

No. 775,073.

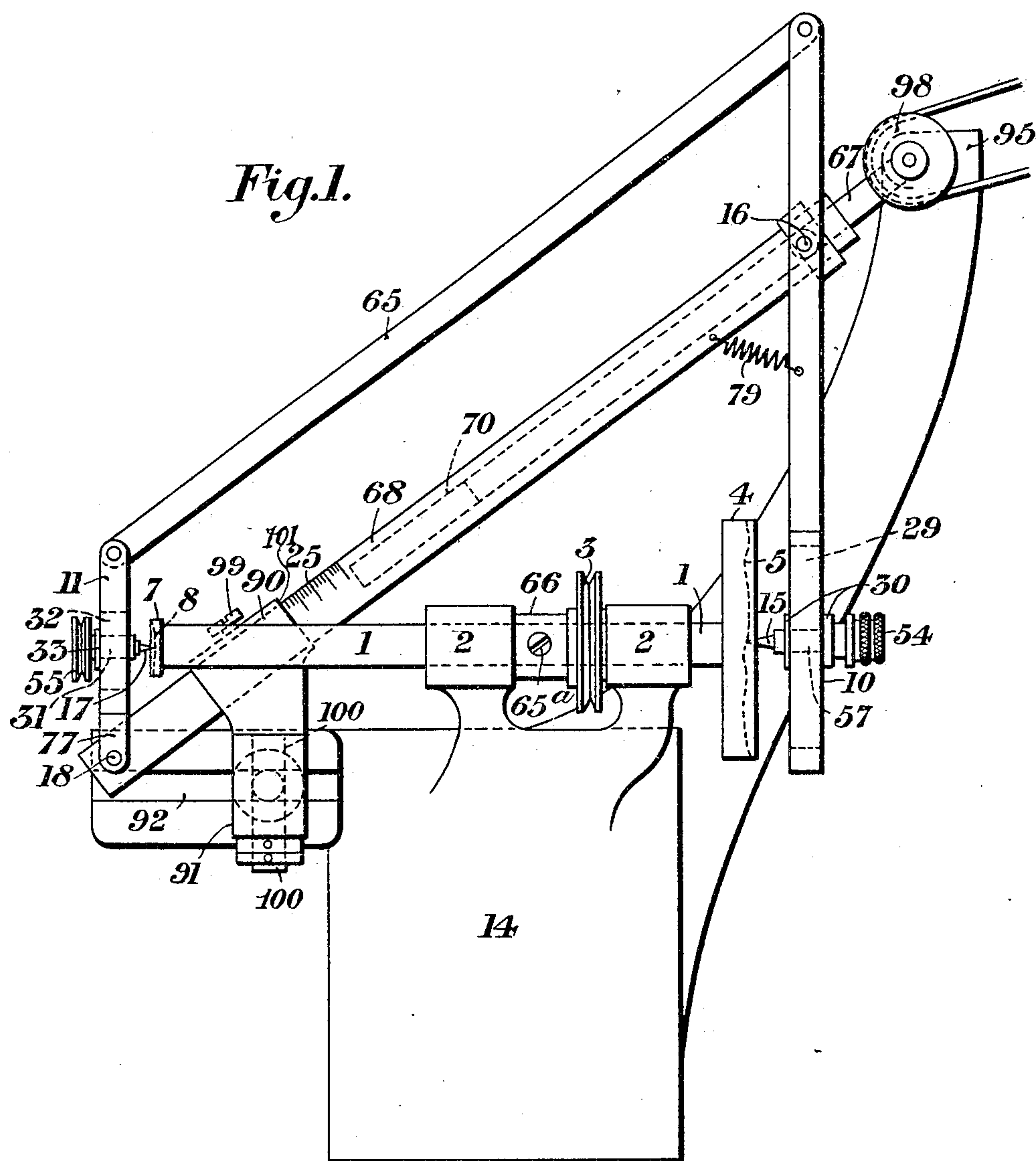
PATENTED NOV. 15, 1904.

M. BARR.
AUTOMATIC ENGRAVING MACHINE.

APPLICATION FILED JULY 1, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses.

Horace Grellet

R. E. McLaren.

Inventor

Mark Barr.

per *Chas. S. Woodroffe*
Attorney.

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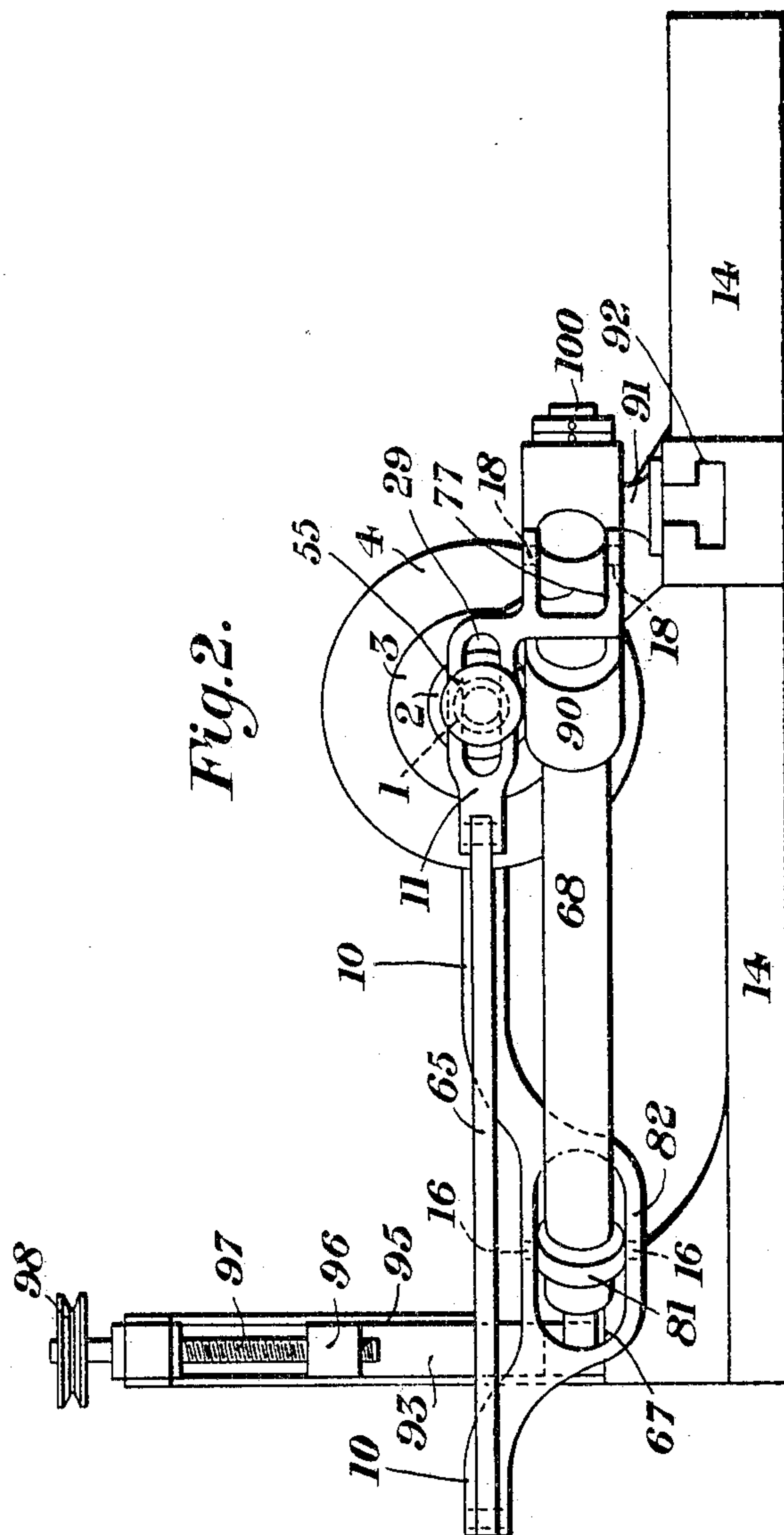
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NO MODEL.

3 SHEETS—SHEET 2.



Witnesses.
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3 SHEETS—SHEET 3.

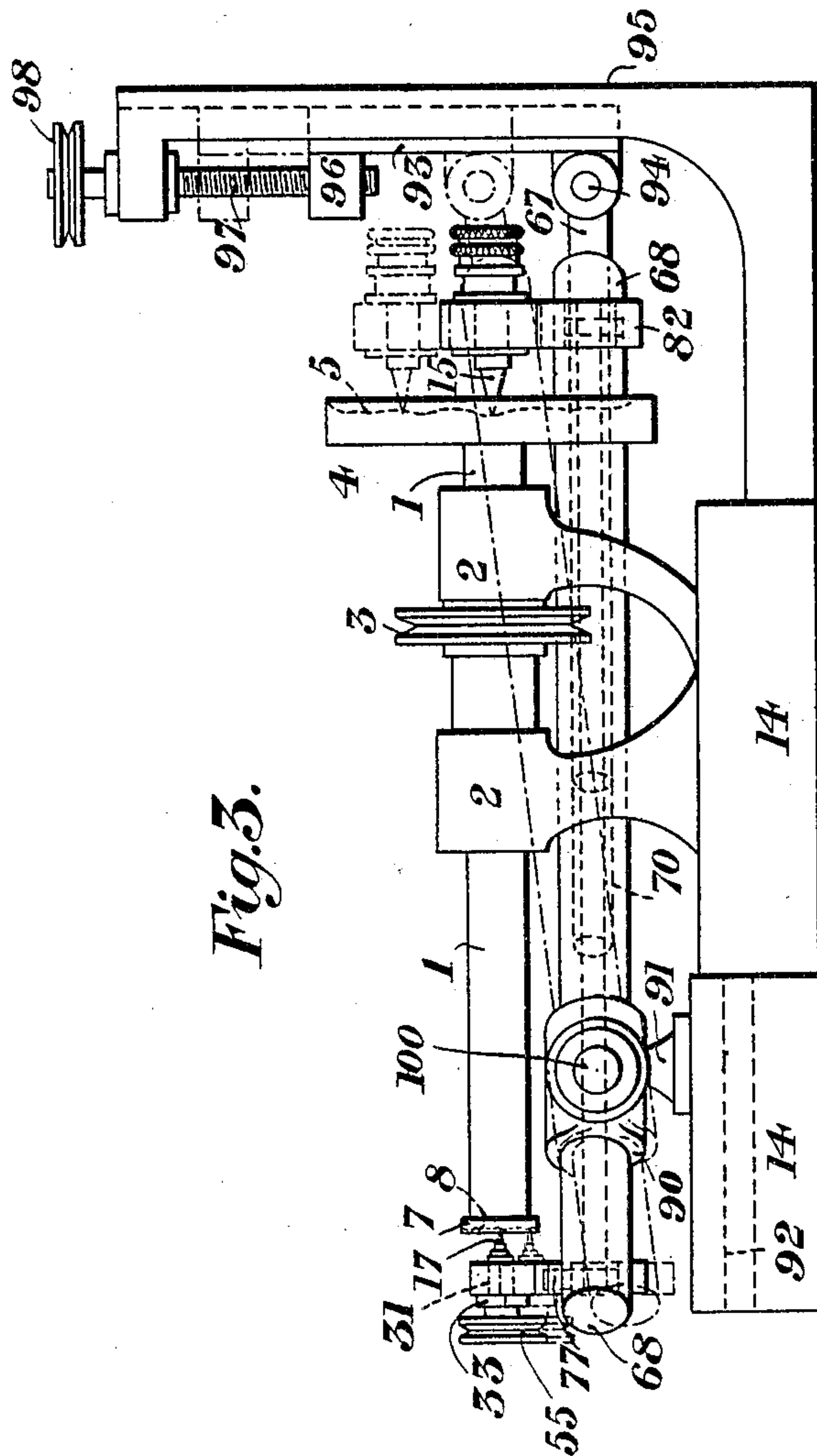


Fig. 3.

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UNITED STATES PATENT OFFICE.

MARK BARR, OF LONDON, ENGLAND, ASSIGNOR TO LINOTYPE AND
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AUTOMATIC ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 775,073, dated November 15, 1904.

Application filed July 1, 1901. Serial No. 66,755. (No model.)

To all whom it may concern:

Be it known that I, MARK BARR, of London, England, (whose postal address is 25 Kensington Court Gardens, Kensington, in the county of Middlesex, England,) have invented certain new and useful Improvements in Automatic Engraving-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in that class of automatic engraving-machines the distinctive feature of which is a single straight rotating shaft one end of which carries the pattern and the other end the work in planes at right angles with the axis common to the three-shaft, pattern, and work, and which shaft has combined with it a linkage carrying the tracer and the tool and communicating the motions of the former homologously to the latter, means for adjusting the position of the linkage for ratio of reduction between the pattern and the work, means for traversing the tracer and the tool radially over the pattern and the work, respectively, means for alining the tracer and the tool axially with the shaft, and means for the adjustment of the tracer and the tool in the direction of their respective axes.

The class of machine above described is specified in a pending application, Serial No. 53,911, filed April 1, 1901, and the present invention consists in an improved linkage.

Referring to the accompanying drawings, which are to be taken as part of this specification and read therewith, Figure 1 is a plan; Fig. 2, a side elevation thereof from the left hand, and Fig. 3 a front elevation of the same figure.

1 is the single straight shaft above mentioned. 2 2 are its bearings carried by the base 14 and in which it can be rotated at the required speed. 3 is its driving-pulley. Means for driving the latter are not included in the drawings because they do not constitute any part of the present invention and are, besides, well known. Any motor that can be quickly

reversed may be used. The position of the shaft 1 in the bearings 2 2 must be capable of longitudinal adjustment and of being incapable of longitudinal motion in its adjusted position for a reason explained farther on. To this end the shaft 1 carries its pulley 3 between the two bearings 2 2, the pulley being held to the shaft by a set-screw 65, passed through the pulley-boss 66.

4 is the pattern-block. It is mounted fast upon and to the respective end of the shaft 1 by any suitable means, having that face of it which carries the pattern (represented in Figs. 1 and 3 by the dotted line 5) outward, as shown.

7 is the work-block. It is likewise mounted fast upon and to the respective end of the shaft 1 by any suitable means, having the face to be engraved outward, as indicated by the dotted line 8 in Figs. 1 and 3. Thus both pattern and work are carried by and rotate with the shaft 1, one on one end of it and the other on the other.

The improved linkage consists of a lever 68 capable of sliding through a sleeve 90, adapted to turn about a horizontal axis at right angles with the shaft 1 in a block 91, held fast to the base 14 and having its fulcrum in the said axis, a lever 10 of the first class turning on a vertical fulcrum 16 in the lever 68, a lever 11 of the second class turning on the vertical fulcrum 18 in the front end of the lever 68, the length of the said lever 11 being equal to that of the lever 10 rearward of the fulcrum 16, and a link 65 connecting the rear ends of the levers 10 and 11 and holding them constantly parallel with each other.

The fulcrum 16 is shown in Fig. 2 as conveniently provided by a pair of studs 80 80, which project from a ring 81, fast on the lever 68, and enter holes in the top and bottom of the loop 82 in the lever 68, the latter being cranked to hold the said loop at the necessary level and the fulcrum 18 by a pin passed through the forked end 77 and the lever 68, the end 77 embracing the said lever for that purpose. An exact adjustment of the sleeve 90 along the lever 68 may become necessary

in getting the machine ready for any particular job. The block 91 is therefore adjustable in a direction parallel with the shaft 1 in a groove 92 in the base 14.

15 is the tracer. It is carried in the front end of the lever 10, the axis of the tracer being preferably at right angles with the length of the said lever.

17 is the tool. It is carried by the lever 11 at the same angle with it as that of the tracer 15 with its lever 10.

79 is a spring pulling from the lever 68 on the lever 10 to keep both the tracer 15 and tool 17 in contact with the pattern 5 and the work 8, respectively. The tracer 15 is moved radially to and fro over the pattern 5 and the tool 17 over the work 8 homologously with each other by rocking the lever 68 on its fulcrum. This is effected by a rod 67, adapted to slide in a bore 70 in the lever 68, a vertical slide 93, having the rear end of the rod 67 pivoted to it by a horizontal pivot 94 and capable of being traversed up and down in a direction at right angles with the horizontal axis about which the sleeve 90 turns in a vertical guide 95, fast on the base 14, by the engagement in a screw-threaded nut 96, fast on the said slide 93 of a traversing-screw 97, turning without longitudinal motion in the standard 95. The screw 97 is turned by any suitable reversible motor driving onto the pulley 98. The action of this screw 97 in moving the tracer 15 over the pattern 5 and the tool 17 over the work 8 will be understood from a comparison of the full lines with the dotted lines of the linkage in Fig. 3. It is indifferent whether the tracer 15 starts at the center of the pattern 5, traveling outward to the circumference, or vice versa.

The dimensional proportions between the pattern 5 and the work 8 are as those between the respective distances of the fulcrum 16 and 18 from the axis of the shaft 1. For adjusting these distances, or, in other words, for adjusting the ratio of reduction between the pattern 5 and the work 8 when that ratio is greater than the minimum ratio of which the machine is capable, the lever 68 must be moved by hand to the front through the sleeve 90.

25 is a scale on the lever 68, having its zero at the front end of it and the rear end of the sleeve 90 serving as the index for it. The scale is one of additions to be made to the distance of the axis of the shaft 1 from the fulcrum 18 and of corresponding subtractions to be made from the distance of the said axis from the fulcrum 16 in setting the lever 68 in the sleeve 90. The zero position of the said lever 68 in its sleeve 90 is always coincident with the maximum ratio between pattern and work.

Let a equal the angle of the lever 11 with the lever 68 when the axes of the tracer 15, the tool 17, and the shaft 1 are alined with each other, d equal the radius of the work 8,

P equal the radius of the pattern 5, t equal the minimum length from 18 to the axis of the tool 17, L equal the maximum length from 16 to the axis of the tracer 15, and when the machine stands set with the above lengths let the lever 68 be at its zero, whence S equals zero at this position—*i. e.*, the above length relationship is always coincident with the zero position of the lever— T equals the distance in the direction of the axis of the lever 68, to which a given point on the said axis must be set. It is the reading on the scale 25. S equals the distance in a direction perpendicular to the vertical plane, which contains the axis of the shaft 1, through which a given point on the axis of the lever 68 moves when any adjustment of the ratio of reduction is made by axially moving the lever 68 from what is called its "zero position." The zero position of the lever 68 is that in which the length from 18 to the axis of the tool 17 is set at its minimum, the length from 16 to the axis of the tracer 15 is set at its maximum, and in which the axes of the tool 17 of the tracer 15 and of the shaft 1 coincide. Then if the scale 25 (which for convenience will read in decimals of inches) has its zero-line in alinement with the edge 101 of the sleeve 90 when the lever 68 is in the above-defined zero position any axial movement of the lever 68 for the purposes of adjusting the ratio of reduction will be in the sense from sixteen to eighteen and will be read off on the scale 25, and the perpendicular distance (which is *nil* for the zero position above described) of the point of intersection of the axis of lever 68 with the vertical plane containing the axis of 1 will be increased by the amount which is called S . Now, therefore, ratio of reduction = $\frac{t+S}{L-S}$; also, ratio of reduction = $\frac{d}{P}$.

$$\text{Therefore } \frac{t+S}{L-S} = \frac{d}{P}.$$

$$\therefore dL - dS = Pt + PS.$$

$$\therefore dL - Pt = PS + dS.$$

$$\therefore dL - Pt = S(P + d.)$$

$$\therefore \frac{dL - Pt}{P + d} = S.$$

If t equals 1 and L equals 15,

$$S = \frac{15d - P}{P + d},$$

in which obviously $S = \frac{T}{\sec. a}$. Therefore

$$T = \sec. a \cdot \frac{15d - P}{P + d}, \text{ sec. } a \text{ being a numerical constant of the machine. For example,}$$

if a equals forty-five degrees then $\sec. a = \sqrt{2}$ or 1.414.

99 is a set-screw working through the sleeve 90 to hold the lever 68 to it in any adjusted position; but moving the lever 68 through the sleeve 90 will rock the levers 10 11. Under those circumstances the set-screw 65 is to be unscrewed, as well as the screw 99, and the shaft 1 moved through its bearings 2 2 at the same time that the lever 68 is moved through the sleeve 90. After the adjustments of the lever 68 and shaft 1 have been effected the tracer 15 and the tool 17 must both be moved along their respective levers 10 and 11 to aline their axes with that of the said shaft. To make such adjustments practicable, the tracer 15 is mounted in a tracer-block 57, adapted to slide in a slot 29 in the lever 10 and to be locked to the latter in the adjusted position by any suitable means, such as locking-nuts 30 30, the tool 17 also being mounted in a tool-block 31, adapted to slide in a slot 32 in the lever 11 and to be locked to the latter in the adjusted position by locking-nuts 33 33. It is very probable that different pattern-blocks 4 will be of different thicknesses, so that any one may, after it has been mounted upon the respective end of the shaft 1, hold the pattern 5 at a greater distance from the end of the said shaft than would another pattern-block hold its pattern. Hence it becomes necessary that both the tracer 15 and the tool 17 should be adjustable in the direction of their axes. For that purpose each one is capable of sliding through its block 57 31 and is fitted with a micrometer adjustment 54 55.

I claim—

1. The combination with a single straight rotating shaft one end of which is adapted to carry the pattern and the other end the work, of a linkage carrying the tracer and the tool and adapted to communicate the motions of the former homologously to the latter, the said linkage consisting of a sleeve adapted to turn about a horizontal axis, a lever capable of sliding through the said sleeve, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class.

2. The combination with a single straight rotating shaft one end of which is adapted to carry the pattern and the other end the work, of a linkage carrying the tracer and the tool and adapted to communicate the motions of the former homologously to the latter, the said linkage consisting of a sleeve adapted to turn about a horizontal axis, a lever capable of sliding through the said sleeve, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the

pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class; and means for adjusting the position of the said linkage for ratio of reduction between the pattern and the work.

3. The combination with a single straight rotating shaft one end of which is adapted to carry the pattern and the other end the work, of a linkage carrying the tracer and the tool and adapted to communicate the motions of the former homologously to the latter, the said linkage consisting of a sleeve adapted to turn about a horizontal axis, a lever capable of sliding through the said sleeve, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said lever of the first and second class; means for adjusting the position of the said linkage for ratio of reduction between the pattern and the work; and means for traversing the tracer and the tool respectively over the pattern and the work between the center and the circumference thereof.

4. The combination with a single rotating shaft one end of which is adapted to carry the pattern and the other end the work, of a linkage carrying the tracer and the tool and adapted to communicate the motions of the former homologously to the latter, the said linkage consisting of a sleeve adapted to turn about a horizontal axis, a lever capable of sliding through the said sleeve, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class; means for adjusting the position of said linkage for ratio of reduction between the pattern and the work; and means for adjusting the tracer and the tool upon the respective parts of the said linkage.

5. The combination with a single rotating shaft one end of which is adapted to carry the pattern and the other end the work, of a linkage carrying the tracer and the tool and adapted to communicate the motions of the former homologously to the latter; the said linkage consisting of a sleeve adapted to turn about a horizontal axis, a lever capable of sliding through the said sleeve, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer

at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class; means for adjusting the position of the said linkage for ratio of reduction between the pattern and the work; means for adjusting the tracer and the tool upon the respective parts of the said linkage; and means for traversing the tracer and the tool respectively over the pattern and the work between the respective center and circumference thereof.

6. The combination of base; single shaft adapted to carry the pattern on one end of it and the work on the other end; bearings on the base for the said shaft; means for adjusting the position of the shaft in its bearings; a sleeve pivoted about a horizontal axis on the base for the lever of the linkage next mentioned to slide through; a linkage consisting of a lever capable of sliding through the above-named sleeve adapted to turn about a horizontal axis, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class; means for adjusting the position of the said linkage for ratio of reduction between the pattern and the work; means for adjusting the tracer and the tool upon the respective parts of the said linkage; and means for traversing the tracer and the tool respectively over the pattern and the work between the respective center and circumference thereof.

7. The combination of base; single shaft adapted to carry the pattern on one end of it and the work on the other end; bearings on the base for the said shaft; means for adjusting the position of the shaft in its bearings; a linkage consisting of a sleeve adapted to turn about a horizontal axis, a lever capable of sliding through the said sleeve, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class; and means consisting of a scale on the sliding lever of the linkage cooperating with the rear end of the sleeve as an index for indicating position of adjustment of the said linkage for different ratios of reduction between the pattern and the work.

8. The combination of base; single shaft adapted to carry the pattern on one end of it and the work on the other end; bearings on the base for the said shaft; means for adjusting the position of the shaft in its bearings; a sleeve pivoted about a horizontal axis on the base for the lever of the linkage next mentioned to slide through; a linkage consisting of a lever capable of sliding through the above-named sleeve adapted to turn about a horizontal axis, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class; means consisting of a scale on the sliding lever of the linkage cooperating with the rear end of the sleeve as an index for indicating position of adjustment of the said linkage for different ratios of reduction between the pattern and the work; and means for traversing the tracer and tool respectively over the pattern and the work between the respective center and the circumference thereof, consisting of a rod adapted to slide in a bore in the sliding lever of the linkage, a slide, a pivotal connection between the adjacent ends of the rod and slide, a guide for the slide, and a traversing-screw engaging with the said slide to traverse it up and down the guide.

9. The combination of base; single shaft adapted to carry the pattern on one end of it and the work on the other; bearings in the base of the shaft; means for adjusting the position of the shaft in its bearings; a sleeve pivoted about a horizontal axis on the base for the lever of the next-mentioned linkage to slide through; a linkage consisting of a lever capable of sliding through the above-named sleeve adapted to turn about a horizontal axis, a lever of the first class having its fulcrum in the rear end of the first-mentioned lever and carrying the tracer at one end of it in contact with the pattern, a lever of the second class having its fulcrum in the front end of the first-mentioned lever and carrying the tool in contact with the work, and a link connecting the rear ends of the said levers of the first and second class; means consisting of a scale on the sliding lever of the linkage cooperating with the rear end of the sleeve as an index for indicating position of adjustment of the said linkage for different ratios of reduction between the pattern and the work; means for traversing the tracer and the tool respectively over the pattern and the work between the respective center and the circumference thereof consisting of a rod adapted to slide in a bore in the sliding lever of the linkage, a slide, a

pivotal connection between the adjacent ends of the rod and slide, a guide for the slide, and a traversing-screw engaging with the said slide to traverse it up and down the guide;
5 and means for axially alining the tracer and the tool with the axis of the shaft consisting of a slot in the respective lever of the linkage, a block adapted to slide therein lengthwise of the respective lever and a locking de-

vice for holding the block in its adjusted position.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

MARK BARR.

Witnesses:

HARRY LAWRENCE COX,
CHAS. S. WOODROFFE.