March 3, 1936. N. O. BURNETT ET AL 2,032,350

PANTOGRAPHIC REPRODUCING MACHINE

Filed March 29, 1934 3 Sheets-Sheet 1

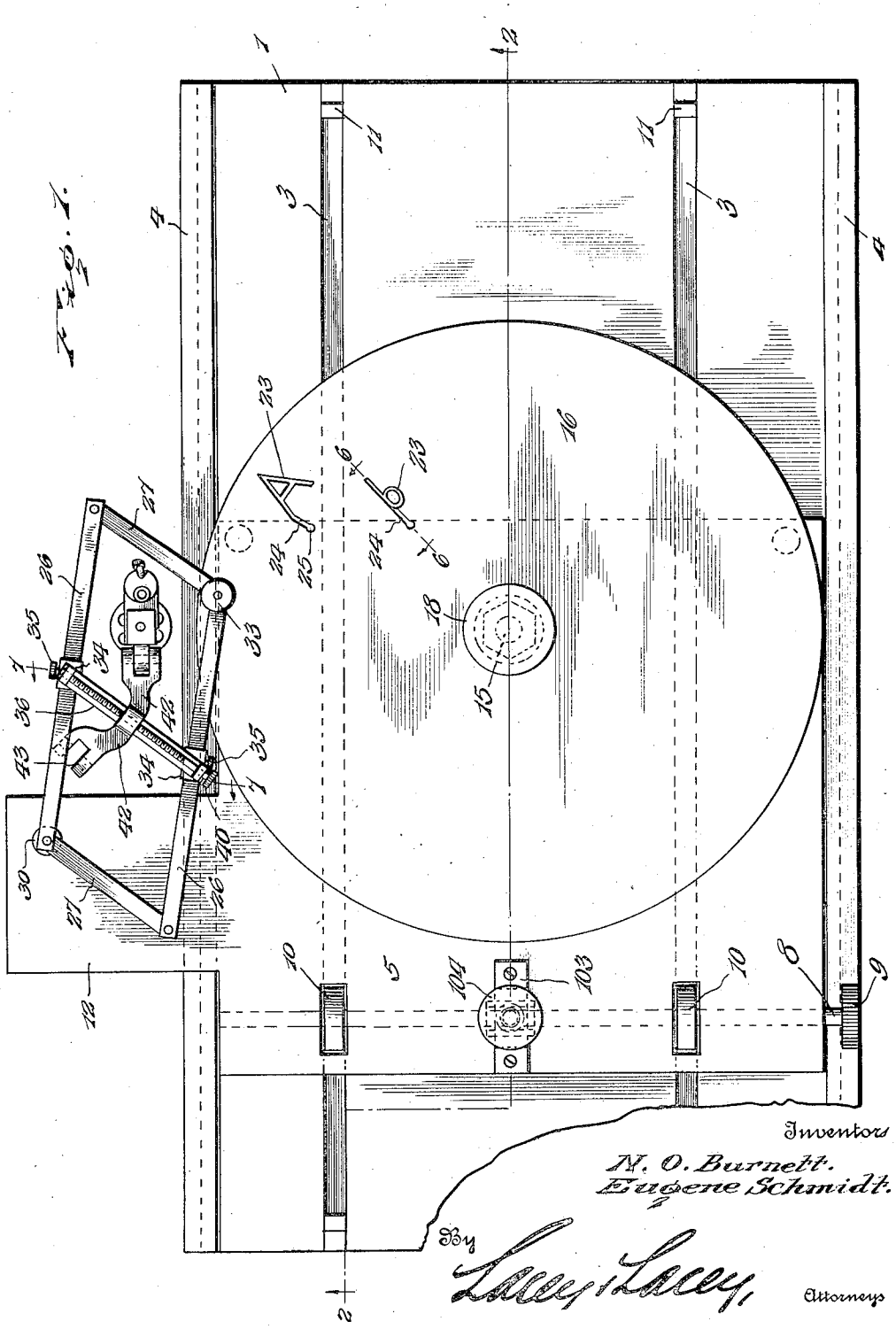


Fig. 1.

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PANTOGRAPHIC REPRODUCING MACHINE

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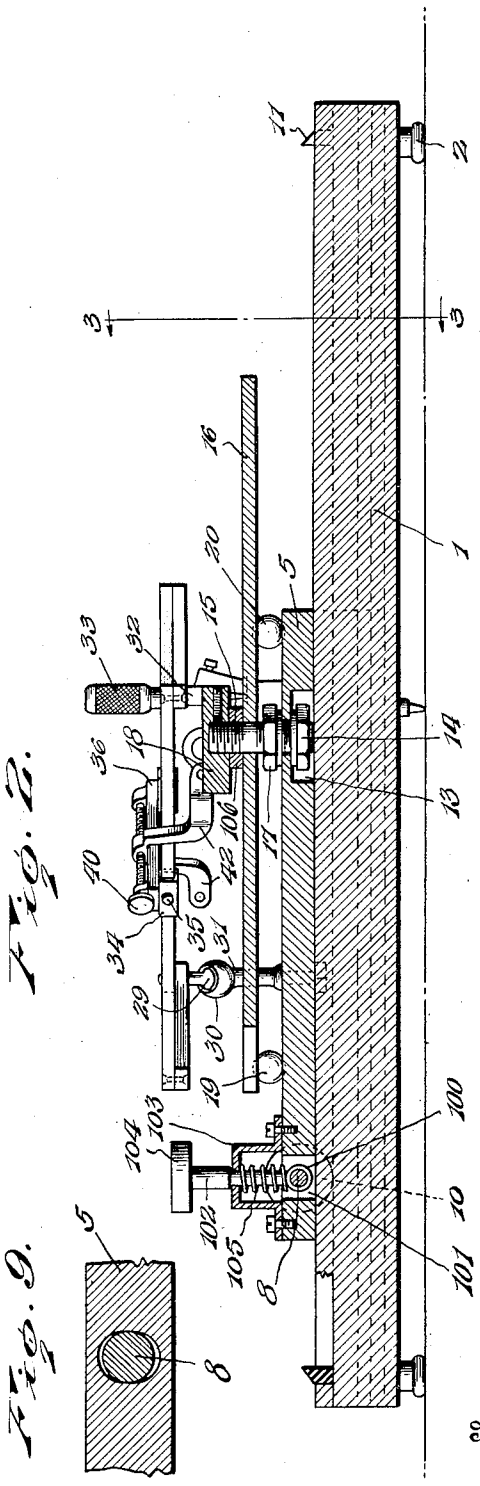


Fig. 2.

Fig. 9.

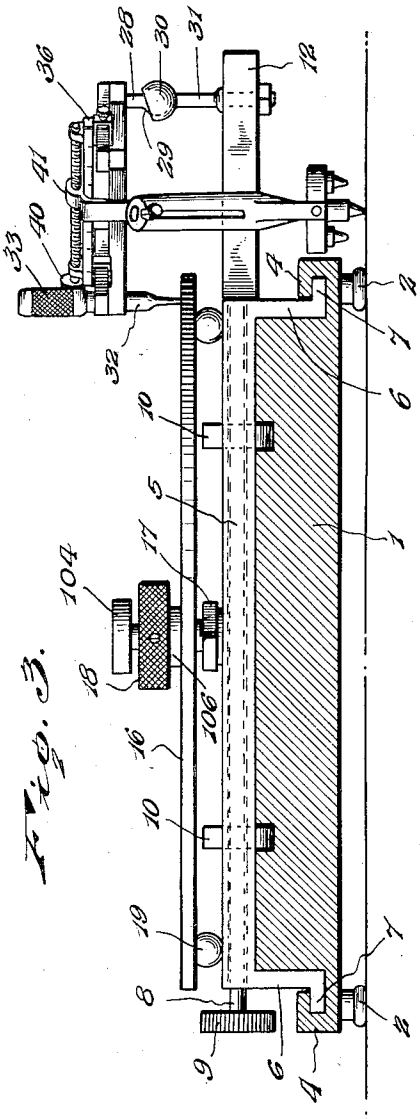


Fig. 3.

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PANTOGRAPHIC REPRODUCING MACHINE

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Fig. 4.

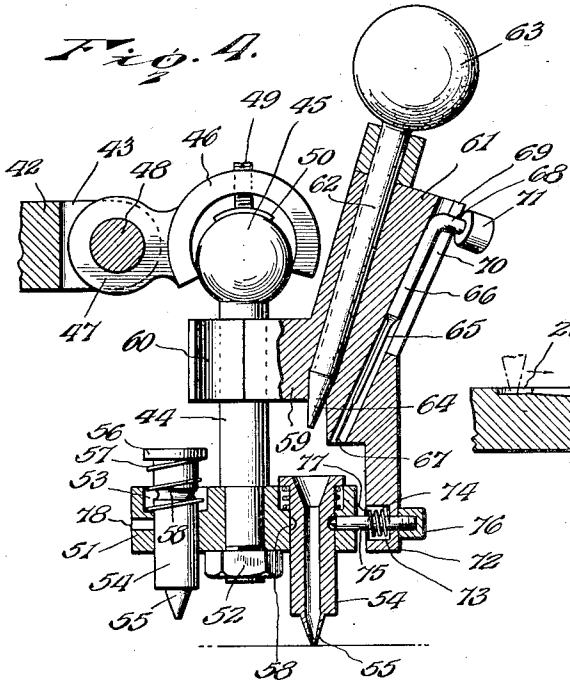


Fig. 6.

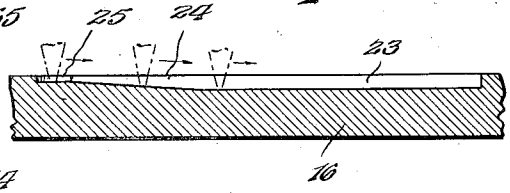
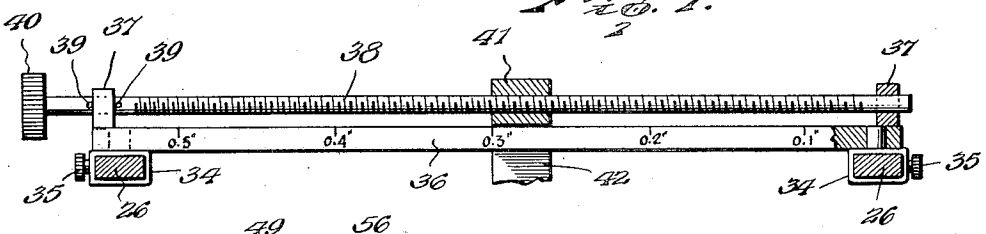


Fig. 7.



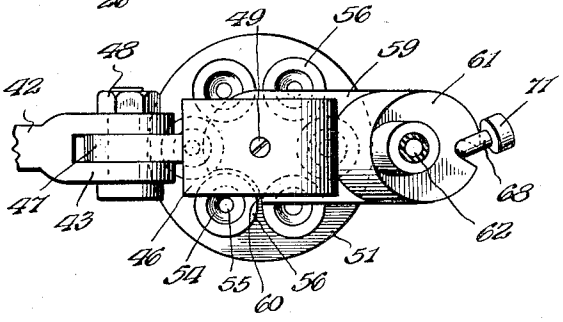
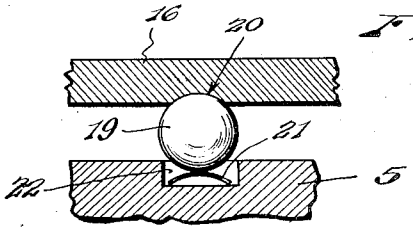


Fig. 5.

Fig. 8.



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UNITED STATES PATENT OFFICE

2,032,350

PANTOGRAPHIC REPRODUCING MACHINE

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Flushing, N. Y.

Application March 29, 1934, Serial No. 718,022

15 Claims. (Cl. 33—25)

This invention relates to pantographic reproducing machines and is designed primarily for use in reproducing a line of letters from a template or pattern disk, although other characters may, of course, be reproduced. One object of the invention is to provide a simple and efficient device which will permit the employment of different sized pens in order to mark a fine or a heavy line, as may be preferred, and another object of the invention is to provide means whereby the pattern character which is to be reproduced may be very easily and accurately engaged by the tracing point, while the marking point will be held off the paper until the pattern character has been properly engaged. Other and incidental objects of the invention will appear in the course of the following description and the invention resides in certain novel features which will be particularly defined in the claims.

In the annexed drawings,

Figure 1 is a plan view of a pantographic reproducing machine embodying our invention.

Figure 2 is a longitudinal section on the line 2—2 of Figure 1.

Figure 3 is a transverse section on the line 3—3 of Figure 2.

Figure 4 is a view, partly in elevation and partly in vertical section, of the pens.

Figure 5 is a top plan view of the pen assembly.

Figure 6 is an enlarged detail section on the line 6—6 of Figure 1.

Figure 7 is an enlarged section on the line 7—7 of Figure 1.

Figure 8 is an enlarged detail section showing the mounting of the rollers which support the pattern disk on the template.

Figure 9 is an enlarged detail section.

In carrying out our invention, there is provided a base 1 which should be of substantial construction so that when placed on a table or other support it will not tend to move about over the same. The base is provided with a plurality of feet 2 so that the area of contact between the base and the support will be minimized and marring of the supporting surface will be avoided. In the top of the base are parallel grooves 3 extending from end to end thereof and spaced equi-distantly from the medial longitudinal line of the base, as will be understood upon reference to Figure 1, the purpose of these grooves being presently made known. Along its sides, the base is provided with flanges 4 which are of re-entrant construction, as shown most clearly in Figure 3. A carriage 5 is mounted upon the base to travel over the same and this carriage is a flat plate provided at its side edges with depending flanges 6 having out-turned lips or ledges 7 at their lower ends. In assembling the parts, the carriage is engaged endwise with an end of the base so that the lips 7 will fit within the recesses or grooves defined by the re-entrant flanges 4 of the base and will slidably engage the same, the carriage being then slid along the base until it is resting over the same. The engagement of the flanges 4 and lips 7 will effectually prevent detachment of the carriage from the base while at the same time guiding the carriage in its movements and permitting free travel over the base. Near one end of the carriage, a shaft 8 is journaled therein and extends across the same, said shaft having one end projecting beyond the side of the carriage and equipped with a knob 9 whereby it may be manually rotated. Intermediate its ends the shaft has fixed thereto rollers 10 which are so spaced as to rest in the grooves 3 of the base and consequently travel along the grooves when the shaft is rotated and effect movement of the carriage over the base. To prevent the carriage being moved off the base, stops 11 are provided at or near the ends of the several grooves so that the travel of the carriage will be obviously arrested by engagement of the carriage with the stops. If, for any reason, it becomes necessary to remove the carriage from the base, the stops may be withdrawn, as will be understood, the stops being normally secured against movement by any convenient or preferred means. As shown in Fig. 9, the shaft 8 is fitted through a passage in the carriage of such form and cross-sectional area as to permit a slight vertical bodily movement of the shaft so that the rollers 10 may be lifted out of contact with the bottoms of the grooves 11 when a quick return of the carriage is desired. A sleeve 100 is fitted about the shaft and a recess or opening 101 is formed in the carriage to accommodate the sleeve, a stem 102 being fixed to and rising from the sleeve. A bracket 103 is secured upon the carriage to guide the stem, which has a head or handle 104 above the bracket and a spring 105, between the collar and the bracket, yieldably holds the rollers to the bottoms of the grooves. To effect a quick return of the carriage to the starting point, an upward pull upon the stem is exerted to slightly lift the rollers 10 and the carriage is then drawn back without releasing the hold upon the stem.

The carrier is formed on one side near one corner with an extension 12 which projects beyond the side of the base, as clearly shown in Figures 1 and 3, and the purpose of which will

presently appear, and at a proper point a recess 13 is formed in the underside of the carriage to receive a nut 14 which is fitted on the lower end of a screw or bolt 15 which fits rotatably in and projects upwardly from the carriage and is adapted to serve as a pivotal center for the template or character disk 16. The screw shaft 15 is held in the carriage by a locknut 17 engaged upon the shaft and turned home against the upper side of the carriage so that it cooperates with the nut 14 to hold the shaft in the carriage, and bearing rings or washers may be interposed between the nuts and the adjacent surfaces of the carriage, as indicated in Fig. 2. The template or character disk 16 is fitted at its center upon the shaft and is held to the shaft by a milled collar or knob 18 which is mounted upon the upper threaded end of the shaft and secured by a set screw, as shown in Fig. 2. The intermediate portion of the shaft is smooth and the disk fits upon the smooth portion with a tight frictional engagement so that rotation of the shaft will turn the disk. Between the knob 18 and the disk 16, a collar 106 is fitted upon the shaft and this collar should be equal in thickness to supplemental disks which may be supplied with the machine or on order. It frequently happens that there is need for characters of a size or design different from those on the one master disk, but in order to maintain alinement it is advisable to have the master disk permanently in place. When a second disk is to be used, the knob and the collar are removed, the supplemental disk is placed on the master disk about the shaft, and the knob is then restored, turned home and secured. The supplemental disk will then furnish the pattern to be traced, and it will be understood that as many supplemental disks may be furnished as may be commercially desirable. The disk rests upon roller balls 19 and is provided at intervals in its under side with recesses or seats, indicated at 20, into which the rollers or balls will engage and thereby arrest the rotation of the disk, it being understood that the recesses or seats 20 are provided in numbers corresponding to the number of characters upon the face of the disk and also spaced according to the spacing of said characters so that the movement of the disk will be arrested whenever a character is brought to the tracing point and will be held in such adjustment until a moving force is again applied. The several balls or rollers 19 rest upon springs 21 seated in recesses 22 provided therefor in the upper side of the carriage and tending constantly to press the balls against the disk. When the rotation of the disk presents a seat to a ball, the ball will be lifted into engagement with the seat by the action of the supporting spring and the spring will yield to the pressure on the ball when the plane face of the disk is bearing upon the ball.

Upon the upper face of the disk, at intervals around the margin of the same, characters 23 are formed therein, letters being indicated in Figure 1. These characters are arranged in one or more circles or annular series concentric with the disk and at the left end of each character an extension of the groove which produces the character is formed, as shown at 24. As shown most clearly in Figure 6, the extension groove 24 is tapered in depth and at its extremity is enlarged laterally to define a circular entrance 25. In engaging the character, the tracing point of the pantograph is brought into position over the circular entrance 25 and is then lowered into the groove so that it will gradually descend to the extreme depth of the groove and thus effect lowering of the pen or marking element so that, by the time the tracing point reaches the end of the letter or other character, the marking point will have made contact with the paper upon which the reproduction is to appear, but until the tracing point does reach the full depth of the groove the marking point will be out of contact with the surface upon which it is to work. Smearing of the receiving surface is thus avoided and sharpness in the definition of the reproduced character is obtained.

The pantograph consists of side bars 26 and end bars 27 which are pivoted together at their points of intersection so that a parallelogram is formed and the side bars will remain parallel and the end bars will also remain parallel in all adjustments of the pantograph. The pantograph is mounted upon the extension 12 of the carriage by a universal joint which comprises a stud 28 depending from the pivot of the pantograph and having a ball 29 formed on its lower end, said ball resting in a cup or socket 30 on the upper end of a pedestal 31 which is secured in the base in any approved manner, as will be understood upon reference to Figure 3. The tracing point 32 is carried by the pantograph at the corner thereof diagonally opposite the supporting corner and this tracer is extended through the meeting ends of the side and end bars of the pantograph so that its shank forms the pivotal connection of the pantograph and, above the said side and end bars, the tracer is equipped with a handle or knob 33 whereby it may be conveniently moved over the outline which is to be traced and may be rotated if desired.

Mounted upon the side bars 26 of the pantograph are sleeves 34 which may be secured in a set position by set screws 35 mounted in the respective sleeves and bearing against the respective side bars, and on the upper sides of said sleeves 34 are pins or studs over which are pivotally fitted the ends of a cross bar 36 having collars or bearings 37 on its upper side at its ends. A threaded rod or shaft 38 is rotatably mounted in the bearings 37 and adjacent one of said bearings is provided with studs or pins 39 which bear against the opposite sides of the bearing and thereby prevent endwise movement of the shaft or rod, as clearly shown in Figure 7. At one end, the shaft 38 is provided with a knob 40 whereby it may be manually rotated and between its ends the shaft passes through and is engaged in a nut 41, as shown clearly in Figure 7. The nut 41 is formed integral with and connects a pair of pen-carrying arms 42 which are disposed at opposite sides of the shaft and the bar 36 and are constructed with forks at their ends, as indicated at 43. The pens, by the use of which marks are to be made upon a sheet of paper or other surface reproducing the traced characters on the template, are carried by the arms 42 and are disposed in the arm nearer the pivotal support of the pantograph or nearer the tracing point, accordingly as the reproductions are to be smaller or larger.

As shown most clearly in Figures 4 and 5, the pen assembly includes a spindle 44 which is formed at its upper end with a ball 45 engageable in a yoke 46 from which extends a perforated lug 47 adapted to fit within the fork 43 of either pen-carrying arm 42, said lug being pivotally held in the fork by a bolt and nut, indi-

cated at 48. A set screw 49 is mounted in the upper side of the yoke 46 and bears at its lower end upon a resilient wear plate 50 which rests upon the ball 45, the ball and spindle being thereby held in a set relation to the yoke. A turret 51 is rotatably fitted upon the lower end of the spindle 44 and is held thereon by a nut 52 mounted on the lower end of the spindle and turned home against the turret, as clearly shown in Figure 4. The turret is provided with a series of openings therethrough arranged in a series concentric with the spindle and having enlarged circular recesses 53 in their upper ends, and in each of said openings is mounted an inkwell 54 carrying a marking point or tip 55 at its lower end, said tip having an opening therethrough which will permit the ink to flow from the well and produce a line of the desired width upon the paper or other surface. It will be understood that the openings in the several tips are of different sizes so that by rotating the turret upon the spindle to bring the proper inkwell or pen to the working position, a line of any desired thickness may be produced. Each inkwell or pen is provided with an annular flange 56 at its upper end and the well is normally held in a raised position by an expansion spring 57 coiled around its upper portion between said flange and the base of the corresponding recess 53, as will be understood upon reference to Figure 4. An annular groove 58 is formed in each well or pen below the upper end thereof and this groove is engaged by a detent when the well has been lowered to the working position so that it will be held against the lifting action of the spring. Fixed to or formed integral with the spindle 44 between the turret 51 and the ball 45 is a bracket consisting of a body portion 59 carried directly by the spindle and having one corner cut away or grooved, as shown at 60. Normally, the upward movement of the several pens or inkwells will be arrested by engagement of the upper end of the inkwell with the bottom of this body portion 59, but if an inkwell is alined with the grooved or cut away portion 60 said inkwell may be lifted from the chamber or opening in which it is seated so that it may be removed for cleaning or other attention. The body 59 of the bracket carries an upwardly extending arm 61 at one side of the spindle and this arm 61 has a pair of openings extending from top to bottom thereof. One of the openings receives the stem of a filler 62 having a bulb 63 at its upper end and having its lower end tapered, as shown at 64. This filler is intended to contain a supply of ink, and its tip 64 will be arranged directly over the inkwell or pen which is in use so that by compressing the bulb 63, ink will be fed into the pen and the supply therein maintained. The outer passage 65, in the arm 61, receives a cleaner which consists of a small rod or wire 66 which is reduced in diameter toward its lower end and terminates in a very fine point 67, as shown. The upper end of the wire 66 is bent laterally, as shown at 68, so that it may rest upon a shoulder or upon the base of a notch 69 at the upper end of the arm 61 and at the side of the passage 65 so that the cleaner will be normally supported in a raised position. When its use is desired, the terminal 68 is shifted from the shoulder or notch 69 to aline with a slot 70 formed in the side of the arm 61 whereupon the cleaner may be forced downwardly so that its point will enter the well or pen and remove therefrom any accumulation of dried ink which may have clogged the action. It is to be understood that the end of the cleaner is very fine and flexible so that when the cleaner is pushed downwardly the point of the same will impinge against the inner wall of the inkwell or point and will be deflected downwardly so that as the lowering movement progresses, the point will effectually pass through the tip of the pen. At its upper end, the cleaner is provided with a knob 71 which constitutes a weight to automatically swing the cleaner into position to engage the end 68 thereof over the shoulder or base of the notch 69. The bracket is also provided with a depending arm 72 which extends close to but clears the edge of the turret disk 51 and in this arm, adjacent the lower end of the same, is a recess 73 housing an expansion spring 74. A pin or detent 75 is slidably mounted through the arm 72 and equipped at its outer end with a knob 76 and between its ends with an abutment 77 against which the spring 74 bears. The knob 76, by bearing against the outer side of the arm, limits the movement of the detent under the influence of the spring. The detent 75 is alined with a radial opening 78 in the edge of the turret disk and is normally held in engagement with said opening by the action of the spring 74, as will be readily understood. If the disk be in such position that an opening 78 is presented to the detent, the detent may engage said opening and if the corresponding inkwell be then depressed, the detent will engage the annular groove 58 therein and thereby hold the inkwell or pen in its lowered working postion, as will be understood upon reference to Figure 4. The turret disk will be held against rotation by the detent when the parts are thus engaged and consequently the inkwell will be maintained in the working adjustment. When the inwell is to be shifted, the detent is withdrawn from its engagement with the turret disk and the disk may then be rotated as desired.

Upon reference to Figure 7, it will be noted that a scale is provided upon the side of the cross bar 37 to facilitate the proper adjustment of the nut 41 and the pen-carrying arms, and it will be understood that similar scales may be provided on the sides of the side bars 26 to insure accuracy of adjustment.

It is thought the operation of the device will be readily understood from the foregoing description taken in connection with the accompanying drawings. The disk 16 of the template may have any desired characters upon its upper face and it will be understood that a plurality of these disks may be provided, each carrying a different set of characters so that any desired type of letter may be readily traced in a line upon a sheet of drawing paper or other drawing surface and the disks will be used interchangeably so that the desired type of character may be readily selected. The base will be sufficiently heavy to be not easily shifted out of position and the edge of the base will form a guide to insure the proper alinement of the letters or characters which are reproduced. The parts having been properly adjusted, the tracing point is brought into engagement with the first character which is to be reproduced and is then moved over the outline of said character, the selected pen describing a similar outline on the paper upon which it rests. The first character having been reproduced, the tracing point is lifted therefrom and the template or pattern disk is rotated to bring the next desired character into position to be engaged by the tracer whereupon

the operation is repeated until the entire line of letters has been reproduced. After each letter is marked upon the drawing surface, the carriage is shifted so that the pantograph and the disk will be moved into proper position to have the second reproduction properly spaced from the first reproduction, this action being repeated after each character has been reproduced. When the entire line has been finished, the carriage may be quickly brought back to the starting point by exerting a slight upward pressure upon the shaft **8** so that the rollers **10** will be raised out of contact with the base and the carriage with all the parts mounted thereon then quickly shifted to the left. The template or pattern disk may have two rows of characters thereon, as indicated in Figure 1, so that capitals and small letters of any one alphabet may be found upon any one disk and it is to be understood that, while the device is intended primarily for use in lettering, other characters may be formed upon the template. The device is very compact and provides for a very appreciable range in the size of the reproduced characters. The ball and socket mounting of the pantograph upon the carriage permits the pantograph to be very easily adjusted to bring the tracing point into engagement with the pattern and facilitates the movement of the pantograph in all directions. The entire pen assembly may be adjusted vertically by shifting the lug **47** pivotally about the bolt **48** and then tightening said bolt while the perpendicularity of the pen may be maintained by properly adjusting the ball **45** and securing it in the set position by the set screw **49**. The reproduction is always through reduction and, consequently, there is obtained a greater apparent accuracy in the reproduction than seems to appar in the impression on the pattern disk and the operation is facilitated because the impressions on the pattern disk are relatively very large and consequently may be very easily engaged by the tracer so that extreme care in tracing is unnecessary. The filler may be of such size as to contain a supply of ink which will last over a reasonable period and may be adjusted to feed ink in a continuous flow to the pen in use so that there will be no need for frequent refilling, cleaning and adjusting. The arrangement of parts is such that the work may be seen clearly at all times and there will be no necessity for a T-square or other long guiding edge inasmuch as the base serves as a guide for a line of letters.

Having thus described the invention, we claim:

1. A pantographic reproducing machine comprising a base having parallel longitudinal grooves in its upper side, a carriage mounted upon the base and having interlocking sliding engagement with the sides thereof, a template mounted upon the carriage, a pantograph secured upon the carriage at one side of the template and adapted to extend over the margin of the template, a shaft journaled in the carriage, rollers secured upon said shaft and engaging in the grooves in the base, and means at one end of the shaft for rotating the same to effect travel of the carriage over the base.

2. A pantographic reproducing machine comprising a carriage provided in its upper side with spaced recesses, a rotary template mounted upon the carriage and having recesses in its underside, balls seated in the recesses in the carriage and adapted to engage the recesses in the template to hold the template in a set position, springs in the seats in the carriage supporting the balls and holding them constantly to the template, and a pantograph secured upon the carriage at one side of the template and arranged to extend over the margin of the template.

3. A pantographic reproducing machine comprising a carriage, a template mounted upon the carriage and having in its upper surface a series of characters for reproduction, and a pantograph secured upon the carriage at one side of the template and including a tracer adapted to be moved over a selected character upon the template, the several characters on the template being formed by grooves in the surface of the template and each having an extension of the groove at one end which is graduated in depth whereby the tracer may be guided into the groove forming the character.

4. A pantographic reproducing machine comprising a carriage, a template mounted upon the carriage, a pedestal secured upon the carriage at one side of the template and having a socket in its upper end, a pantograph having a depending stud at one corner terminating in a ball seating in said socket, a tracer carried by the pantograph at a diagonally opposite point from the stud, and a marker adjustably mounted upon the pantograph between the sides of the same.

5. A pantographic reproducing machine comprising a carriage, a template mounted thereon, a pantograph secured upon the carriage at one side of the template, sleeves slidably engaged upon the side bars of the pantograph, a cross bar having its ends pivotally mounted upon said sleeves, a threaded rod rotatably mounted upon said cross bar, a pen-carrying bracket having threaded engagement with said rod whereby it may be shifted transversely of the pantograph, and a pen carried by said bracket.

6. A pantographic reproducing machine comprising a carriage, a template mounted upon the carriage, a pantograph secured upon the carriage at one side of the template, a threaded rod rotatably mounted upon the pantograph transversely of the same and adjustable longitudinally thereof, a bracket engaged with the threaded rod and extending to the opposite sides of the same, and a marker adapted to be mounted upon either end of said bracket and carried thereby.

7. A pantographic reproducing machine comprising a carriage, a template mounted upon the carriage, a pantograph secured upon the carriage at one side of the template, a pen-carrier mounted upon the pantograph, a rotatable pen-holder suspended on the pen carrier, and a plurality of pens mounted upon the pen holder.

8. A pantographic reproducing machine comprising a carriage, a template mounted upon the carriage, a pantograph secured upon the carriage at one side of the template, a pen-carrying bracket mounted on the pantograph, a pen holder attached to the pen-carrying bracket, a plurality of pens mounted upon the pen holder and selectively movable to the working position, and means for holding a selected pen against movement at the working position.

9. A pantographic reproducing machine comprising a carriage, a template mounted upon the carriage, a pantograph secured upon the carriage at one side of the template, a pen-carrier mounted upon the pantograph, a pen holder suspended on the pen-carrier, a plurality of pens mounted upon the pen holder and selectively movable to the working position, means for maintaining the selected pen against movement at the working

position, and means mounted on the pen holder to fill and clean the pen.

10. In a pantographic reproducing machine, the combination of a pen-carrier, a yoke pivotally attached to the pen-carrier, a spindle suspended in said yoke for universal movement, a turret rotatably mounted on the lower end of the spindle, a plurality of hollow pens removably mounted in said turret, yieldable means on the turret for holding the pens relatively raised, means on the spindle to normally prevent detachment of the pens, and means at one side of the turret to engage the same and a selected pen to hold the pen in its lowered working position and prevent rotation of the turret.

11. In a pantographic reproducing machine, a pen-carrier, a spindle suspended on the pen-carrier, a turret disk rotatably mounted on the lower end of the spindle and having a plurality of vertical openings therethrough, hollow pens fitted in said openings and each provided with an annular groove in its outer surface, the turret being provided with radial openings leading into the vertical pen-receiving openings, yieldable means for holding the pens normally raised, a bracket on the spindle normally preventing removal of the pens and having a cut away portion arranged to permit removal of a single pen, an arm depending from said bracket, and a detent mounted in the lower end of said arm and arranged to engage a radial opening in the turret and an annular groove in a lowered pen whereby to prevent movement of the turret and to hold the pen in lowered working position.

12. A pantographic reproducing machine comprising a base having parallel longitudinal grooves in its upper side, a carriage mounted upon the base, a template mounted upon the carriage, a pantograph secured upon the carriage at one side of the template and adapted to extend over the margin of the template, a shaft journaled in the carriage and having limited vertical movement, rollers secured upon the shaft and engaging in the grooves in the base, means for rotating the shaft to effect travel of the carriage, and means for lifting the shaft and yieldably holding it lowered.

13. A pantographic reproducing machine comprising a carriage, a template mounted on the carriage, a pedestal secured upon the carriage at one side of the template, a pantograph having a depending stud at one corner, a universal joint connecting the stud of the pantograph with the upper end of the pedestal, a tracer on the pantograph at a diagonally opposite point from the stud, and a marker carried by the pantograph between the stud and tracer.

14. In a pantographic reproducing machine, the combination of a pen-carrier, a yoke pivoted to the pen-carrier, a spindle suspended in the yoke, means in the yoke to hold the spindle in a set position, a pen-holder rotatably mounted on the spindle, a plurality of pens in the pen-holder, and means to hold a selected pen in working position.

15. In a pantographic reproducing machine, the combination of a pen-carrier, a spindle suspended on the pen-carrier, a pen-holder rotatably mounted upon the spindle, a plurality of vertically removable pens mounted in the pen-holder, means for locking a selected pen in working position, and a bracket secured on the spindle above the pen-holder and overhanging the same and having a cut-away portion permitting removal of one pen.

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