

No. 759,956.

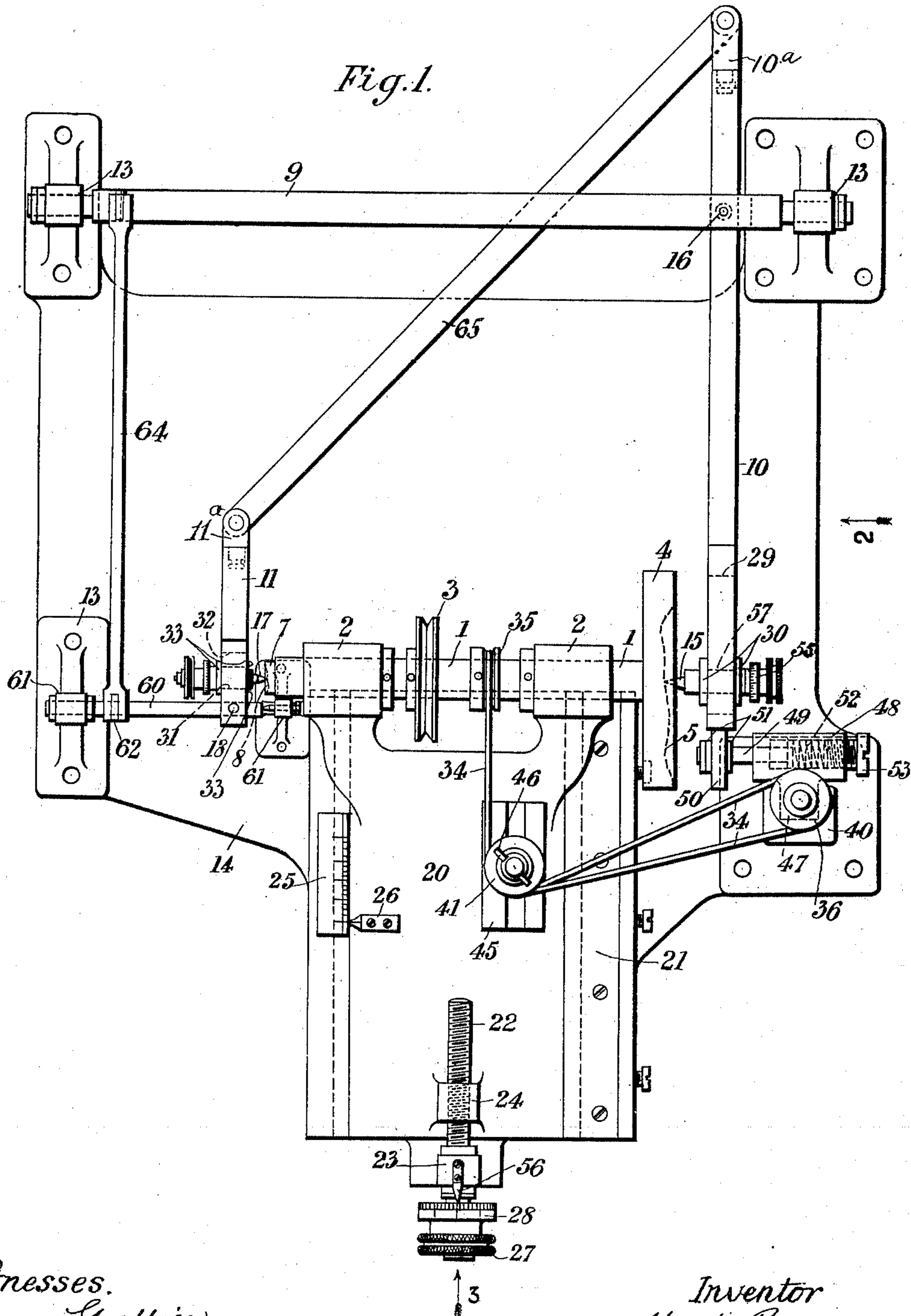
PATENTED MAY 17, 1904.

M. BARR.
AUTOMATIC ENGRAVING MACHINE.

APPLICATION FILED MAY 31, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses.
Horace Grellier.
Rodolphe J. Glessey

Inventor
Mark Barr
per *Chas. S. Woodroffe*
Attorney.

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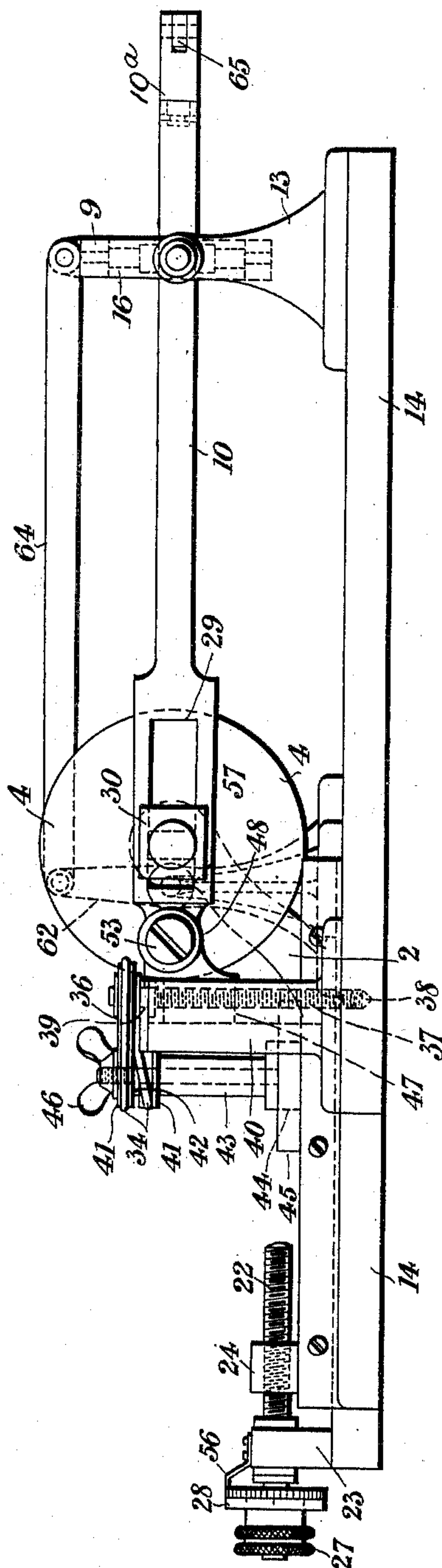
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AUTOMATIC ENGRAVING MACHINE.

APPLICATION FILED MAY 31, 1901.

NO MODEL.

3 SHEETS—SHEET 2.



Witnesses.
Horace. Grellier.
Rodolphe J. Cleary.

Inventor
Mark Barr:
per Jas. S. Woodruff
Attorney.

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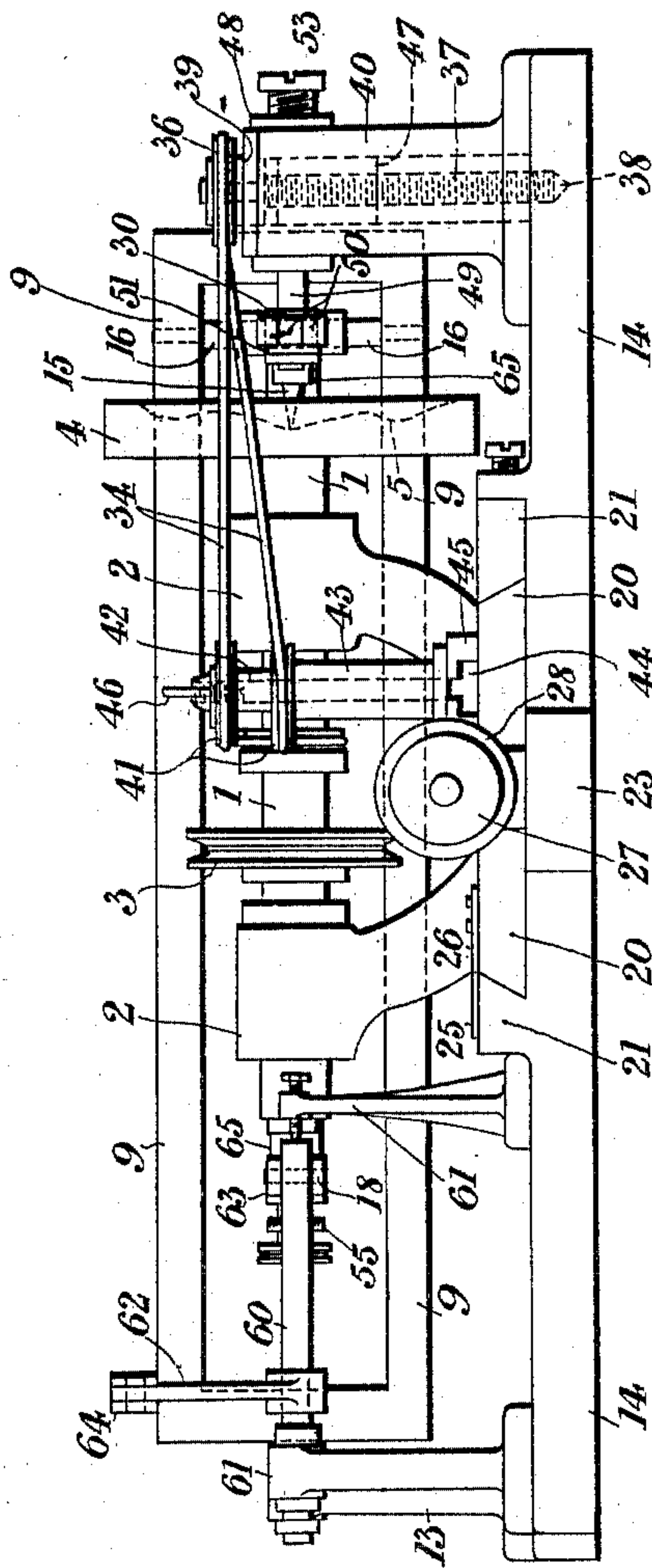
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3 SHEETS—SHEET 3.

Fig. 3.



Witnesses.
Horace Grellier.
Rodolphe J. Cleary.

Inventor
Mark Barr.
per Charles Woodroffe
Attorney.

UNITED STATES PATENT OFFICE.

MARK BARR, OF KENSINGTON, ENGLAND, ASSIGNOR TO THE LINOTYPE COMPANY, LIMITED, OF LONDON, ENGLAND.

AUTOMATIC ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 759,956, dated May 17, 1904.

Application filed May 31, 1901. Serial No. 62,613. (No model.)

To all whom it may concern:

Be it known that I, MARK BARR, of 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 or follower and the tool and communicates the motions of the former to the latter, means for adjusting the position of the shaft for ratio of reduction between the pattern and the work, means for alining the tracer and the tool axially with the shaft, means for the homologous adjustment of the tracer and the tool, and means for traversing the tracer and the tool radially over the pattern and the work, respectively.

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 right hand, and Fig. 3 a front elevation of the same figure looking at it in the direction of the arrows 2 and 3.

1 is the single straight shaft above mentioned. 2 2 are its bearings, 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.

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 (represented by the dotted line 8 in Figs. 1 and 3) outward, as shown. Thus both pattern and work are carried by and rotated with the shaft, one at one end thereof and the other at the other end, the pattern and work being in planes parallel with each other and perpendicular to the axis of the shaft and both facing in opposite directions.

The improved linkage consists of a rocker 9, mounted to rock in bearings 13 13, carried by the base 14, and upon which they stand in positions proper for holding the axis of the rocker parallel with and in the same horizontal plane as the axis of the single shaft 1, a lever 10 of the first class having a swiveled rear end 10^a and fulcrumed on a post 16, turning about a vertical axis in the rocker 9 near the respective end of it, the fulcrum 16 intersecting the axis of the said rocker, a shaft 60 parallel with the single shaft 1 and mounted to rock in bearings 61 61, fast on the base 14, an arm 62 fast to the shaft 60 and upstanding thereon, a lever 11 of the second class having a swiveled rear end 11^a and fulcrumed on the parallel shaft 60 by a pin 18 passed through the said lever and shaft, the end 63 of the lever being forked to embrace the shaft and the pin 18 serving as the fulcrum of the lever, a link 64 connecting the arm 62 to the top of the rocker near the respective end of it, and a link 65 connecting the swiveled rear ends 10^a and 11^a of the levers 10 and 11. It is to be noted that the length of the lever 10 rearward of the fulcrum 16 is equal to the length of the lever 11.

15 is the tracer. It is carried by 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 near the fulcrum 18 of it and at the same angle with it as that of the tracer 15 with the lever 10.

The dimensional proportions between the pattern 5 and the work 8 are as those between

the distances of the fulera 16 and 18 from the axis of the shaft 1. For adjusting those distances, or, in other words, for adjusting the ratio of reduction between the pattern and the work when that ratio is greater than the minimum ratio of which the machine is capable, the shaft 1 must be moved at right angles with its own axis to or from the linkage just described. Its bearings 2 2 are accordingly carried by a slide 20, capable of a reciprocating motion between a pair of guide-strips 21 21 upon the base 14. This motion is imparted to it by a traversing screw 22, turning without axial motion in a bracket-piece 23, standing up from the base 14 and engaging in a nut 24, fast on the slide 20.

25 is a scale on one of the strips 21, and 26 is its index on the slide 20. The unit of this scale is equal to the minimum distance between the axis of the shaft 1 and the fulcrum 18, while the scale itself is one of additions to be made to the distance of the axis of the shaft 1 from the fulcrum 18 and of the correlative subtractions to be made from the distance of the said axis from the fulcrum 16 in setting the shaft 1 up toward the linkage.

27 is a milled head for turning the screw 22, 28 a micrometer-disk on it reading subdivisions of the scale 25, and 56 its index on the bracket-piece 23.

The zero position of the shaft 1 is always coincident with the maximum ratio between pattern and work.

Let t equal minimum length of tool-arm measured from axis of tool to horizontal axis of oscillation of the said arm, L equal maximum length of tracer-arm measured from axis of tracer to horizontal axis of oscillation of the said arm, P equal the radius of the pattern 5, d equal the radius of the work 8, and S equal the reading on the scale 25, to which the slide 20 must be set, and when the machine stands set with the above lengths let the slide 20 be at its zero, whence S equals 0 at this position—i. e., the above length relationship is always coincident with the zero position of the slide. Now, therefore, ratio of reduction equals $\frac{t+S}{L-S}$; also, ratio of reduc-

tion equals $\frac{d}{p}$. Therefore

$$\frac{t+S}{L-S} = \frac{d}{p}$$

$$dL - dS = Pt + PS$$

$$dL - Pt = PS + dS$$

$$dL - Pt = S(P + d)$$

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

If t equals 1 and L equals 15,

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

After the shaft 1 has been adjusted 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 55. The axial adjustments of the tool 17 are in all cases homologous with those of the tracer 15.

The tracer may be moved over the pattern 5 either from the center to the circumference or vice versa. It is so moved by the following means:

34 is an endless belt passed round a driving-pulley 35, fast on the shaft 1, and a driven pulley 36, fast on the end of a vertical screw 37, adapted to turn only about its axis in a bearing 38 in the base 14 and one 39 in the top of a vertical slotted guide 40, fast on the said base.

41 41 are a pair of pulleys about which the belt 24 is led to be kept tight thereby. This tightening is effected by moving them away from the shaft 1. Accordingly they are mounted to run loose upon a sleeve 42, which fits over a standard 43, having a foot 44, adjustable in a guide 45, fast on the slide 20. They are locked in their adjusted position by a screw-threaded ring-nut 46, engaging the upstanding and screw-threaded end of the standard 42, and which when it is screwed down the said standard pinches the sleeve 42 between it and the guide 44.

47 is a screw-threaded nut on the screw 37 and capable of only one motion—a reciprocating vertical one in the guide 40. The length of this motion in either direction is equal to the radius of the pattern 5.

48 is a horizontal cylinder incorporated along one of its sides with the nut 47 in the way shown in Fig. 1.

49 is a rod working through the closed end of it in the direction of the lever 10. The end of the latter is forked, the two prongs 50 50 embracing the rod 49 between two collars 51 51, fast thereon.

52 is a spring resilient between the inner

end of the rod 49 and the nose of a set-screw 53, that works through the respective closed end of the cylinder 48. The function of the spring 52 is to keep the tracer 15 and the tool 17 in working touch with the pattern 5 and the work 8, respectively, by rocking the levers 10 11 on their fulcra 16 18, accordingly, while that of the set-screw 53 is to regulate the strength of the said spring.

10 Referring to the part of the machine called the "rocker" 9, it must be understood that the invention does not limit me on the one hand to the rectangular open-frame shape shown in the figures, and that, on the other hand, some
15 special conformation of this rocker 9 is necessary. The functions of this rocker 9 are to rock in its bearings 13 13, to provide a fulcrum for the rock of the lever 10 to and from the pattern-block 4, to carry the rear end of the
20 link 64, and to afford a clear way for the link 12. That being so, any open or framed construction capable of discharging the said functions comes within the scope of the invention.

I claim—

25 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, in planes at right angles with the axis common to the three, of a linkage carrying the
30 tracer and the tool and adapted to communicate the motions of the former homologously to the latter, the said linkage consisting of a rocker, a lever of the first class having its fulcrum in the rocker and carrying the tracer at
35 one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the parallel shaft, a lever of the second class having its fulcrum in the parallel
40 shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two levers.

45 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 in planes at right angles with the axis common to the three; of a linkage carrying the
50 tracer and the tool and adapted to communicate the motions of the former homologously to the latter, the said linkage consisting of a rocker, a lever of the first class having its fulcrum in the rocker and carrying the tracer
55 at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the parallel shaft, a lever of the second class having its fulcrum in the parallel
60 shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two levers; and means for adjusting the position

of the first-named shaft in a direction at right 65 angles with its own axis to or from the rocker.

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 in planes at right angles with the axis common 70 to the three; 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 rocker, a lever of the first class having its fulcrum in 75 the rocker and carrying the tracer at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the parallel shaft, a lever of the second 80 class having its fulcrum in the parallel shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two 85 levers; means for adjusting the position of the first-named shaft in a direction at right angles with its own axis to or from the rocker; and means for traversing the tracer and the tool respectively over the pattern and the work 90 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 in planes 95 at right angles with the axis common to the three; 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 rocker, a lever 100 of the first class having its fulcrum in the rocker and carrying the tracer at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the 105 parallel shaft, a lever of the second class having its fulcrum in the parallel shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two levers; means 110 for adjusting the position of the first-named shaft in a direction at right angles with its own axis to or from the rocker; and means for adjusting the tracer and the tool upon the 115 respective parts of the said linkage.

5. The combination of a single rotating shaft one end of which is adapted to carry the pattern and the other end the work in planes at right angles with the axis common to the three; 120 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 rocker, a lever of the first class having its fulcrum in the rocker 125 and carrying the tracer at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bear-

ings, an upstanding arm fast on the parallel shaft, a lever of the second class having its fulcrum in the parallel shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear end of the two levers; means for adjusting the position of the first-named shaft in a direction at right angles with its own axis to or from the rocker; 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; slide; single shaft adapted to carry the pattern on one end of it and the work on the other end in planes at right angles with the axis common to the three; bearings on the slide for the said shaft; a linkage consisting of a rocker, a lever of the first class having its fulcrum in the rocker and carrying the tracer at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the parallel shaft, a lever of the second class having its fulcrum in the parallel shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two levers; bearings on the base to carry the rocker with its axis parallel with and in the same horizontal plane as the axis of the single shaft; means for adjusting the position of the said slide and with it the first-named shaft in a direction at right angles with its own axis to or from the rocker; 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; slide; single shaft adapted to carry the pattern on one end of it and the work on the other end in planes at right angles with the axis common to the three; bearings on the slide for the said shaft; a linkage consisting of a rocker, a lever of the first class having its fulcrum in the rocker and carrying the tracer at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the parallel shaft, a lever of the second class having its fulcrum in the parallel shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two levers; and means consisting of a micrometer-screw turning in a bracket on the base and engaging in a nut on the slide, a scale on the guide for the slide and an index on the latter reading with

the said scale, for adjusting the position of the said slide and with it the first-named shaft in a direction at right angles with its own axis to and from the rocker of the linkage.

8. The combination of base; slide; single shaft adapted to carry the pattern on one end of it and the work on the other end in planes at right angles with the axis common to the three; bearings on the slide for the said shaft; a linkage consisting of a rocker, a lever of the first class having its fulcrum in the rocker and carrying the tracer at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the parallel shaft, a lever of the second class having its fulcrum in the parallel shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two levers; bearings on the base to carry the rocker with its axis parallel with and in the same horizontal plane as the axis of the shaft; means consisting of a micrometer-screw turning in a bracket on the base and engaging in a nut on the slide, a scale on the guide for the slide and an index on the latter reading with the said scale, for adjusting the position of the said shaft and with it the first-named shaft in a direction at right angles with its own axis to and from the rocker of the linkage; and 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 driving-pulley on the first-named shaft, a screw turning in fixed bearings on the base; a pulley fast on the said screw and driven from the said driving-pulley, a traversing nut on the said screw, a cylinder incorporated with the said nut, a spring-protruded rod projecting from the said cylinder to engage with the linkage at the end of the lever that carries the tracer.

9. The combination of base; single shaft adapted to carry the pattern on one end of it and the work on the other in planes at right angles with the axis common to the three; bearings in the slide for the shaft; a linkage consisting of a rocker, a lever of the first class having its fulcrum in the rocker and carrying the tracer at one end of it in contact with the pattern, a shaft parallel with the single rotating shaft and rocking in fixed bearings, an upstanding arm fast on the parallel shaft, a lever of the second class having its fulcrum in the parallel shaft and carrying the tool near its fulcrum and in contact with the work, a link connecting the respective ends of the rocker and arm, and a link connecting the rear ends of the two levers; bearings on the base to carry the rocker with its axes parallel with and in the same horizontal plane as the axis of the shaft; means consisting of a micrometer-screw turning in a bracket on the base and engaging

in a nut on the slide, a scale on the guide of the slide and an index on the latter reading with the said scale, for adjusting the position of the said slide and with it the first-named
5 shaft in a direction at right angles with its own axis to and from the rocker of the linkage; means for traversing the tracer and the tool respectively over the pattern and the work between the respective center and the
10 circumference thereof consisting of a driving-pulley on the first-named shaft, a screw turning in fixed bearings on the base; a pulley fast on the said screw and driven from the said driving-pulley; a traversing nut on the said
15 screw, a cylinder incorporated with the said

nut, a spring-protruded rod projecting beyond the said cylinder to engage with the linkage at the end of the lever that carries the tracer; and means for axially alining the tracer and the tool with the axis of the shaft consisting of a
20 slot in the respective lever of the linkage, a block adapted to slide therein lengthwise of the respective lever and a locking device for holding the block in its adjusted position.

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

MARK BARR.

Witnesses:

WALTER J. SKERTEN,
CHAS. S. WOODROFFE.