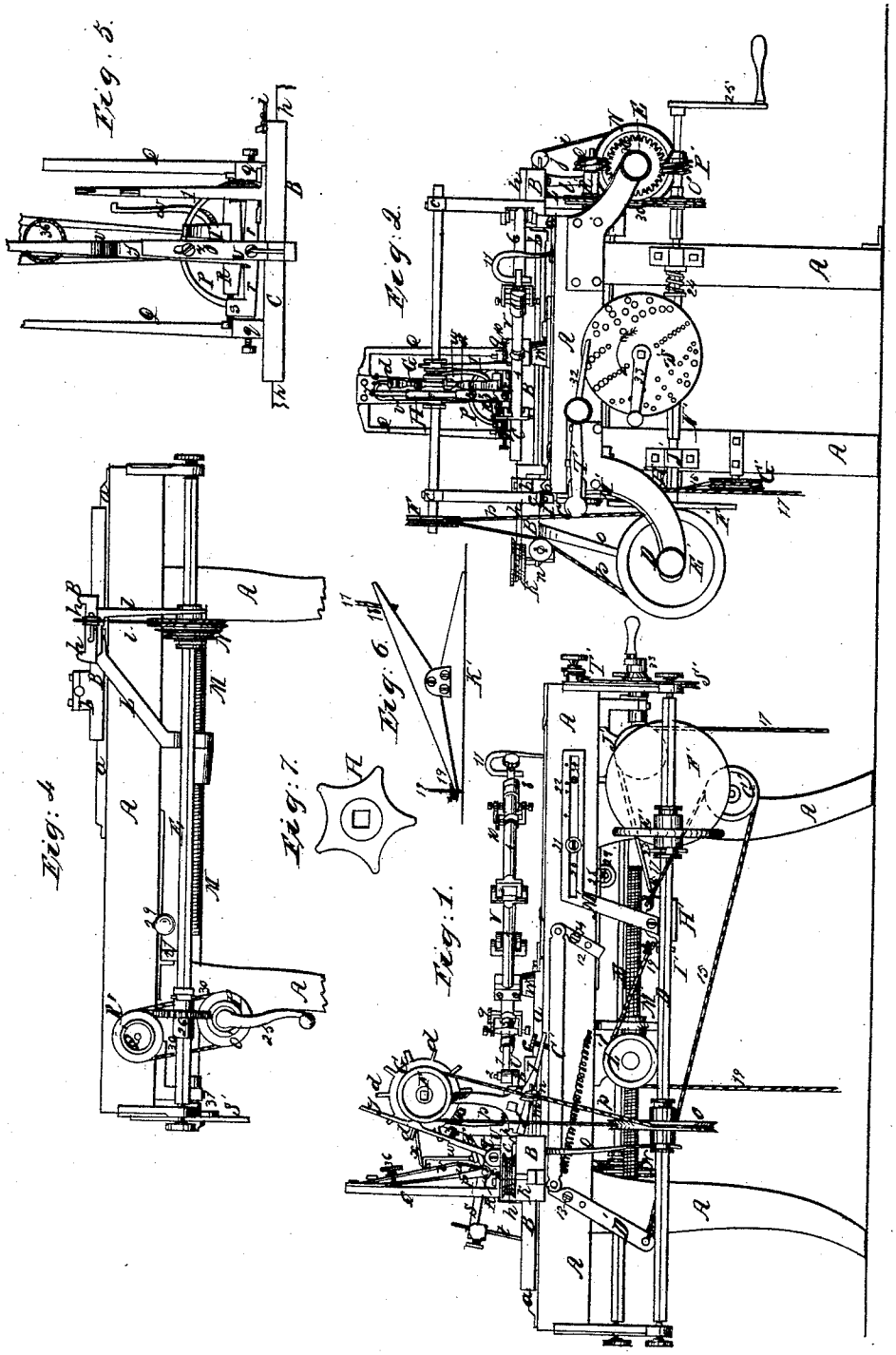
2 Sheets—Sheet 1.

J. B. BLAIR.

Engraving Machine.

No. 9,743. Patented May 24, 1853.



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

2 Sheets—Sheet 2.

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Engraving Machine.

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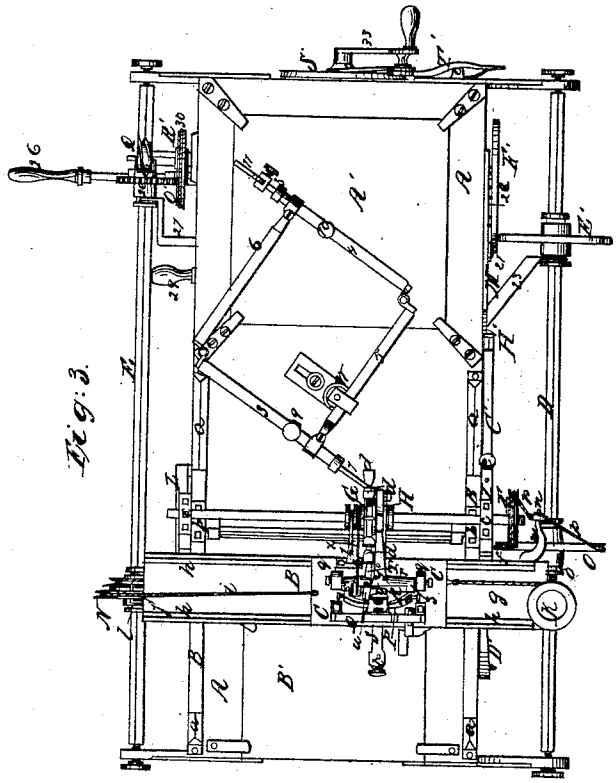


Fig. 3.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN B. BLAIR, OF ALTON, ILLINOIS.

ENGRAVING-MACHINE.

Specification of Letters Patent No. 9,743, dated May 24, 1853.

To all whom it may concern:

Be it known that I, JNO. B. BLAIR, of Alton, in the county of Madison and State of Illinois, have invented a new and Improved Machine for Engraving; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1, is a side elevation, Fig. 2, an elevation of the front end, Fig. 3, a plan of the machine, Fig. 4, side elevation, opposite to that of Fig. 1, exhibiting such gearing as are not shown in the other figures, Fig. 5 an enlarged face view of the carriage and gearing having the needle attached, Fig. 6, side elevation of pedal, Fig. 7, a view of the cam wheel used in connection with the needle shaft, not shown distinctly in the other figures.

The nature of my invention consists in the arrangement of a machine so as to be capable of performing the work of a graver or other tool, to produce either mezzotint or other engraving with a greater uniformity and regularity than that at present done by hand, the construction of which is as follows:

Upon a frame or table A, I place a carriage B, having ways *a*, upon which it moves lengthwise of the machine. Attached to this are boxes *b*, in which a shaft, of a crank form works, connecting to this shaft, two upright arms are raised, with boxes *c* set on their upper extremities—in these boxes, another shaft works, operated by a pulley F. Upon this shaft a box or collar slides, carrying two wheels G, H; that of G is provided with a number of projections or beaters *d* on its outer edge, and the edge of that of H is scalloped or waved, (see Fig. 7) so as to produce certain movements, when in operation, in the needle. Extending forward and from the lower portion of one of the upright arms, already named, an arm I is arranged, having an adjusting screw *e* and a spring *f* acting upon it, the spring being secured to the bottom of the carriage B. (See Fig. 7.) Near the extreme of one end of the carriage B a draft pulley K is fastened, on the inside a recoil spring is arranged, from this pulley a cord *g* runs, and is made fast to the end of another carriage C immediately above the other, having a transverse motion to the carriage beneath, sliding on ways *h*, making part of the carriage B. From the other end of the carriage C, another cord *i* extends, passing over a small conducting roller *j*, and then down, and on a cone wheel N on a line shaft E upon which it winds. Attached to the carriage B, and near the small pulley *j* a bent bar L passes down and under the table A, and at the end is made large, with a hole bored through and a female screw formed, this works on a large shaft or screw M placed centrally and lengthwise to the machine. Forward, and on the shaft M a suitable ratchet wheel 31 is secured. Fixed loosely on the shaft and against the ratchet wheel, a dial wheel S′ with a pawl to work on the ratchet is placed. This dial wheel, has a number of holes properly arranged on its face (see Fig. 2) into which a catch bar 32 falls. The holes are placed concentric on the surface in eight or more lines all revolving around the common center of the dial wheel. The largest of these concentrics has seventeen holes and the smallest only two, the rest are graduated according to these two lines; marking the extremes, the purpose of which will be shown hereafter. This catch has a hand piece connected, as at T′ so that by applying a slight pressure at one end, the opposite end is raised, or the catch 32 is drawn from the holes on the face of the dial wheel, or placed in other holes. A crank 33 is also placed on the end of the shaft, in front of the wheel, and by turning in the direction opposite to that indicated by the arrow the carriage B is advanced toward the front, the pawl gliding over the ratchet, but if turned in a contrary way, the pawl catches into the ratchet wheel and turns the dial wheel and runs the carriage back, the distance being shown by the catch bar 32 in falling into the holes described. As an example, the bar 32 (as seen in Fig. 2) being placed in the larger concentric line would give on a complete turn of the dial wheel, seventeen intervals between lines made by the needle, and in the space passed over by the carriage B. Passing down from the same place as the bar L, a bar *l* connects the cone wheel N, so that as the carriage B advances or is drawn back, the cone wheel will make the same movements on the shaft E. On the other end a similar bar *o*, projects down, and moves in like manner a

large wheel O, also a bent arm *m* passes out horizontally, from the same place as that of *o* and carries a small conducting roller *n*. The large wheel O moves on a shaft D similar to that of E. Around this, up and over the pulley F and the small roller *n* a band *p* is placed.

The carriage C has two butts *q* on its face, through which set screws pass, and sustain a shaft *r*, at each end of which two lips or cams project, as *s*, (seen more distinctly in Fig. 5) against which a semi-circular piece P rests and connects with frame Q on the carriage C, by means of a strip of spring metal, at the lower edge of this contrivance a shaft R is inserted, and sustained as in the other case. From this shaft an arm S holding the needle *t* passes out, and over a copper plate B′ on which it is intended to operate, opposite to this arm, another T passes forward from the same shaft, and reaches just below and near the wheel G, so that as the wheel G revolves, the projections *d* arranged on its periphery will come in contact with the arm T and beat it down, and raise the needle. Between these arms, a small lip *u* is raised on their shaft, on which a spring *v* presses, so that as the needle arm is raised by the action of the wheel G this spring will serve to force it down or back to its original position. Raised from the shaft *r* a long arm or lever *y*, (adjusted by a screw *z*, passing through a stanchion U on the carriage C) is intended to be acted upon by the cam wheel H. From the carriage C and onto the collar carrying the wheels G and H, so that there will be uniformity in the movements of the collar and carriage, a bar 1 is used. Also attached to the collar is a rod *x* that connects with an arm *w* on the arm T, to keep the needle from the plate.

The stanchion U has at its bottom, a part projecting forward, to which, when required a pantograph is joined, as at 2. This pantograph V consists of four arms 3, 4, 5, 6 with joints and bands attached as shown in the drawings. In the arms 3 and 4, sliding arms 7 and 8 are inserted, and secured by screws 9 and 10; that of 7 connects with the carriage C at 2, and that of 8 carries a tracing point 11. The whole resting upon the fulcrum W. Thus arranged the pantograph is capable of executing any work common to instruments of its character, in connection with the machine.

Below the arm I, a long bar C′, (upon which the arm rests,) is placed, having a lever D′ and short arm 12 joined, having centers of motion at the points 13 and 14 and held back by a spring attached on the underside of the bar C′ and to the side of the frame of the machine, so that on the raising or lowering of the lever D′ (the centers 13 and 14 being a short distance beneath the junctions of the bar, short arm and lever) the bar C′ can also be raised or lowered, turning down horizontally or up about these two centers. From the lever D′ a strong cord 15 passes to and around a pulley G′, and is attached to a sliding box H′, that moves on a bar I′ the upright, or arm of which is seen at 16 in Fig. 7; the bar proper is immediately behind the axle D. From this box, and from the same point as before named, another strong cord 17 passes up, and over a pulley J′ down and on to a pedal K′ see Fig. 6, at 18, which is secured to the floor or the frame. At the opposite side of the box H′ another cord, as 19 is attached which passes over another pulley L′ and connects the pedal, at 19. By the operator pressing his foot down on either of the points as 18 or 19 of the pedal, it will be seen that the box will move accordingly. From the center of the box H′ rises a flat plate M′, with a slot 20 cut therein, in which a small screw 34 is placed running into the frame of the machine, the whole supported by a screw 21. On either side of this slot, small prickers 22 are placed, eight or more in number, for the purpose, when the hand of the operator is over or resting upon the small screw 34 he will be made aware of the exact moves of the box H′ through the action of the prickers named on the surface of the hand. Also from the center of this box a horizontal bar 23 passes, and connects with a wheel E′ on the shaft D, which partakes of the same movements as that given to the box.

The wheel E′ has pressing against its circumference a wheel F′ having a flat, disk surface, so as to allow the wheel E′ a free movement over its face, when moved by the action of the box H′. The wheel F′ is supported in place, by a shaft running crosswise of the machine (see N, Fig. 2.)

At 24 the shaft is provided with a strong spring, which serves to keep the disk wheel, hard on the wheel E′. On this shaft also a pulley O′ is made fast, and also a screw P′ and crank 25. Over the screw P′ a toothed wheel 26 moves on the shaft E and as in the drawing gears with the screw P′. The toothed wheel is moved by a bar 27 which connects with a lever, that passes transversely of the machine, having its handle at 29 and fulcrum at 28, and by pulling the levers forward, the toothed wheel 26 will gear with a screw Q′ similar to the first named, back of which a pulley R′ is fixed, with a cord or band 30 passing to the other pulley O′. Thus by moving the toothed wheel either way it gears either in the upper or lower screws and turning the crank in one way, the shaft E can be turned either to the right or left.

Having thus described the construction of my engraving machine, which may differ however, by a few modifications or the sub-

stitution of other mechanical devices, so as to obtain substantially the same results, I shall proceed to describe the operation of the same.

In shade of a light character, first place the carriages B and C in position over the plate B′; second, press the side of the pedal, 18, slowly down—this side as before stated connects by means of the cord 17 with the box H′, consequently the box is moved forward, also moving the slide scale M′ and the wheel E′ nearer the center of the wheel F′, which movable parts are all connected and by cords and otherwise attached to this box H′. The cord 15 also attached at the same part necessarily slacks off or gives way, over the pulley G′, which slack it taken up by the raising of the lever D′, by means of the spring placed so as to act on its upper end and above its fulcrum or center 13. This movement will necessarily lower the bar C′ which is hinged or jointed with lever D′ as before noticed, and this in its turn lowers the outer end of the supporting arm I of the frame having the two wheels G and H, and this frame having its bearings in the boxes *b*, *b* will be brought forward and down, according to the amount of depression of the bar C′. The wheels G and H being thus brought forward are more or less rendered inactive on the parts on which they operate. Thus with the wheel G, its action on the arm T of the needle bar's shaft R can be very slight (its strokes) and the needle will work on the copper plate accordingly. If the wheel was brought hard on the arm T, the needle would make deeper indentations on the plate B′. In like manner the wheel H is rendered more or less effective when it is in operation, which is only when the indentations are to be of a scattered nature, of which further explanation is to be made. The hand of the operator having during the pressing down of the pedal before noticed, been resting on the small screen 34. he is made aware of what degree of shade the machine will make at the time, or he is enabled by so continuing his hand on this screw to make any graduation necessary in the shade to be made on the copper plate, by the movement of the prickers 22 of the scale M′ on the surface of his hand. Having got the required shade, gear the toothed wheel 26 in with the screw or worm wheel Q′, commence turning the crank 25. This gives motion to the wheel F′ and this to the wheel E′ and the shaft D, from which motion is given to the wheels G and H by means of the pulleys O and F, and the needle *t* commences its work on the plate B′, caused by the revolutions of the wheel G, carrying the beaters *d*, *d*, that strike on the outer end of the tail arm T of the needle shaft.

The toothed wheel 26 in revolving turns the shaft E and with it the cam wheel N, to which the carriage C is connected, and is thus drawn across the machine, the cord *i* being in the larger turn of the wheel, in case the shade is of a very light character, so that the carriage C would move rapidly over the plate B′ and allow the needle to make a very few indentations. The line thus would be a line of dots, finely made by the needle, and with a good interval between them, and in a direct or right line. Again by the wheel E′ being drawn near the center of the wheel F′, so will the action of the wheel E′ be much slower. Consequently the strokes of the needle will be very few in crossing the plate B. This arrangement is sufficient for all purposes and dispenses with the changing of the cord around the cone wheel N, which may be employed according to the style of the engravings, which may be of a dark or light character. In shade of a darker character, the opposite course would be pursued. Thus the pedal would be pressed down on the opposite side 19, and would draw the box H′ with its different attachments back by means of the cord 19 connecting at the opposite end of the box H′. Consequently when the machine was in operation, the wheel E′ would make more revolutions. The frame carrying the wheels G and H would be brought more into action with the parts they operate, and the needle would make a greater number of indentations and much deeper, in the passing of the carriage C over the frame of the machine. The scale of prickers 22 on M′ as before indicates the degree of shade.

The carriage (C) which has traversed across the machine; the needle having made one line of the length required; must now be prepared to repeat the operation. The catch 32 see Fig. 2, is placed in the line of any of the holes on the dial wheel S′ according to the nature of the work to be done. Supposing the work is of a dark shade, the catch would be in the line with some of the holes near the circumference of the dial wheel, and if for light would be nearer the center, so that on turning the crank 33 in a direction shown by the arrow, the dial wheel would also be turned, the catch 32 gliding out of one of the holes and falling into the next succeeding one, thereby indicating the space moved over by the carriage B, or the amount of interval which will exist between the line already made on the copper plate D′ and that which is to be made, but on turning the crank 33 in the direction opposite to that of the arrow, the carriage B would run in an opposite direction, that is, toward the forward part of the machine, the dial wheel remaining immovable, being held by the catch bar 32, its pawl passing over the surface of the ratchet wheel 31, which turns as the

main shaft or center screw M does, being secured firmly to it, as before named. The carriage B having been advanced the required distance for the next line, and by drawing the tooth wheel 26 out of gear and clear of the two screws or worm wheels P′ Q′ will allow the carriage C to be drawn suddenly back by means of the recoil spring pulley K, placed at the opposite end of the carriage, and be ready to execute the next line or second one, which would be parallel to the first, or by gearing the toothed wheel 26 into the worm or screw wheel P′ and continue turning the crank 25 in the same direction as previously done, the carriage C will return at the same rate of speed back over the plate B′ and will also make a similar line to the first. The lines thus far made are of a light, or shaded character, consisting of indentations or regular dots in a straight line, which may be drawn closer together and deeper for shade, or may be placed farther apart and the indentations on the copper plate of a slight depth for light. Lower the arm *y* so that it will rest against the fluted surface of the wheel H by unscrewing the set screws *z*; then the action of the arm will be to and fro, causing the lips or cams *s* of the arm's shaft *r* to turn so as to force the needle's shaft *r* out and back, a line made by this arrangement, with the carriage C in motion, would be of a scattered nature, thus assuming any line, directly across the plate, the indentations made by the striking of the needle, would be first on one side and then on another of this assumed or imaginary line and so continuing until the operation was completed. Displace the attachment of the rod *x* and arm *w* and the needle shaft will turn so as to allow the point of the needle to come directly on the plate B′, and clear the tail arm T of the wheel G by throwing the wheel's frame a little forward, and an unbroken line will be made on the plate, tightening the set screw 36 so as to force the spring *v* hard against the lip or bit *u* of the needle shaft R, and the needle's point will be forced deeper into the plate. The number of lines thus far made, are sufficient for any line engraving. Thus the first is in this manner made composed of dots . . .; the second, : : :; the third, ——. Each one being heavily or lightly made.

Thus far as has been fully seen, any number of lines may be placed by the crossing of the carriage C, parallel with each other running from one side of the machine to the other, or left to right. Now by turning the crank 33 rapidly, having placed the carriage C with the needle in position, one line may be made at right angles to those already described, move the carriage C and repeat the operation of turning the crank, and another line will be made, (the crank turning the screw M and that moving the lower carriage B.) Now we have lines thus far which run from left to right and from the top to the bottom of the plate B′ by means of the two carriages C, B, one having a motion at right angles to the other. Turn the last named crank 33 and the main one 25 regularly together, and the consequence will be, that the indentations of the needle will be in diagonal lines. Temper the revolutions of these two cranks 33 and 25 and the indentations or marks of the needle will be both diagonal and curving in proportion to the comparative extent of motion of each carriage. (The cranks of course having direct influence on the carriages B and C.) Remove the needle *t* and in its place substitute a blunt one or beater, and reverse the scale of prickers 22 on the plate M′, and place a new plate at B′ and commence operating the machine, and we produce a mezzotint engraving—which surface instead of being composed of lines or marks of a sharp instrument, is beat down, so that the working of the lights and shades would be the reverse of the course practised in line engraving; hence the changes.

The pantograph V I sometimes find convenient to employ, making it perform the same work, but in a different manner, as those now in common use. Thus by placing a drawing A′ which has to be engraved under the tracing point 11, and putting the carriages in motion particularly that of C to which the opposite end is attached as before described, the tracing point will continue to move across the drawing as long as the carriage C is moving making a line parallel but opposite in direction to the course of the carriage. Again if that of B should advance the tracing point would follow. Therefore the principles of this are but similar to the principles of others with but one exception. This exception is in the attachment of the end at 2 of the carriage C, which in the hand pantograph would be the pencil or marking end, and by placing the hand on the tracing point 11 and following the lines of the design to be copied, a duplicate would be produced by the opposite or marking end—but this has the power applied at 2 and the tracing end 11 is left free in its movements, the exact termination of the lines in the drawing being noted by the eye of the operator, who governs the movements of the carriages to correspond with the character of the design which is being thus transferred to the plate B′ and in like manner the different shades and tones of the picture are repeated on the copper plate.

In reducing or enlarging the engraving or copy, the two slides or arms 7 and 8 are drawn out or moved back in their sockets 3 and 4, so as to bring the two extremes 11 and 2 in line with the fulcrum W, then as

the distance 2, W is to W 11 so will be the relative proportions of the engraving to that of the design or drawing A′.

Having thus fully described the construction and operation of my improved engraving machine, what I claim therein as new and for which I desire to secure Letters Patent is:

1. The so combining of the needle whether sharp or blunt, with a pantograph or other copying or tracing instrument, through the medium of double carriages moving at right angles to each other, as that the dots or punches of said needle may be dispersed or aggregated at pleasure, for the purpose of forming the lights or shadows—the character of the lights and shadows being indicated by a sliding scale moving before the eye or under the hand of the operator, substantially as described.

2. I also claim the combination and arrangement of the sliding box H′, on the bar I′, the cords 15, 17, 19, (the first cord connecting the sliding box with the spring lever D′, and the two latter connecting the sliding box with the pedal) and the arm 23, for the purpose of moving by means of the pedal K′, the wheel E′, toward or from the center of the wheel F′, on the face of which it works spring tight, to change its motion and give to the needle a relatively changed motion, substantially as described.

3. I also claim in combination with the carriage and needle the wheel G with its lifting pieces *d*, and the cam wheel H, or their equivalents, for changing the character of marks, lines, or dots upon the plate to be engraved at pleasure, and this I claim whether the same be operated in connection with the pantograph or not, substantially as described.

J. B. BLAIR.

Witnesses:
W. H. BAILHACHE,
HENRY G. MCPIKE.