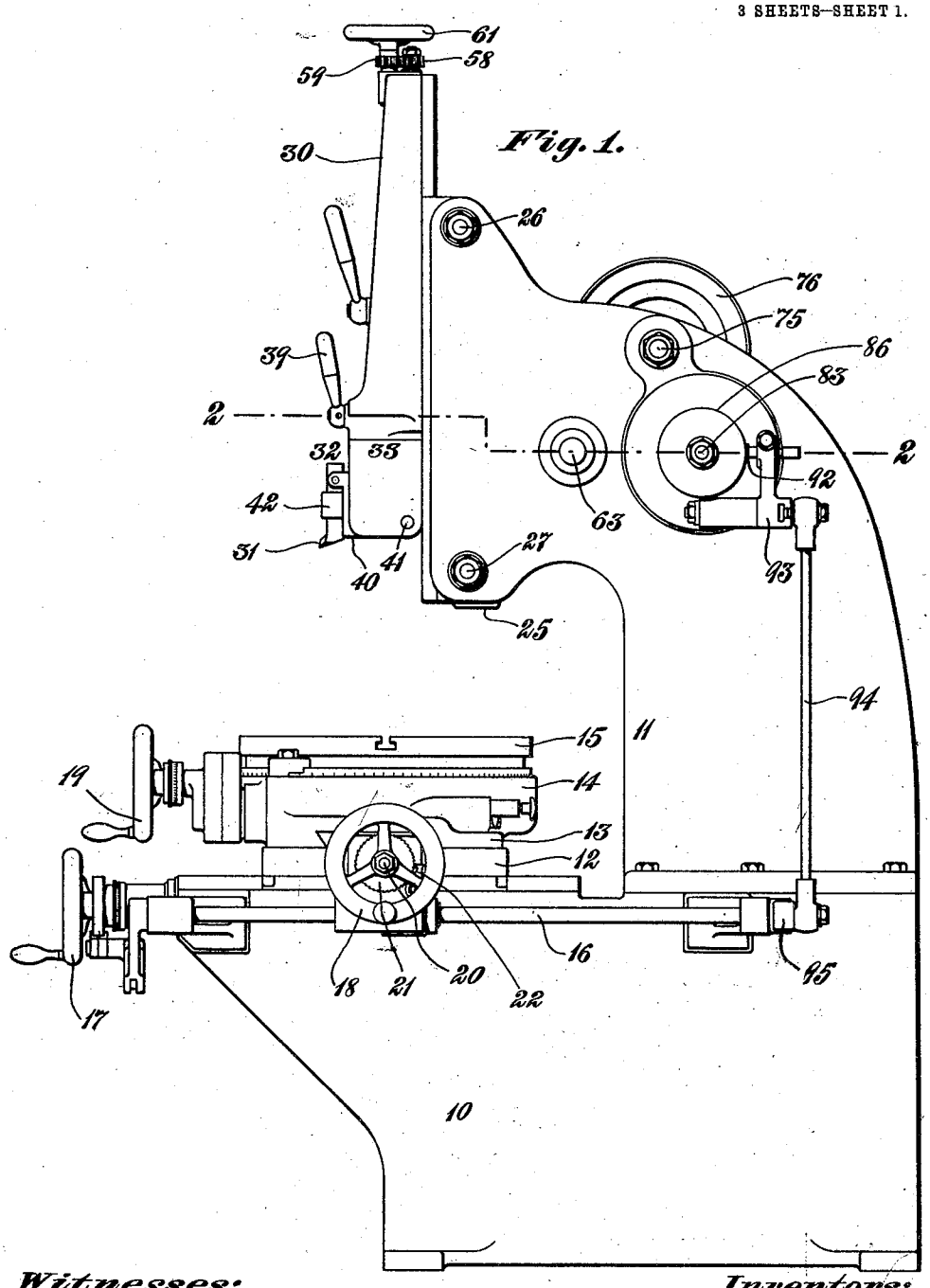
APPLICATION FILED NOV. 2, 1911.

**1,084,544.**

Patented Jan. 13, 1914.

3 SHEETS—SHEET 1.

*Fig. 1.*




*Witnesses:*

L. L. Markel.

W. M. Stewart.

*Inventors:*

B. M. W. Hanson

F. C. Allen

By their Attorneys,

Sutherland & Hudson

B. M. W. HANSON & F. C. ALLEN.

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3 SHEETS—SHEET 2.

Fig. 2.

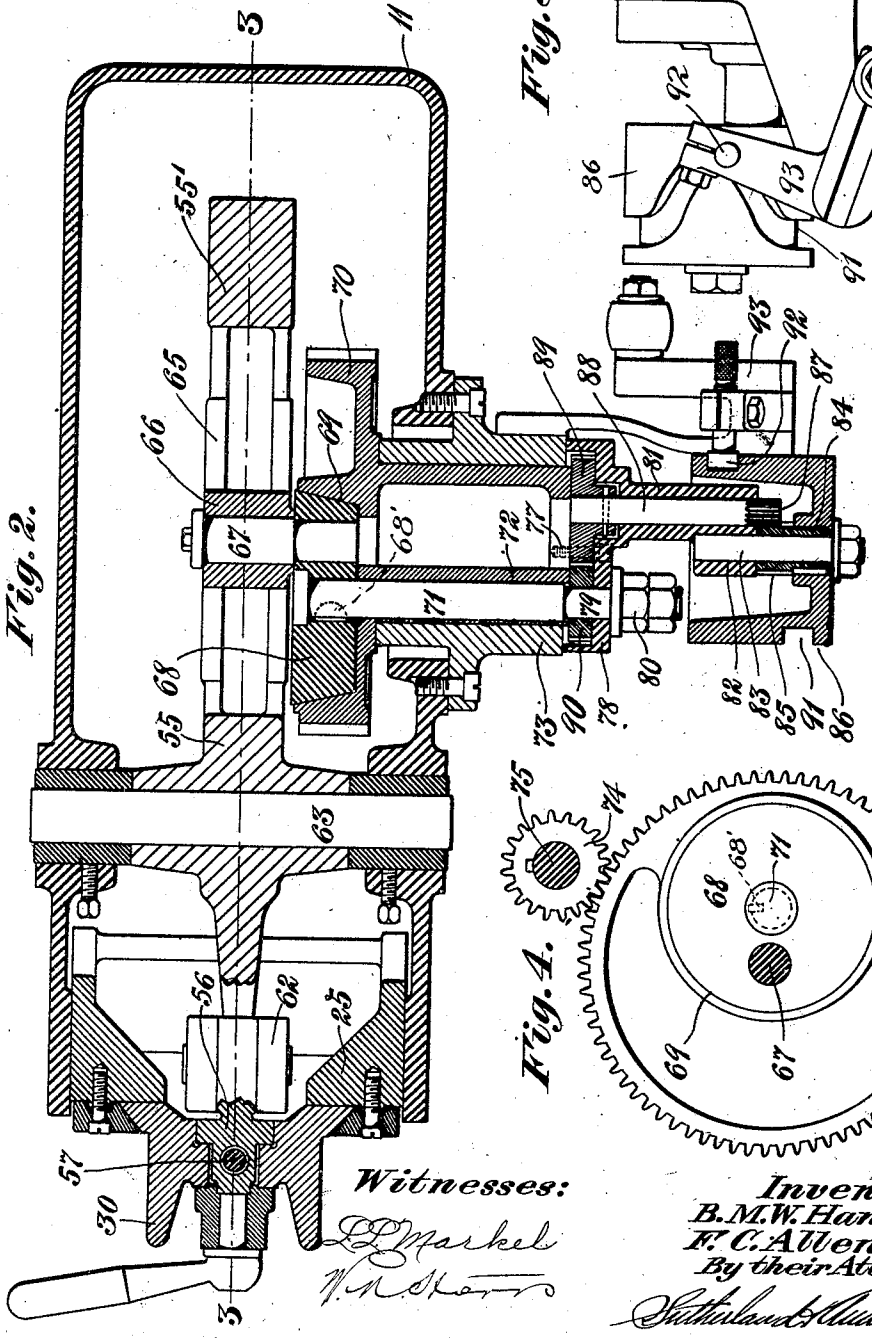


Fig. 5.

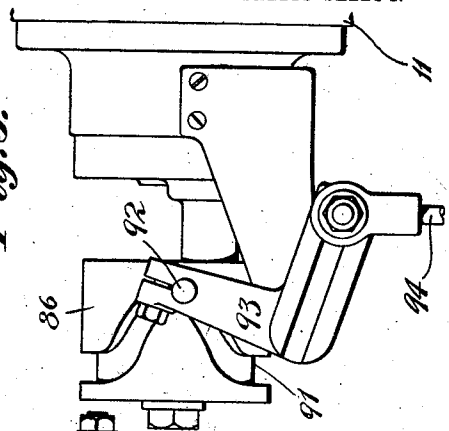


Fig. 4.




Witnesses:

L. L. Markel

W. M. Stevens

Inventors:

B. M. W. Hanson

F. C. Allen

By their Attorneys,

Sutherland & Audeum

B. M. W. HANSON & F. C. ALLEN.

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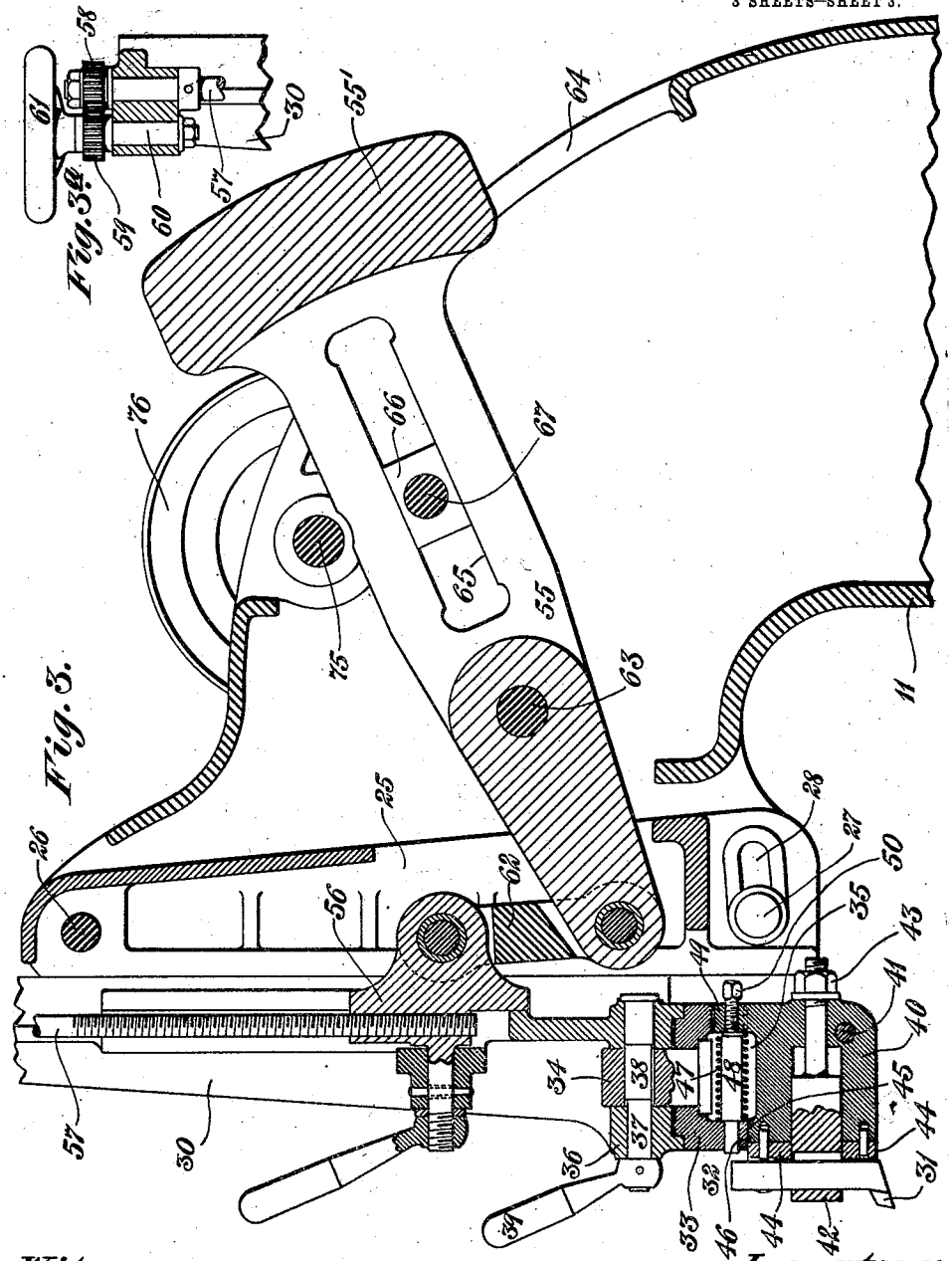
3 SHEETS—SHEET 3.

Fig. 3.




*Witnesses:*

L. L. Markel.

W. M. Storrs

*Inventors:*

*B. M. W. Hanson*

*F. C. Allen*

*By their Attorneys,*

Sutherland & Hudson

# UNITED STATES PATENT OFFICE.

BENGT M. W. HANSON AND FREDERICK C. ALLEN, OF HARTFORD, CONNECTICUT, ASSIGNORS TO THE PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF NEW JERSEY.

## SHAPER.

1,084,544. Specification of Letters Patent. Patented Jan. 13, 1914.

Application filed November 2, 1911. Serial No. 658,110.

*To all whom it may concern:*

Be it known that we, BENGT M. W. HANSON and FREDERICK C. ALLEN, citizens of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Shapers, of which the following is a specification.

This invention relates to shapers.

Our improvements can be incorporated with utility in various styles of machines of the character mentioned.

In the drawings accompanying and forming part of the present specification, we have illustrated in detail one convenient form of embodiment of the invention which will be set forth fully in the following description, this disclosure being primarily provided to enable those skilled in the metal-working art to practice the invention. We may depart from such disclosure, however, in several respects within the scope of the claims, without departing from the spirit of the invention.

In the organization illustrated the machine is a vertical shaper, although this is not essential, it being immaterial in what direction the tool travels.

A machine involving our invention comprises several features of advantage, one being the effective means whereby the range of movement of the tool can be adjusted without affecting the proper feeding of the work-carrying means. Another point resides in means for feeding the tool with a minimum expenditure of power. Another point is the swiveling of the tool-supporting head so that when the tool has cut upon one face of work, said head may be turned to cause the tool to operate upon another face of work, by reason of which no adjustment need be touched unless of course we except the adjustment of the head. Another point is the substantial mounting and bracing of a swinging member of the tool-supporting head so that chattering or shake is reduced to the least possible extent. The machine involves other features of novelty and advantage which with the foregoing will be set forth fully in said description. We might remark that it is not necessary that all of these features be employed in one machine.

Referring to said drawings: Figure 1 is a side elevation of a shaper involving my invention. Fig. 2 is a horizontal section on the line 2—2 of Fig. 1. Fig. 3 is a vertical section on the line 3—3 of Fig. 2. Fig. 3ª is a sectional detail of a portion of slide-adjusting mechanism hereinafter described. Fig. 4 is a detail view in elevation, of part of the gearing for oscillating the tool-carrier. Fig. 5 is a similar view of a cam constituting part of the slide-feeding mechanism.

The views are on different scales, and throughout the same like characters refer to like parts.

The different parts of the machine may be supported upon any suitable framework; that shown comprises a bed 10 and a column 11 rising from and suitably fastened to said bed as by bolts, as is usual in metal working machines of various kinds. Upon the bed 10 is the main slide 12 which has a movement toward and from the column 11. The slide 12 supports a cross slide 13 upon which is mounted the turntable 14, the latter being equipped with a work-holder as the plate 15.

In shaping machines it is customary to provide a power-operated shaft as 16 for intermittently actuating through the intervention of suitable mechanism, the slides (12 and 13). While this shaft 16 may be given any suitable motion to attain the desired end, it has preferably imparted thereto after the usual fashion, a rocking or oscillatory movement. That is to say it is common in this art to operate by power during one period of action one of the two slides and to operate at a different time the other of the two slides also by power. For example when the slide 12 is being operated by the power of the shaft 16 the slide 13 will, if necessary, be adjusted by hand, whereas when the slide 13 is being operated through the agency of said shaft 16 the slide 12 if necessary, is operated by hand. The main slide 12 may be operated by the hand-wheel 17 and its usual adjuncts, while the hand wheel 18 and its appurtenances may be employed for operating the cross slide 13, the hand wheel 19 and devices connected therewith being provided to rotate the turn table 14. The feed screws 20 for the slides 12 and 13 may be provided with ratchet wheels 21 engageable

preferably by pawls 22 which in turn are actuated by the shaft 16 all as common in shapers of various types.

The foregoing is a brief description of a construction which is common in shapers, and my invention does not concern any of the mechanism on the bed, although it is associated with a shaft 16 or its equivalent from which said slides receive their power. It will be, of course, understood that when the shaft 16 is rocked it will serve to operate that pawl 22 which is for the time being in action, so that said pawl can, through the intermediate parts operate step by step its appropriate slide, this action occurring after a cut has been made by the tool.

The head or overhanging portion of the column 11 is provided with a suitable slide-carrier and to the slide thereon as will hereinafter appear, is connected the shaping tool. A slide-carrier such as answers our purpose, is that denoted in a general way by 25 and which may as shown, be pivotally supported as at 26 at its upper end, to the top of the column 11. Owing to the pivotal mounting of this carrier it is adapted for angular adjustment, and it may be maintained in its adjusted position by bolts as 27, extending through arcuate slots 28 near the lower part of said carrier, said bolts being provided with nuts on the outer sides of the column. By loosening the nuts the carrier 25 can be swung either forward or backward to adjust the tool connected therewith and when the adjustment is obtained the nuts will be set up, to clamp the carrier substantially in place. It will be seen that the organization just described permits this carrier to be swung about a horizontal axis which provides for one adjustment of the tool, a second adjustment of said tool being secured by means hereinafter described. The carrier 25 supports a tool-slide as 30 which is reciprocated by power as will hereinafter appear, and the mechanism for operating said slide is such that the stroke of said slide and therefore of the tool can be varied. Means are also provided for adjusting said tool slide 30 to govern the position of cut all as will hereinafter appear.

A tool such as meets our requirements is that denoted by 31 and it is sustained by a head such as that denoted in a general way by 32, said head being swiveled to the slide 30 for movement about a vertical axis, for instance by having the body or main portion 33 of the said tool-carrying head 32 connected by a bolt or stud 34 with said slide 30, the head of said bolt or stud being located in a chamber 35 in said body 33 and the shank thereof fitting a hole in the web 36 of said slide 30. The shank of the stud or bolt is perforated to receive the clamping member 37 which is made in the form of a stud shaft having a cam portion 38 situated in the hole or perforation of said shank, said locking or clamping member 37 being equipped with a handle or lever 39. The cam portion 38 on the manipulation of the handle, 39, is adapted to force the tool carrying head 32 upwardly into solid engagement with the slide 30 as shown in Fig. 3, the head of the pivot pin or bolt 34 at this time engaging the top or roof of the chamber 35. To adjust the head 32 the cam shaft 37 will be turned so as to cause the cam 38 to free the pin or stud 34 at which time said head 32 can be turned to accomplish the desired object at which point the cam shaft 37 will be operated so as to effect the clamping of the head 32 against the slide 30 as already described. In addition to the body 33 the tool-head 32 has a swinging member 40 pivoted to said body at 41, and this swinging body directly carries the tool, said swinging member 40 being furnished with a tool post 42 the stem of which is provided with a nut 43 adapted to engage against the outer surface of the swinging member 40. The head of the tool post 42 has a perforation to receive the tool 31 and the tool is adapted to be drawn against the hard metal facings 44 by the action of the nut 43, said facings being pinned or otherwise secured to the front face of the swinging member 40. It will be observed that the outer surface of the tool post 42 or its equivalent is back of the cutting edge or point of the tool 31 and therefore back of the cutting plane by reason of which the tool can cut entirely through work, no matter what its depth or thickness, without interference.

In a shaper the cut usually takes place on the advance of the tool-carrying slide, and during the cutting operation by the tool 31 the thrust against the tool is in the opposite direction, and this effect is transferred to the swinging member 40 which has a flat surface 45 adapted to bear against a similar flat surface 46 on the body member 33 so that during the cutting operation the effect is as though the swinging member 40 were rigid or integral with the body member 33. During the retractive stroke of the parts the swinging member 40 permits the cutting portion of the tool 31 to lightly travel against the work without cutting and if any obstruction is encountered during the backward movement the swinging member can, of course, give, and in this way the work will not be marred. As a matter of fact in the present case we provide means for yieldingly receiving the thrusts of the swinging member on backward movements thereof, and for this purpose the spring 47 may be provided, said spring being coiled about a pin 48 disposed in the chamber 35 and rigidly connected with the body 33, one end of the spring bearing against said body 33 and the other end bearing against the lug or ear 49 rising from said swinging member 40 so

that when the tool 31 strikes any obstruction or protuberance on the backward movement thereof, the shock is buffed or taken up by said spring. There may be cases where it is desirable to prevent movement of the swinging member 40 on the retractive motion of a shaping tool such for example as where a very long tool is being used, and to secure this result the screw 50 for example may be utilized. This screw is tapped through the lug or ear 49 on the swinging member 40 and normally its tip or inner end is free of the pin 48. If the screw 50 is operated so as to cause it to engage the pin 48 the swinging member 40 will be effectually locked against all movement relatively to the body 33. We also call attention to the fact that the tool post 42 is situated between the axis of oscillation of the swinging member 40 and the abutment surface 46 so that thereby we get maximum holding efficiency of said swinging member 40 by the body member 33 during cutting. The best effects are secured when the axis of oscillation of the swinging member 40 is diagonally opposite the abutment surface 46 as shown.

As a means for reciprocating the slide 30 the lever 55 may be provided, and although the effect of said lever may be transferred to said slide in any desirable manner, we prefer that it be applied to a member such as the block 56 to which said slide is connected for adjustment for a reason that will hereinafter appear. The slide 30 is provided with a screw shaft 57 which is longitudinally-immovable in the slide and the threaded portion of which is tapped into the block 56. It will, therefore, be clear that by rotating the shaft 57, the slide 30 may be fed up and down. Any suitable means may be provided for rotating the shaft 57. It is shown provided with a spur-gear 58 in mesh with the spur-gear 59 rigid with the shaft 60 also carried by the slide 30 and at the upper end thereof, said stub shaft 60 being provided with a hand wheel 61. Therefore by turning the hand wheel 61 the slide 30 through the intermediate parts may be adjusted vertically on the carrier 25 and with respect to the block 56, whereby the point at which the cut is to be made can be regulated. The carrier 25 is provided with suitable ways for guiding said block 56 for up and down movement, and the latter is shown connected by the link 62 with the forward or inner end of the oscillatory lever 55. It will therefore, be understood that as said lever 55 is rocked or swung the tool 31 through the intermediate parts will be correspondingly operated whereby said tool will be first given a working stroke and then a return or ineffective stroke.

The lever 55 is shown fulcrumed between its ends being supported by the shaft 63 sustained by bearings carried by the sides of the column 11 in which column said shaft 55 is located, the column having a slot 64 at its rear to permit free swinging movement of said lever 55. The rear branch of the lever has a longitudinal slot 65 in which the block or shoe 66 is situated, said block or shoe being of rectangular construction and freely fitting the pin 67 extending eccentrically from the disk 68 which fits a counterbore 69 formed eccentrically in a driving member such as the gear 70. The disk 68 is rigid with the shaft 71; for example said disk may be keyed to said shaft by a key 68′, as shown, said shaft being supported for rotary motion by the elongated hub 72 of said gear 70 and extending outward beyond said hub for a purpose that will hereinafter appear. By rotating the shaft 71 the disk 68 can be turned so as to bring the axis of the stud or pin 67 into coincidence with the axis of the gear 70 or at various points removed from said axis by reason of which the stroke of the lever 55 can be varied or said lever also thrown out of action during the rotation of the gear 70, the last mentioned action occurring when the axes of the pin 67 and gear 70 are coincident as shown in Fig. 2. The hub of the gear 70 may as shown be set into a bearing sleeve 73 fitted in one side of the column 11. In mesh with the spur gear 70 is the pinion 74 fastened to the power shaft 75 which may be driven in any desirable manner for instance by a pulley 76. It will, therefore, be clear that when the shaft 75 is being rotated the slide 30 and therefore the tool 31 through the intermediate parts will be reciprocated, the length of the reciprocation depending upon the distance of the stud 67 from the axis of rotation of the spur gear 70.

We desire to call attention to the fact that the lever 55 is counterbalanced which result may for instance be secured by providing the outer branch of said lever with a weight 55′. It will be remembered that said lever has been described as supported for oscillation or rocking movement, between it sends and the mass of the weighted arm of said lever is sufficient to counterbalance or counterpoise the parts connected with the inner arm of said lever including said inner arm itself, so that there is no tendency on the part of said lever 55, the slide 30 or the parts connected therewith to move of themselves, by virtue of which the only thing necessary for the lever-operating mechanism to do, is to actuate said lever and therefore the various parts connected therewith which as will be clear is highly advantageous. We desire also to call attention to the fact that the mechanism for adjusting the slide 30 to govern the position at which the tool makes its cut, is connected with said lever 55 at one side of its axis of oscillation, while the

stroke-varying means is connected with said lever at the opposite side of said axis.

The hub 72 has fastened thereto as by screws 77 or otherwise the chambered or cupped cap-plate 78, and the reduced portion 79 of the shaft 71 extends through a perforation in said cap plate and is provided with holding and check nuts 80. By unloosening these nuts 80 the shaft 71 can be freely turned to adjust the stud 67, and when the adjustment is obtained said nuts will be tightened. The means shown for rotating the shaft 71 and therefore adjusting the stud 67 will be hereinafter described. The cap plate 78 is shown provided with a hollow stud or tubular projection 81 having a lateral offset 82 in which is fitted the pin 83, the axis of which is substantially coincident with the axis of rotation of the spur gear 70. The pin may be driven into a hole in said offset. It is provided with a sleeve 84 having the gear 85 integral therewith, said sleeve extending through a hole in the outer wall of the shell-like cam 86 and being as shown keyed to said cam. It, therefore, follows that when the cam 86 is turned the gear 85 will also be turned. The gear 85 is in mesh with a gear 87 at the outer end of the shaft 88, said shaft being provided at its inner end within the cup-like cap plate 78 with a gear 89 in mesh with the gear 90 fastened to the reduced portion 79 of the shaft 71. It will be clear that owing to the described construction the stud 67 is adjusted by rotating the cam 86, and this cam which receives its motion from the main shaft 75 also serves to operate through intermediate connections described below the slide-operating shaft 16 to which we have already referred. It will, therefore, be understood that notwithstanding the fact that the stroke of the tool is varied, the slides (12 or 13) when operated by power will commence their movements at the proper times. By virtue of this last mentioned feature the feed of the slides 12 and 13 is insured at the exact point notwithstanding the adjustment of the lever 55 or analogous member.

The cam 86 has an exterior groove 91 which receives a stud 92 on one branch of the angle lever 93 fulcrumed at its angle to the framing of the machine, the other arm of said angle lever being connected with a rod 94 jointed at its lower end to the crank arm 95 fastened to the shaft 16. It, therefore, follows that when the gear 70 driven from the main shaft as already described is rotated it oscillates through the described parts the lever 55 and also rotates the cam 86 whereby said cam will through the described parts rock the shaft 16 to effect the action by power, of one of the two slides 12 and 13.

What we claim is:

1. In a machine of the class described, the combination of a work-carrier and an operating shaft therefor, a tool-supporting member, a lever operatively connected with said tool-supporting member, a power-transmitting member, a disk eccentrically supported by said power-transmitting member and provided with an eccentric pin adjustably connected with said lever, a cam and connections therewith, for actuating said shaft, said cam being rotative with said power-transmitting member, and means for rotating said disk and for also rotating said cam independently of said power-transmitting member.

2. In a machine of the class described, the combination of a work-carrier and an operating member therefor, a tool-supporting member, a lever operatively connected with said tool-supporting member, a power-transmitting member, a pin adjustably connected with said lever, a rotary member to which said pin is eccentrically connected and the axis of which is eccentric to said power-transmitting member, an actuating device and connections therewith for actuating said work-carrier operating member, said actuating device being rotative with said power-transmitting member, and means for rotating said rotary member and for also rotating said actuating device independently of said power-transmitting member.

3. In a machine of the class described, the combination of a work-carrier and an operating shaft therefor, a tool-supporting member, a power-transmitting member, a rotary member supported by said power-transmitting member and having its axis of rotation eccentric to that of said power-transmitting member, an eccentric pin carried by said rotary member and adjustably connected with said lever, an actuating device and connections therewith for actuating said shaft, said actuating device being rotative with said power-transmitting member, and means including meshing gears, for rotating said rotary member and for also rotating said actuating device independently of said power-transmitting member.

4. In a machine of the class described, the combination of a work-carrier and an operating shaft therefor, a tool-supporting member, a lever operatively connected with said tool-supporting member, a power-transmitting member, a shaft rotatively and eccentrically supported by said power-transmitting member, a member rigidly connected with said last mentioned shaft and provided with an eccentric pin adjustably connected with said lever, a cam rotative with and independently of said power-transmitting member and geared to said last mentioned shaft, whereby when said last mentioned shaft is turned the cam will be also turned,

and operative connections between said work-carrier operating shaft and said cam.

5. In a machine of the class described, the combination of a work-carrier and an operating member therefor, a tool-supporting member, a lever operatively connected with said tool-supporting member, a power-transmitting member, a pin adjustably connected with said lever and also adjustably connected with said power-transmitting member, an actuating device and connections therewith, for actuating said work-carrier operating member, said actuating device being rotative with said power-transmitting member, and means for adjusting the relation of said pin with respect to said power-transmitting member and said lever to vary the stroke of the lever, and for also correspondingly adjusting said actuating device independently of said power-transmitting member.

In testimony whereof we affix our signatures in presence of two witnesses.

BENGT M. W. HANSON.
FREDERICK C. ALLEN.

Witnesses:
W. M. STORRS,
F. E. ANDERSON.