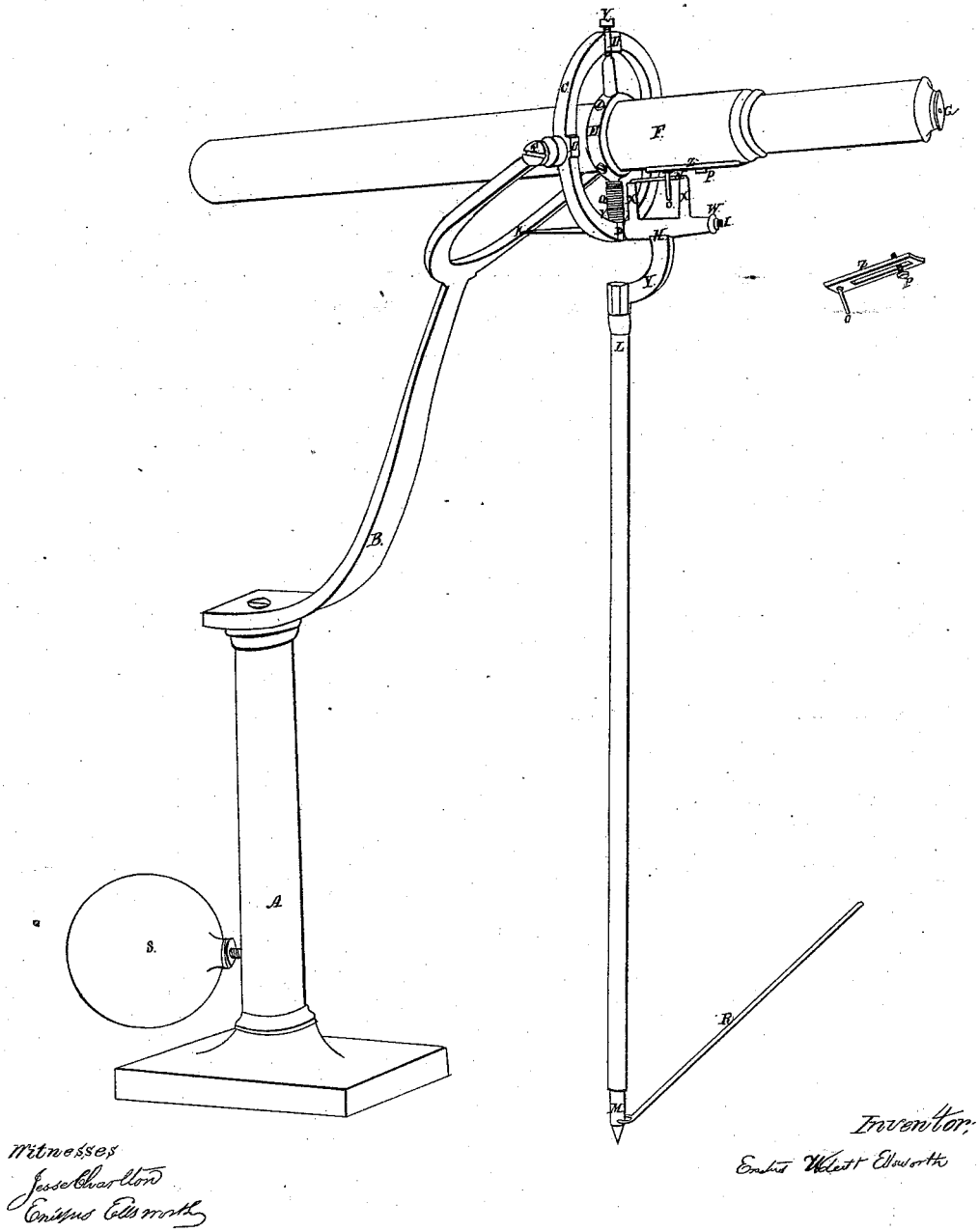
E. W. ELLSWORTH.

Drafting Instrument.

No. 4,070. Patented June 7. 1845.



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UNITED STATES PATENT OFFICE.

ERASTUS W. ELLSWORTH, OF EAST WINDSOR, CONNECTICUT.

INSTRUMENT FOR DRAWING.

Specification of Letters Patent No. 4,070, dated June 7, 1845.

To all whom it may concern:

Be it known that I, ERASTUS WOLCOTT ELLSWORTH, of the town of East Windsor, county of Hartford, and State of Connecticut, have invented a new and useful Machine for Drawing; and I do hereby declare that the following is a full and exact description.

My invention consists in a mechanical arrangement which so combines an index in the focus of the eye-glass of a telescope with a pencil, crayon, blunt point, or other marking implement that when said index is apparently made to pass over the outlines of any object, the said pencil, crayon, blunt-point or other marking implement shall trace the outlines of said object.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

It consists of a firm, upright standard marked A in the drawings, to the top of which is screwed a curved fork B. At the extremities of the tines of this fork are pivot screws T (one only being represented in the drawings) the points of which are turned inward toward each other. These points support a ring C, between the tines of said fork and allow it to turn freely on its horizontal diameter. At right angles with these pivot-screws are two others in the ring itself, marked V, V (the lower one not seen in the drawings.) The upper of these last mentioned pivots is a movable screw like those which pass through the tines of the fork the opposite one is fixed firmly on the inner periphery of the ring. All the above described pivot screws, with the exception of the one last mentioned, have heads notched like the common wood-screw, or otherwise formed to allow of their being carefully adjusted, in order that the parts which they support may move upon them freely, yet without looseness or lateral motion. The pivots V, V, which pass through the ring C support by two axles a smaller ring E, which ring grasps the large tube of a spy-glass F, which, within certain limits, the pivots T, T, V, V, allow to be turned freely in any direction. Beneath the lower of the pivots marked V, a double axle I, K, passes through the edge of the ring C and is fixed firmly at right-angles with its plane. This axle is largest in diameter at its middle where it is fastened in the ring, and tapers gradually toward both ends, on which screw threads are cut, either of which will receive the milled head W. A hub H which fits both extremities of the double axle and which may be closely adjusted by screwing the milled head against it, has two upright projections or posts X X, between the upper extremities of which passes a smooth cylindrical wire of steel N, parallel with the axle on which the hub turns. The posts X X and wire N do not rise so high as to interfere with the free lateral motion of the spy-glass on the pivots V V. From the lower side of the hub H, and in the same plane as the posts X X passes another projection Y, which is curved inward so that when the hub is turned, its lower extremity moves in the plane of the ring C. To the lower end of projection Y is firmly attached a tube L, about three eighths of an inch in diameter, which extends downward to within an inch of the plane on which the standard A rests. This tube throughout its whole length swings in the plane of the ring C, the axis of the axle I K being its center of motion. Into the lower end of L slides as freely and accurately as possible another tube, M of nearly the same length in the lower extremity of which may be fastened, any common marking implement used for drawing. Near the lower end of the tube M, a handle is attached by means of a fork, the extremities of the tines of which are pointed and turned inward toward each other. These points enter pivot holes on opposite sides of the tube, forming a connection similar to that between the fork B, and the ring C. The instrument is operated entirely by means of this handle which is held freely between the fingers of the draftsman in the same manner as a pen.

The connection between the hub H, and the larger tube of the spy-glass F, by means of which, lateral motion is communicated to said tube is as follows. A screw P enters the lower side of the tube F, which has a broad head and acts as a clamp upon a piece of metal, marked Z, in the drawings, and binds it to the tube. The upper surface of this piece is filed concave, so as to fit the cylindrical convexity of the spy-glass tube. The hole in Z, through which P passes, is not circular, but is elongated in the direction of the axis of the tube. Thus when the screw P is loosened, the piece Z may be made to slide toward or from the axle on which the spy-glass is suspended in

the ring C. The whole distance through which Z may slide is equal to the distance between the posts X X. From this piece Z, near that end of it which is turned toward the axle of the telescope, and parallel with said axle, projects downward a cylindrical pin of steel O, of the same diameter as the wire N, with which it is kept in contact by the spiral spring Q wrapped around the lower extremity of the axle of the telescope.

The telescope which I use in this instrument, is of the simple construction denominated the "astronomical telescope," although this particular form is not essential. A convex object glass is placed in the front or object end of the larger tube, and the image formed by it is magnified by a convex eye-glass in the sliding tube G. In the focus of the eye-glass is placed an index which I construct either with a pair of hairs or spider web lines intersecting each other at right angles in the axis of the sliding tube, or of a circular piece of plane glass with a minute dot in the center. It is not necessary that the magnifying power of the telescope should be high; six or eight diameters is sufficient. Although objects are seen inverted through an astronomical telescope, yet this will occasion the draftsman merely a temporary inconvenience which will be more than counterbalanced by several permanent advantages. When it is desired to copy objects placed within a few inches of the object end of the telescope, which is sometimes the case, particularly in tracing engravings, I insert an object glass of short focal length in the object end of the sliding tube, and remove the other object glass.

Such is my invention, which may be more fully understood by inspection of the accompanying drawings. It is used by placing it on some firm level surface, fastening the paper on which the draft is to be made under the pencil tubes, adjusting the spy-glass by means of the sliding tube G so that the object to be drawn and the index in the telescope are both distinctly visible and then moving the pencil by the handle R in such a manner that the index shall appear to the eye of the operator at G to pass along the outlines of the object to be copied.

This invention (which I entitle a delineator) is intended for tracing outlines only, and cannot be advantageously used for shading. Outlines drawn by it (within certain limits, which limits may be increased by increasing the length of the pencil tubes L M and the height of the standard A) may be taken on any required scale, whether on the same, greater, or smaller than that of the original object. The scale on which any given object will be drawn, will vary inversely as the distance of the instrument from that object. Not only the size of the draft is at the option of the artist, but he may reverse the right and left of his work, as is done in engraving and type-setting. For if, when the pencil tube L is suspended from the extremity I of the double-axle I K, the pencil be carried to the right of the paper on which a drawing is to be made, the object-end of the spy-glass will also be directed to the right side of the object to be drawn, and vice-versa. But if the pencil tube L, be suspended from the side K of the axle I K, and the parts O Z P be transferred to the same side of the ring C, and fastened to the telescope as before, then a movement of the pencil on the paper toward the right will be accompanied by a corresponding movement of the object end of the telescope, not toward the right of the object, but toward its left. Thus, while the pencil is on the right side of the paper, the eye of the draftsman will be directed to the left side of whatever he may be copying, and as up and down on the drawing are unaffected by the transfer of the hub H from I to K, or from K to I it follows that such a transfer will affect the right and left position of the objects copied. The artist may also produce a distortion in the length or breadth of his drawing, by sliding the piece Z, and consequently the pin, O, which it carries, nearer to or farther from the axle on which the spy-glass turns in the ring C. When the said pin is clamped at a certain determinate distance from said axle, the proportions of the objects copied are preserved in the drawing. This distance may be easily ascertained and marked by the maker of the instrument after it is completed, by setting up, and copying a regular geometrical figure, such as a square or an equilateral triangle. If the copy of such a figure is not found to be regular; the pin O must be moved backward or forward, and the experiment repeated until the proportions of length and breadth can be accurately copied. It will then be found that the distances from the axis of the axle which supports the spy-glass to the point of contact between the pin O and the wire N, and from the axis of the axle on which the pencil tubes are suspended, to the same point of contact are exactly equal. Particular care is necessary on the part of the maker in fixing the position of the pivots, and in making all the working joints move freely, yet closely.

This delineator is applicable to all kinds of drawing in which it is desirable to obtain accurate outlines, or to produce an enlarged or diminished representation. It may be applied to all the purposes of the pentagraph and the camera-lucida, and will be found less clumsy in use than the former, and capable of producing more accurate and

delicate work than the latter. In the variety of its applications and accuracy of its performance, the inventor believes it to be unsurpassed by any other invention for similar purposes with which he is acquainted.

What I claim as my invention and desire to secure by Letters Patent consists in—

A mechanical arrangement which so combines an index constructed of cross-hairs or spider web lines intersecting each other at right angles, or a dot on a plane lens or any other similar contrivance placed in the focus of the eye-glass of a telescope, with a pencil, crayon, blunt-point, or other marking implement, that when said index is apparently made to pass over the outlines of any object seen through the telescope, the said pencil, crayon, blunt-point, or other marking implement shall trace said outlines as herein described.

East Windsor Ct. Feby 27, 1845.

ERASTUS WOLCOTT ELLSWORTH.

Witnesses:

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MARY S. ELLSWORTH.