

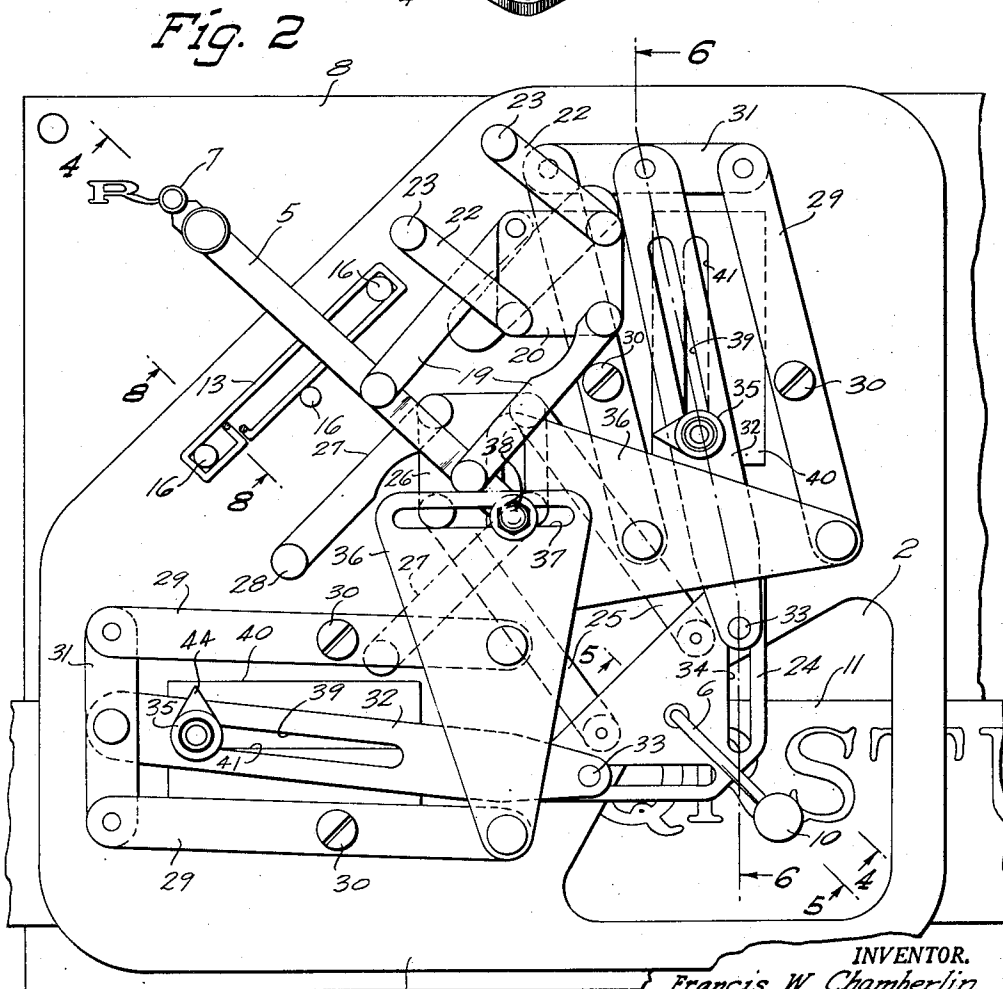
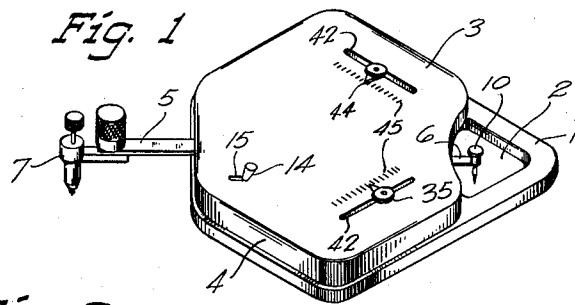
June 27, 1950

F. W. CHAMBERLIN  
REPRODUCING DEVICE

2,512,918

Filed May 2, 1946

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 3

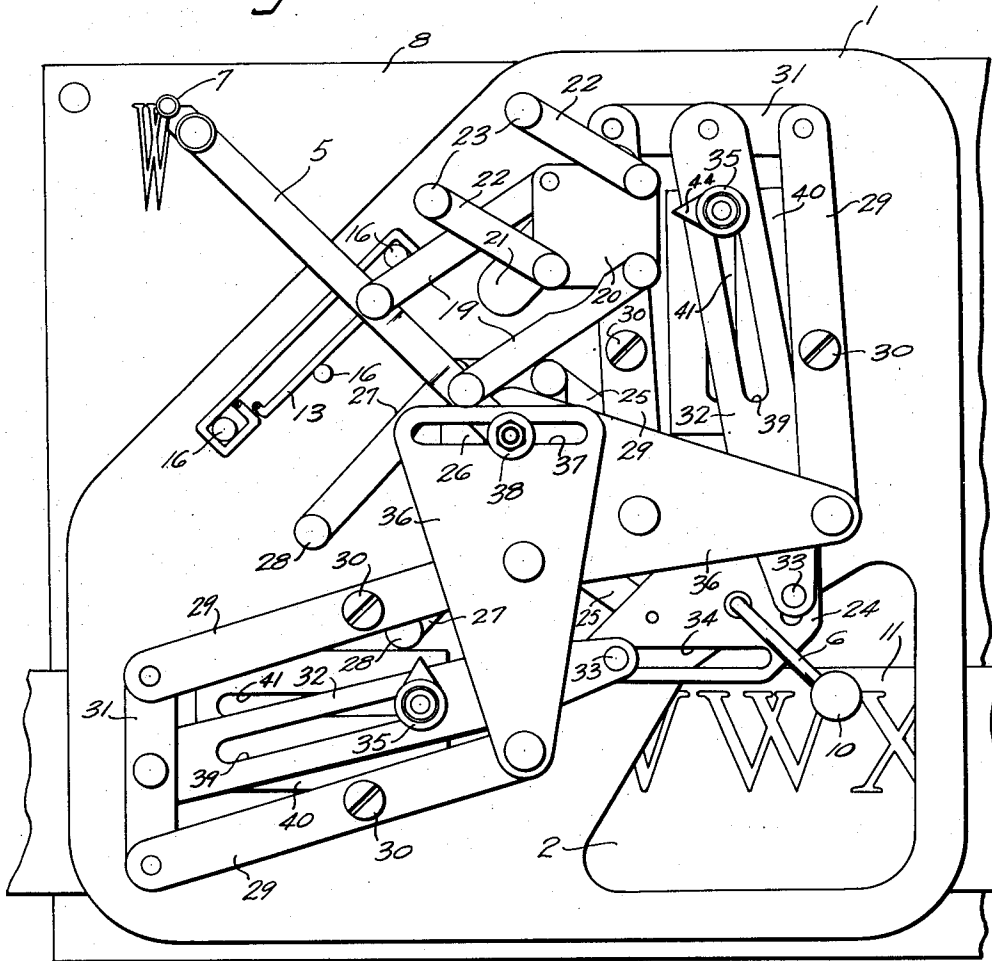
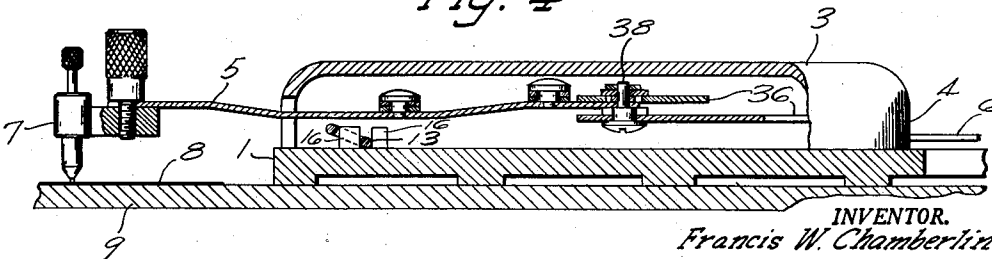


Fig. 4



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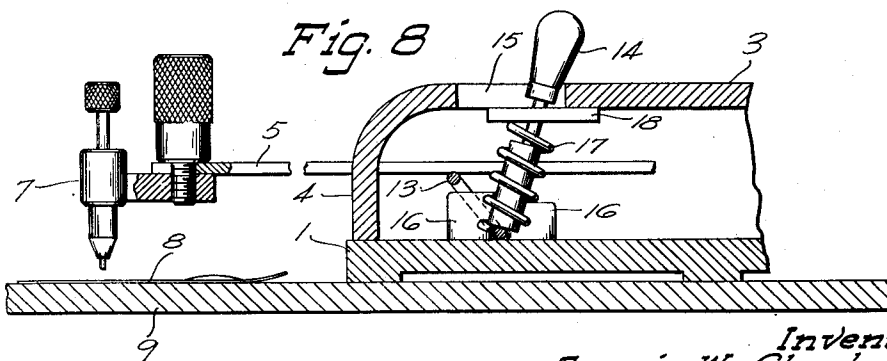
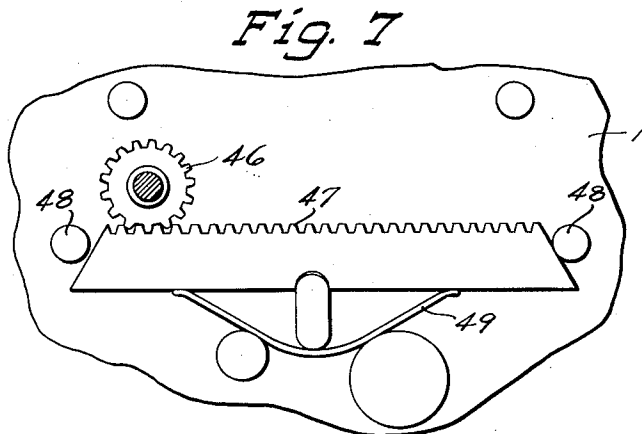
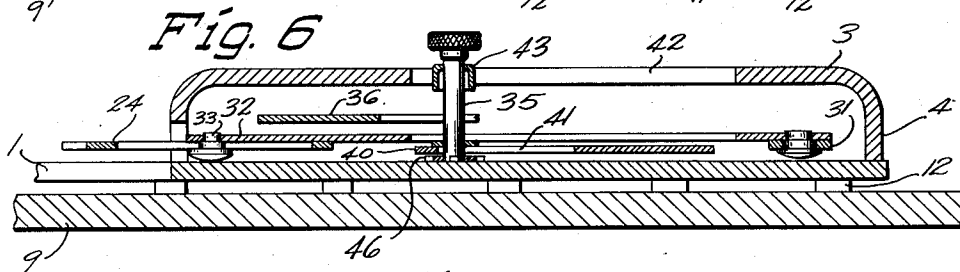
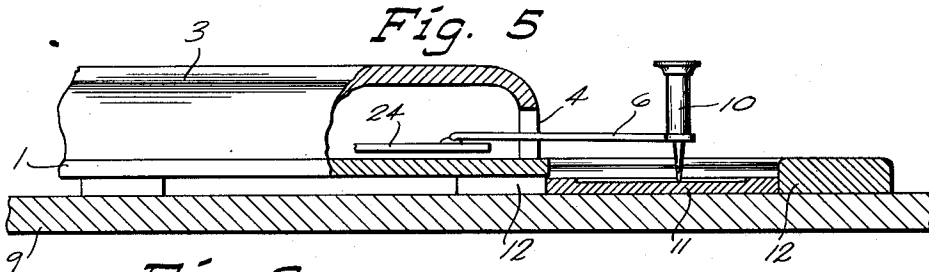
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## UNITED STATES PATENT OFFICE

2,512,918

## REPRODUCING DEVICE

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Application May 2, 1946, Serial No. 666,703

9 Claims. (Cl. 33—23)

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This invention relates to a reproducing device and has particular reference to a device that reproduces characters of a template or work copy onto a receiving member which are either an exact copy or enlarged or reduced in independently variable height or width as desired, within predetermined limits.

Heretofore, in order to obtain characters, such as numbers, letters, figures, designs or patterns, of different height and width, it was necessary to have a number of templates with the characters on each template of the height and width required. It is expensive to maintain a complete supply of templates with characters of different heights and widths and it takes time to change templates to obtain the size of character needed. Often a template having the exact dimensions of the letter needed is not available.

In order to eliminate this difficulty and others, the present device was developed, with the principal object of the invention being to provide a reproducing device which will reproduce characters of independently variable vertical and horizontal dimensions within predetermined limits.

Another object is to provide a reproducing device with which only a single work copy need be employed for predetermined height and width changes of a character to be reproduced, and with which many differently styled alphabets may be used.

Another object is to provide a reproducing device in which the reproduced character is oriented in the same direction as that on the work copy or template.

Another object is to provide a reproducing device that may be employed by either a right handed or left handed operator.

Another object is to provide an inexpensive reproducing device that will last substantially indefinitely.

Another object is to provide an accurate reproducing device which will make a true and faithful reproduction of characters over a wide range of heights and widths without distortion.

A further object is to provide an accurate reproducing device that is readily adjusted to reproduce characters of different widths and heights.

A further object is to provide a reproducing device in which the character to be reproduced is inscribed on paper or the like rather than on a template.

A further object is to provide a compact reproducing device which can be readily carried from place to place.

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Another object is to provide a scribing device in which the template or work copy is free of the device and quickly changeable or reversible.

An embodiment of the invention is illustrated in the accompanying drawings:

Figure 1 is a perspective view of the reproducing device;

Fig. 2 is a top plan view of the invention with the cover removed and the device set for reproducing a letter of maximum width, but of minimum height and with the parts positioned upon completion of the reproduction of the letter "R";

Fig. 3 is a similar view with the device set for reproducing a letter of maximum height, but of minimum width, and with the parts positioned upon completion of the reproduction of the letter "W";

Fig. 4 is a section taken on line 4—4 of Fig. 2;

Fig. 5 is a section taken on line 5—5 of Fig. 2;

Fig. 6 is a section taken on line 6—6 of Fig. 2 through one of the lever arms illustrating the rack and pinion arrangement for setting the pivot post;

Fig. 7 is a top plan view of the rack and pinion arrangement with the fixed plate and linkage removed; and

Fig. 8 is a section taken on line 8—8 of Fig. 2 through the scribing arm assembly.

The reproducing device of the invention, as illustrated in the drawings, has a base 1 constituting a plate-like member which may be of generally rectangular shape, with the margin or edge of the plate extending across one corner to provide an open space for the scriber, and with the body of the plate containing a generally triangular opening at the diagonally opposite corner to provide a window 2 for the template.

A cover 3 is mounted over the base 1 and encloses the mechanism thereon. The cover 3 has downwardly turned side flanges 4 resting on the base 1 and which are cut away at the open corner and window referred to for the passage there-through of the scriber arm 5 and tracer arm 6, respectively.

A manually adjustable scriber stylus 7 is carried by the outer end of the arm 5 in the open corner of base 1 where it is adapted to make contact with a paper 8 or other surface upon which a character is to be outlined. For this purpose the device is portable and adapted to rest on a table 9 and if desired it may rest directly upon the paper upon which the character is to be reproduced.

A fixed tracer stylus 10 is carried by the outer end of the arm 6 in the open window 2 of base 1 and is adapted to be pressed into a line or groove

in the top of a template 11 which simulates the character to be reproduced or to trace over a pattern on a paper or the like without the employment of a template.

The template 11 may constitute a plastic or metal strip disposed horizontally beneath base 1, preferably between short supporting legs 12 for the base which serve as guides for locating the strip beneath the window 2, and the template may have various letters, figures or characters marked out by grooves or slots forming various patterns to be selectively reproduced as in lettering a drawing or sign.

The tracer stylus 10 is adapted to be moved horizontally along the grooves of the selected pattern in template 11 and to transmit the corresponding movements to the scribe stylus 7 which reproduces the same upon the paper 8.

Where letters or figures are to be reproduced, it is desired to be able to change the height and width of the reproduced characters without requiring the employment of a different template for each change. This is accomplished by the mechanism mounted on base 1 inside the cover housing 3 and which is adapted to transmit the component movements of the tracer stylus 10 to the scribe stylus 7 in predetermined corresponding increments of movement of any desired ratio in a direction across the template, vertical to the letter being reproduced, and in a direction at right angles thereto longitudinally of the template and horizontally of the letter.

The mechanism referred to resolves a given movement of the tracer stylus 10 into two separate components of movement at right angles to each other and which are then transmitted by means of an adjustable lever arm for each through corresponding parallel linkage back to a common actuation of the scribe stylus 7.

The arms 5 and 6 are disposed to move only in corresponding horizontal planes except for the raising of the arm 5 when the device is not in use so that the scribe stylus 7 is raised from paper 8, and also except for a spring action in arm 6 effecting raising of the tracer stylus 10 from the template 11 when the device is not in use.

The scribe arm 5 is lifted to inoperative position as shown in Fig. 8 by means of a rectangularly bent wire frame 13 with the ends of the wire at one side of the frame secured to a handle 14 that extends upwardly through a slot 15 in the cover 3 so that movement of the handle in one direction drops the frame down to a position below arm 5, while movement of the handle in the other direction tilts the frame upwardly to effect lifting of the arm 5 by the upward movement of the side of the frame opposite handle 14. The pivotal side of the frame 13 to which handle 14 is secured, is held in place on base 1 by means of posts 16. The handle 14 is held in its extreme positions by means of a coil spring 17 encircling the body of it between the frame 13 and a slide 18 which engages the inside of cover 3 across the slot 15, the handle passing the vertical to reach its extreme positions whereby the spring holds it past dead center in either position.

Each of the arms 5 and 6 is maintained in a predetermined direction against rotation throughout the range of movement thereof. While the arms 5 and 6 need not be parallel and may take any desired shape it is preferred for lettering to have them substantially parallel as shown, and they are maintained in the same parallel relation throughout their corresponding movements.

The arm 5 is maintained directionally and prevented from pivoting by a pair of spaced parallel links 19 having their corresponding inner ends pivotally connected to the arm 5 and extending laterally therefrom with their outer corresponding ends pivotally connected to a control plate or frame 20. The control plate 20 is supported for horizontal movement by a table-like supporting plate 21 on base 1. The movement of control plate 20 is in turn restricted by a pair of spaced parallel links 22 having their corresponding inner ends pivotally connected to the plate 20 at a center line at right angles to a center line joining the pivotal connections for links 19 and extending laterally relative to the links 19 with their outer ends pivotally connected to posts 23 on base 1.

The arm 6 is supported on a horizontal plate or frame 24 movable in a plane parallel to template 11 and is maintained directionally and prevented from pivoting by a pair of spaced parallel links 25 having their inner corresponding ends pivotally connected to plate 24 and extending horizontally therefrom with their outer corresponding ends pivotally connected to a control plate or frame 26. The movement of control plate 26 is in turn restricted by a pair of spaced parallel links 27 having their corresponding inner ends pivotally connected to the plate 26 at a center line at right angles to a center line joining the pivotal connections for links 25 and extending laterally relative to the links 25 with their outer ends pivotally connected to posts 28 on base 1.

Movement of arm 6 in its horizontal plane effects a corresponding movement of arm 5 in its horizontal plane thereby resulting in a reproduction by stylus 7 of any pattern traced by stylus 10. This is accomplished by two sets of parallelogram linkage each interposed between lever arms connecting the same to the corresponding arms 5 and 6.

Each set of linkage comprises a pair of spaced parallel links 29 pivoted substantially centrally to corresponding supporting posts 30 on base 1. The outer ends of the links 29 are tied together by a link 31 pivoted thereto.

The linkage is connected to tracer arm 6 by means of a lever arm 32 which has its inner end pivoted to plate 24 by means of a pivot pin 33 riding freely in a closed slot 34 in the plate, and its outer end pivoted to cross link 31. The lever arm 32 is fulcrumed to pivot in a horizontal plane on an adjustable post 35 on base 1.

The linkage is connected to scribe arm 5 by means of a cross link 36 pivoted to the inner ends of links 29 and having a closed slot 37 in its outer end in which a pin 38 attached to arm 5 is adapted to ride freely. The slot 37 for one cross link 36 should be parallel to the slot 34 for the connection of the corresponding lever arm 32 to plate 24.

The pin 38 at the inner end of arm 5 extends upwardly through both slots 37 so that its movement in any direction is directly responsive to the separate or simultaneous movement of cross links 36.

Each set of linkage is disposed substantially at right angles to the other and slots 34 and 37 for one linkage are at right angles to the slots 34 and 37 for the other linkage so that the vertical and horizontal components of movement of stylus 10 over the template letter are resolved separately through the respective linkages and

act upon arm 5 and stylus 7 in the same ultimate direction of movement.

In the drawing, Figs. 2 and 3, the upper or right hand linkage is adapted to transmit the movement of tracer stylus 10 from left to right or right to left, i. e. longitudinally of the template 11, and the lower or left hand linkage is adapted to transmit the movement of tracer stylus 10 toward and away from the operator, i. e. vertically of the letter on the template 11.

Where the operator is left handed, the device may be turned 90° clockwise from the position shown in Figs. 2 and 3 and the template 11 may be inserted across window 2 at right angles to the position shown for it in the drawings, in which case the transmittal of movement through the linkage will be correspondingly reversed relative to the letter on the template.

The device is adapted to change the ratio between the height and width of the letters being reproduced on paper 8 at will by adjustment of the position of the fulcrum post 35 for the corresponding lever arm 32. For this purpose each fulcrum post 35 rides freely in a slot 39 extending longitudinally of lever 32. The post 35 is supported on base 1 by means of a fixed plate 40 spaced above the base and having a slot 41 through which the post extends, the slot 41 extending at right angles to a center line joining the corresponding pivot posts 30.

The post 35 extends upwardly through slot 41 in plate 40, slot 39 in lever arm 32 and a slot 42 in cover 3 and is held against lateral displacement by the plate 40 and cover 3.

The upper end of post 35 is rotatably held in a slide 43 riding in slot 42 and which has a pointer 44 adapted to designate scale markings 45 on cover 3 to indicate the required adjustment for the fulcrum post.

The adjustment of post 35 along the corresponding slots 39, 41 and 42 is effected by a pinion 46 secured to the lower end of the post and meshing with a rack 47 which rests on base 1. The rack 47 is floating so as to prevent binding of the post and has oppositely tapered or beveled ends engaging studs 48 on base 1. The rack 47 is biased toward the studs and in a direction to effect meshing of the same with pinion 46 by means of a suitable spring 49.

When the distances of the fulcrum post 35 from the opposite pivotal end connections for arm 32 bears the same ratio as the corresponding distances between the pivotal support posts 30 and the corresponding pivotal end connections for links 29 of either linkage, the directional component of movement transmitted by said linkage will effect a movement for scribe stylus 7 in the direction of said component substantially equal to the movement of tracer stylus 10 in the same direction. If both posts 35 are set at the neutral point, above described, the letter or character outlined by scribe stylus 7 will equal in dimensions the letter or character on template 11 which is traced by stylus 10.

In the device the lever ratio for links 29 is constant. Consequently, when, by adjustment of fulcrum post 35 as indicated by pointer 44 on scale 45, the leverage for arm 32 is changed to increase the distance between post 35 and the outer end of the arm 32, over the neutral distance described above thereby decreasing the leverage ratio for arm 32, for either linkage, the directional component of movement transmitted by said linkage will effect a movement for scribe stylus 7 in the direction of said component cor-

respondingly greater than the movement of tracer stylus 10 in the same direction.

Likewise, when, by adjustment of fulcrum post 35 as indicated by pointer 44 on scale 45, the leverage for arm 32 is changed to decrease the distance between post 35 and the outer end of the arm 32 below the neutral distance described above, thereby increasing the leverage ratio for arm 32, for either linkage, the directional component of movement transmitted by said linkage will effect a movement for scribe stylus 7 in the direction of said component correspondingly less than the movement of tracer stylus 10 in the same direction.

The right hand transmitting linkage controls within predetermined limits the width of the character reproduced by stylus 7 and the left hand transmitting linkage controls within predetermined limits the height of the character reproduced by stylus 7.

Fig. 2 illustrates ratio pivot post 35 of the right hand transmitting linkage at the inner end of the slot 41 and ratio pivot post 35 of the left hand transmitting linkage is set at the outer end of its corresponding slot 41.

The tracing stylus 10 is disposed in the lower right hand corner of the "R" of the template and the stylus 7 is disposed in the lower right hand corner of the "R" reproduced on paper 8. The "R" reproduced by scribe stylus 7 under the setting for fulcrum posts 35 shown in Fig. 2 is one of minimum height and maximum width within the limits of the particular device shown in the drawings.

Fig. 3 illustrates the opposite setting wherein the ratio setting for pivot post 35 of the right hand transmitting linkage is at the outer end of the slot 41 and that for pivot post 35 of the left hand transmitting linkage is at the inner end of the corresponding slot 41. The tracing pin 10 is set at the upper right hand corner of the "W" of the template and the scribe pen 7 is set at the upper right hand corner of the "W" reproduced on paper 8. The "W" reproduced by pen 7 under the described pivot settings for fulcrum posts 35 is one of maximum height and minimum width.

The fulcrum posts 35 also may be set to effect the reproduction of a letter reduced in both height and width over that of the template, or increased in both height and width from that of the template.

It is preferable to employ a large letter on the template and to construct the device to reduce the dimensions of the letter or character in reproducing it, since a more accurate reproduction is thereby obtained.

The invention may be employed as an enlarging, copying or reducing apparatus and may be used as an engraving, machining, profiling or die sinking machine as well as a drafting instrument to reproduce characters such as letters, figures, designs or patterns of any desired vertical or horizontal dimension within the predetermined capacities of the device. The device operates to reproduce objects correctly at independently variable vertical or horizontal dimensions by simple adjustment of the pivots of the transmitting linkages which operate to transmit a tracing movement of the tracer stylus 10 to the reproducing pen or other work member of the scribe stylus 7.

The two linkages disposed at right angles to each other constitute a vector resolving means which in operation resolves any movement of

tracer stylus 10 over a character on template 11 into two angular components and transmits such components to the scribe stylus 7 in a single resultant.

The height and width of the character to be reproduced is independently determined by the position of the respective ratio pivots or fulcrum posts for each transmitting linkage.

The device is compact and light in weight, and may be readily transported and employed with numerous types of templates such as the grooved metal strip illustrated or ordinary paper on which the characters to be reproduced are written or printed.

Various embodiments of the invention may be employed within the scope of the accompanying claims.

I claim:

1. A reproducing device for reproducing an object from a pattern thereof, comprising a base, a tracing stylus adapted to be moved freely over the pattern to dimensionally outline the same, a reproducing tool adapted to reproduce said dimensional outline thereon upon a work piece, means including an adjustable pivot fixed to said base when the device is set for operation to divide the movement of said tracing stylus into a plurality of angular components, and means to move said reproducing tool in accordance with the resultant of said components without pivotal distortion.

2. A reproducing device for reproducing an object from a pattern thereof, comprising a base, a tracing stylus on the face of said base adapted to be moved freely over the pattern to dimensionally outline the same, a reproducing tool adapted to reproduce said dimensional outline thereon upon a work piece, separate means to divide the movement of said tracing stylus into a plurality of angular components, means to move said reproducing tool in accordance with the resultant of said components without pivotal distortion, and adjustable means fixed to said base when the device is set for operation to regulate the pivotal movement of said separate means to vary the ratio of either component of movement transmitted to said tool to the corresponding component of movement of said tracing stylus to vary the corresponding dimensions of the reproduction as compared to the pattern.

3. A reproducing device for reproducing an object from a pattern thereof, comprising a base, a tracing stylus on the face of said base adapted to move over the pattern to dimensionally outline the same, a reproducing tool adapted to reproduce the outline of the pattern upon a work piece, a pair of parallel linkages pivoted to said base substantially intermediate the ends thereof to receive different complementary component movements of said tracing stylus, means to resolve the component movements transmitted by said linkages into a resultant movement for said reproducing tool, and adjustable means fixed to said base when the device is set for operation for regulating the pivotal movement of said linkages and for determining the relative magnitude of the component movement transmitted by one of said linkages to vary the corresponding dimensional component of the object as compared to that of the pattern.

4. A reproducing device for reproducing an object from a pattern thereof comprising a base, a tracing stylus adapted to move over the pattern to dimensionally outline the same, a reproducing tool adapted to reproduce the outline of the

pattern upon a workpiece, a pair of parallel linkages disposed to receive different complementary component movements of said tracing stylus, and means fixed to said base when the device is set for operation to adjustably determine the relative magnitude of the component movement transmitted by each of said linkages separately and independently to vary the corresponding dimensional component of the object as compared to that of the pattern.

5. A reproducing device for reproducing a character from a pattern onto a workpiece comprising a base, a tracing stylus adapted to move over the pattern located beneath the base and exposed to the stylus through an opening in the base to dimensionally outline the same, a reproducing member adapted to reproduce the outline of the pattern upon the workpiece, a pair of parallel linkages disposed to receive different complementary component movements of said tracing stylus, cross-links extending across the inner ends of said parallel linkages adjacent the stylus and pivoted thereto and having end portions extending inwardly from said links to overlap with each other, and means provided in the overlapping end portions of said cross-links at right angles to each other and connected to the reproducing member to transmit the movement of one pair of linkages to said reproducing member independently of movement of the other pair of linkages for reproducing a character on the workpiece.

6. A reproducing device for reproducing a character from a pattern onto a workpiece, comprising a base, a tracing stylus adapted to move over the pattern located beneath the base and exposed to the stylus through an opening in the base to dimensionally outline the same, a reproducing member adapted to reproduce the outline of the pattern upon the workpiece, a pair of parallel linkages disposed at substantially right angles to each other to receive different component movements of said tracing stylus, means at right angles to each other separately connecting each respective parallel linkage to the tracing stylus to divide the movement of the tracing stylus into two separate components of movement at right angles to each other and transmit one directional component of movement of the tracing stylus to one of said parallel linkages without movement of the other parallel linkage, cross-links extending across the inner ends of said parallel linkages adjacent the stylus and pivoted thereto and having end portions extending inwardly from said links to overlap with each other, and means provided in the overlapping end portions of said cross-links and connected to the reproducing member to transmit the movement of one pair of linkages to said reproducing member independently of the other pair of linkages for reproducing a character on the workpiece.

7. In a reproducing device having a base and mechanism adapted to reproduce a character from a pattern onto work piece with a cover disposed over the base of the device to house the operating mechanism, a reproducing arm extending outwardly of the base and cover and supporting a reproducing tool for engagement with the work piece to reproduce a character thereon, a shifting assembly to raise and lower said reproducing arm to engage or disengage the tool from the work piece, which comprises a frame disposed beneath said arm and having a handle extending upwardly therefrom through a slot in said cover for tilting the frame upwardly to lift said

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reproducing arm by movement of the handle in one direction and for lowering said arm by movement of the handle in the other direction, a coil spring encircling said handle beneath the cover, and a slide engaging said cover across the inside of the slot therethrough to confine said spring and hold the handle past dead center in the tilting or lowering movement thereof.

8. In a reproducing device having means to determine the angular movement of transmitting linkage pivoted to the base of the device in reproducing a character from a pattern onto a work piece, said means comprising a fixed plate spaced from the base and having a slot therein registering with a slot in said linkage, a pivot post extending through said slots and having a pinion on the lower end thereof, a rack meshing with said pinion and disposed between studs provided in said base and having tapered ends to float between said studs, and spring means biasing said rack into engagement with the pinion of the pivot post to effect movement of said pivot post along said slots when rotated by the operator and to hold the pivot post in a fixed position under spring tension when the same is released by the operator.

9. A reproducing device for reproducing a character from a pattern onto a workpiece, comprising a base, a tracing stylus adapted to move over the pattern to dimensionally outline the

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same, a reproducing member adapted to reproduce the outline of the pattern upon the workpiece, a plurality of parallelogram linkages disposed in angular relation to each other to receive different component movements of said tracing stylus with one pair of opposite links of each linkage pivoted to said base substantially intermediate the ends thereof, means pivoted to said linkages and separately connecting each respective parallelogram linkage to the tracing stylus to divide the movement of the tracing stylus and separately transmit the movement of the stylus to one of the linkages, and means to resolve the component movements transmitted to said linkages into a resultant movement for said reproducing member.

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