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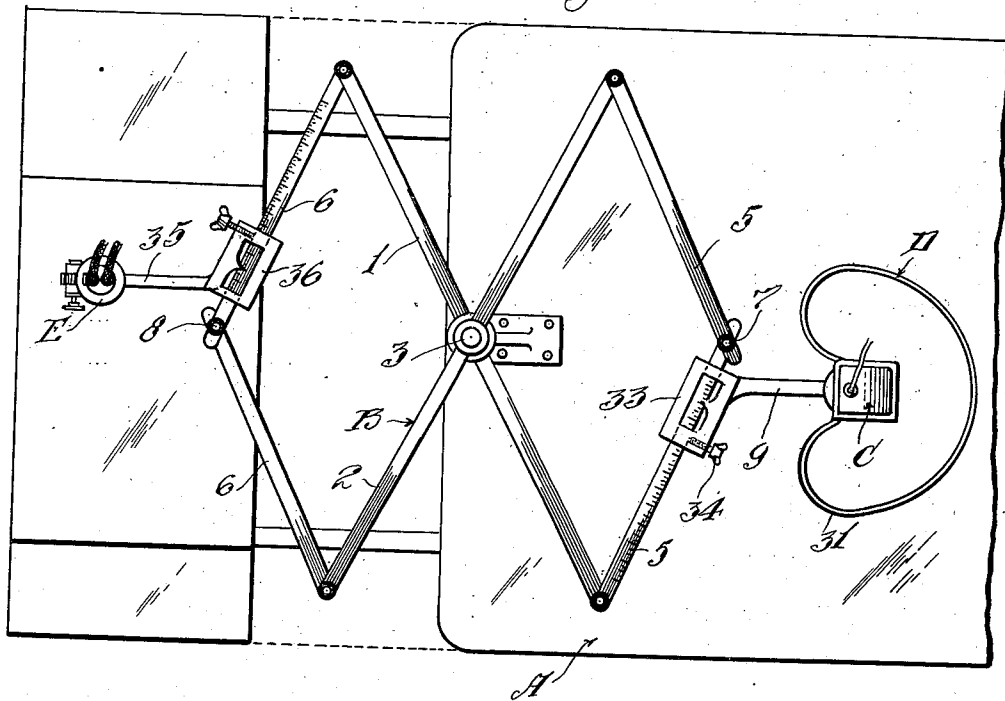
S. J. BRUNO  
REPRODUCING MECHANISM

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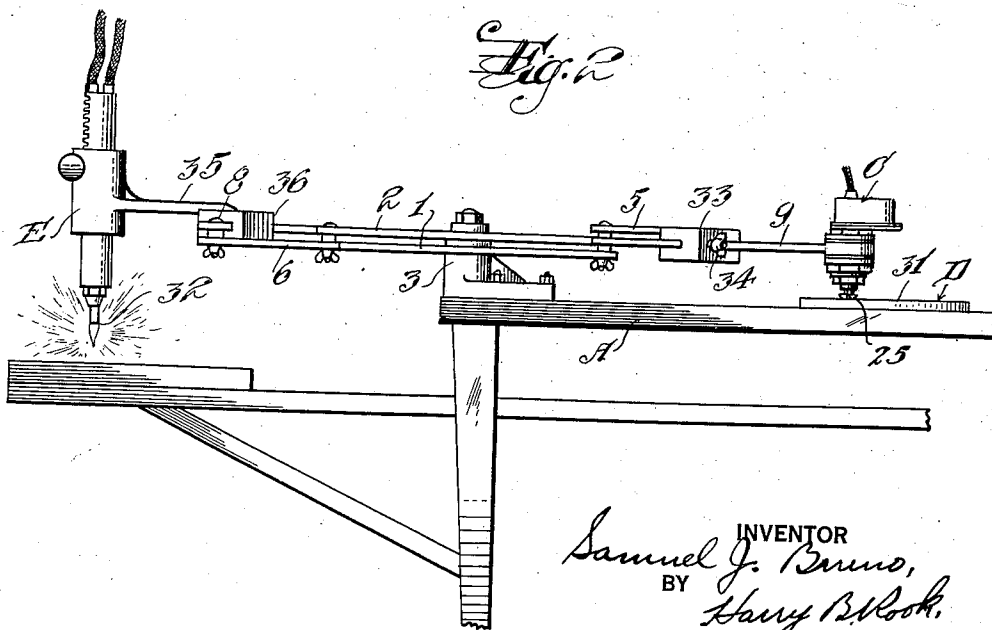
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2 Sheets-Sheet 1

*Fig. 1*



*Fig. 2*



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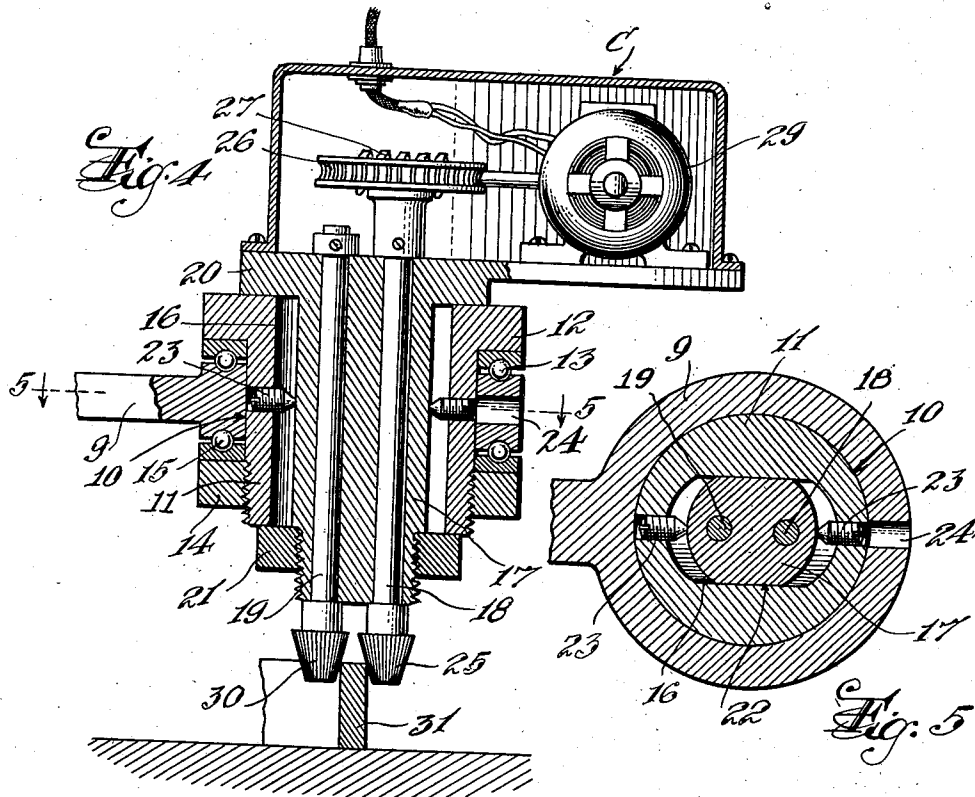
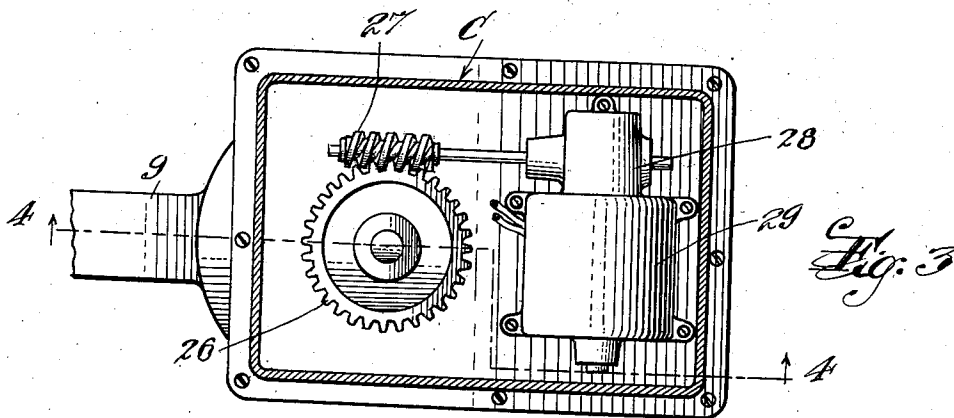
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# UNITED STATES PATENT OFFICE

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## REPRODUCING MECHANISM

Samuel J. Bruno, Jersey City, N. J.

Application June 16, 1936, Serial No. 85,489

9 Claims. (Cl. 33—25)

This invention relates in general to mechanism for automatically moving and controlling a tool or instrument in accordance with a template or pattern, and more particularly to such a mechanism for severing metal by the use of a torch which is moved over the metal to be severed in accordance with a pattern or template.

Certain known machines of this general character are objectionable in that with them it is difficult or impossible to transcribe sharply varying curves or angles of the pattern with sufficient accuracy upon the metal being severed. Other similar machines which include follower rollers or tracers for upstanding track patterns or templates have the disadvantage of requiring a complex differential mechanism to maintain substantially constant the average speed of the followers as they move around curves and angles in the template track. Therefore, prime objects of my invention are to provide a reproducing mechanism of the general character described which shall embody novel and improved features of construction whereby sharply varying curves of small radius in a template or pattern may be accurately reproduced on work, and to provide such a mechanism which shall permit the followers to accurately move around curves and angles of a template track without the necessity for a differential mechanism or other complex apparatus to ensure movement of the reproducing instrument in accurate conformity to the pattern.

Another object is to provide a reproducing mechanism of the character described which shall include a novel and improved construction and combination of a "lazy tongs" or pantograph, a reproducing instrument such as a torch, and a motor driven follower for a pattern or template track, whereby the mechanism shall be simple and inexpensive in construction, small, and capable of being contracted when out of use so as to be easily stored in a small space.

Other objects of the invention are to provide such a reproducing mechanism which shall include a pair of cooperating track follower rollers, means for driving them, and means for mounting and adjusting the follower rollers on the pantograph or the like to compensate for the width of the template track and the width of the transcribing element of the reproducing instrument, for example, the tip of a torch, so that the dimensions of the work shall accurately conform to the dimensions of the template; and to obtain other advantages and results as will be brought out by the following description.

Referring to the accompanying drawings in

which corresponding and like parts are designated throughout the several views by the same reference characters,

Figure 1 is a top plan view of a reproducing mechanism embodying my invention.

Figure 2 is a side elevation thereof.

Figure 3 is an enlarged top plan view of the driving mechanism for the template follower, showing the casing in horizontal section.

Figure 4 is a vertical longitudinal sectional view on the line 4—4 of Figure 3, and

Figure 5 is a horizontal sectional view on the line 5—5 of Figure 4.

Specifically describing the illustrated embodiment of the invention the reference character A designates a table or other suitable support for my reproducing mechanism which includes a "lazy tongs" or pantograph B on the opposite ends of which are mounted a tracer mechanism C for following a template or pattern track D, and a reproducing instrument such as a torch E.

The pantograph comprises two bars 1 and 2 which are pivoted together at the middle of their lengths on a bracket 3 which is mounted on the top of the table or support A, said bars 1 and 2 having pivotally connected at their ends two pairs of links 5 and 6, the links of each pair of which are pivotally connected at 7 and 8 respectively.

The template following mechanism C is mounted on one of the end pair of links 5 while the torch E is mounted on one of the other pair of end links 6.

The track following mechanism C comprises a bracket 9 one end of which has a circular bearing 10 in which a bearing bushing 11 is rotatably mounted. As shown, the bushing 11 has a flange 12 at one end between which and the bracket 9 is arranged a ball bearing 13, while the other end of the bushing has screw threaded thereon a thrust collar 14 between which and the bracket 9 is another ball bearing 15, the bushing being thus freely rotatable in the bracket but held against longitudinal movement in the bearing 10.

The bushing 11 has a coaxial opening 16 extending therethrough and elongated in cross section to receive a bearing block 17 within which are journaled shafts 18 and 19 which project from opposite ends of the block. The block is held against longitudinal movement in the opening 16 by a flange 20 at its upper end and by a nut or collar 21 at its other end, and is non-rotatable in the opening 16. As shown in Figure 5 two opposite sides 22 of the opening 16 are flat and parallel and the corresponding sides of the block 17 are similarly flat and parallel to nicely

contact with the sides 22 of the opening. The block 17 is adjustable transversely or in an axial plane of the bushing, and is held in adjusted position by diametrically opposite set screws 23 threaded in the bushing. Access to the set screws may be had through an opening 24 in the bracket 9, one screw being first adjusted through the opening 24, after which the bushing may be rotated for adjustment of the other screw.

At its lower end the shaft 18 has a frusto-conical serrated or grooved track following roller 25, while the other end of the shaft has a worm gear 26 meshing with a worm 27 driven through speed reducing mechanism 28 from an electric motor 29 mounted on the upper end of the block 17. The other shaft 19 has an idler track following roller 30 which cooperates with the driving roller 25 to receive the upstanding template or pattern track 31 between them, the rollers resting by gravity on the upper portions of the vertical sides of the track as clearly shown in Figure 4.

In operation, the rollers 25 and 30 are set in operative relation to the track 31, and when the motor 29 is started, the driving roller 25 will travel along the track 31 and extend and contract the pantograph B as well as swing it about the pivot 3 so as to cause the torch E to follow a path conforming to the contour of the pattern track 31. In traversing curves of the track, the bushing 11 will rotate so as to avoid any tendency to deflection of the rollers from the track. The rollers may be small so as to accurately follow sharply varying curves or angles, and due to the combination of the idler and driver 30 and 25 respectively, the necessity for a special and expensive differential mechanism to compensate for curves in the track, is obviated. These features and the use of the pantograph pivoted at its center to swing in its horizontal plane, in combination with mounting of the tracer C and reproducing instrument E, ensure accurate reproduction of the pattern and provide a simple, inexpensive, small and compact mechanism which can be contracted into a small space when out of use.

To compensate for the width of the track and the width of the torch tip 32, the block 17 may be transversely adjusted by the set screws 23, whereby the dimensions of the work severed by the torch or designs formed on the work by the torch may accurately conform to the dimensions of the template track 31.

While the invention is especially useful in a machine for severing metal by means of a heat producing instrument such as an oxyhydrogen torch or an electric arc, it will be understood that it may be utilized in other reproducing mechanisms employing other reproducing instruments; and the details of structure of the mechanism may be widely varied within the scope of the invention.

In all forms of the invention the reproducing instrument E is mounted on the frame or pantograph B for universal movement in a horizontal plane, the frame being extensible and contractible in its own horizontal plane and rotatable in said plane about the axis 3 that is centrally disposed with respect to the frame and perpendicular to said plane; and the bearing block 17 is rotatable about an axis parallel with the axis 3 and the axes of the follower rollers 25 and 30.

Having thus described my invention, what I claim is:

1. In a reproducing mechanism, a pattern tracer including a support movable in a horizon-

tal plane, a bearing block, a pair of follower rollers rotatable on said block about vertical axes to embrace a pattern track, means for driving one of said rollers, and means for mounting said bearing block on said support for transverse movement in a vertical plane parallel to the axes of said follower rollers.

2. In a reproducing mechanism, a pattern tracer including a support movable in a horizontal plane, a bearing block, a pair of follower rollers rotatable on said block about vertical axes to embrace a pattern track, means for driving one of said rollers, and means for mounting said bearing block on said support for transverse movement in the common vertical plane of said follower rollers' axes.

3. A reproducing mechanism comprising a frame extensible and contractible in its own plane and rotatable in said plane about a centrally disposed axis perpendicular to said plane so that its ends are capable of universal movement in said plane, a reproducing instrument mounted on one end of said frame and a tracer carried by the other end of the frame, said tracer including a support, a pair of follower rollers rotatable on said block about vertical axes to embrace a pattern track, means for driving one of said rollers, and means for mounting said bearing block on said support for transverse movement in a vertical plane parallel to the axes of said follower rollers.

4. A reproducing mechanism comprising a frame extensible and contractible in its own plane and rotatable in said plane about a centrally disposed axis perpendicular to said plane so that its ends are capable of universal movement in said plane, a reproducing instrument mounted on one end of said frame and a tracer carried by the other end of the frame, said tracer including a support, a pair of follower rollers rotatable on said block about vertical axes to embrace a pattern track, means for driving one of said rollers, and means for mounting said bearing block on said support for transverse movement in the common vertical plane of said follower rollers' axes.

5. A reproducing mechanism comprising a frame including a pair of crossed bars pivoted intermediate their ends on a fixed support, two pairs of links the links of each pair of which are pivotally connected together at one end and have their other ends pivotally connected to the corresponding ends of said crossed links, a reproducing instrument and a tracer mounted on said pairs of links respectively, said tracer including a support, a pair of follower rollers rotatable on said block about vertical axes to embrace a pattern track, means for driving one of said rollers, and means for mounting said bearing block on said support for transverse movement in the common vertical plane of said follower rollers' axes.

6. In a reproducing mechanism, a tracer including a support, a bushing rotatable therein about a vertical axis and having non-circular opening therethrough, a bearing block non-rotatably mounted in said opening but capable of transverse movement in an axial plane of said bushing, a pair of follower rollers journaled on said block to rotate about axes in said plane and embrace a pattern track between them, and means for rotating one of said rollers.

7. In a reproducing mechanism, a pattern tracer including a support movable in a horizontal

plane, a bearing block, a pair of follower rollers rotatable on said block about vertical axes to embrace a pattern track, means for causing movement of said rollers along a pattern track, and means for mounting said bearing block on said support for transverse movement in a vertical plane parallel to the axes of said follower rollers.

8. A reproducing mechanism comprising a reproducing instrument, a frame mounting said instrument for universal movement in a horizontal plane, a pattern tracer to propel said frame including a support connected to said frame and movable in a horizontal plane, a bearing block, a pair of follower rollers rotatable on said block about vertical axes to embrace a pattern track, and means for mounting said bearing block on said support for transverse move-

ment in a vertical plane parallel to the axes of said follower rollers.

9. A reproducing mechanism comprising a reproducing instrument, a frame mounting said instrument for universal movement in a horizontal plane, a pattern tracer to propel said frame including a support connected to said frame and movable in a horizontal plane, a bushing rotatable therein about a vertical axis and having a non-circular opening therethrough, a bearing block non-rotatably mounted in said opening but capable of transverse movement in an axial plane of said bushing, a pair of follower rollers journaled on said block to rotate about axes in said plane and follow a pattern track, and means for rotating one of said rollers.

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