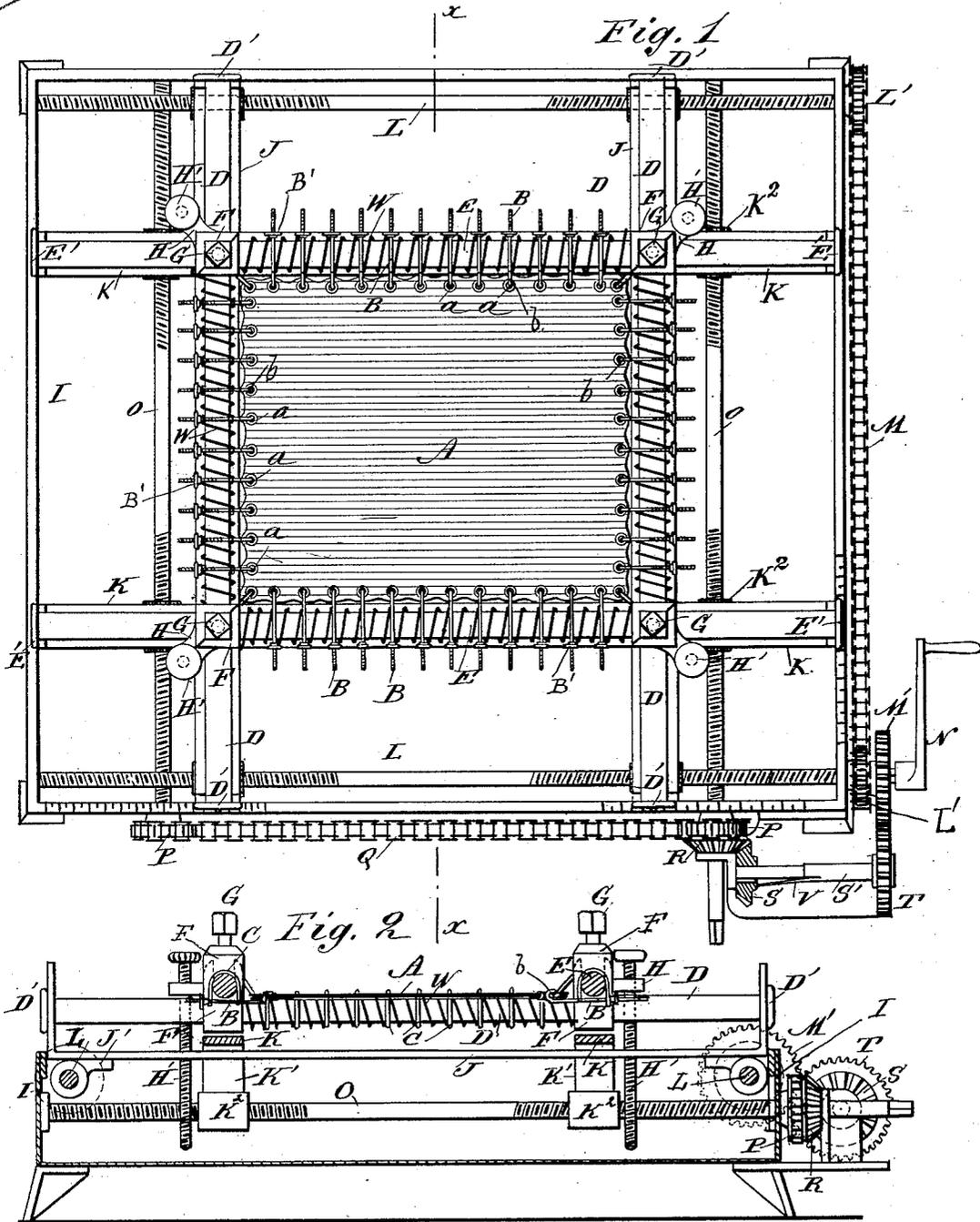


# A. FOUGEADOIRE.

## APPARATUS FOR ENLARGING AND REDUCING DRAWINGS.

No. 333,737.

Patented Jan. 5, 1886.



WITNESSES:

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FIG. 4.

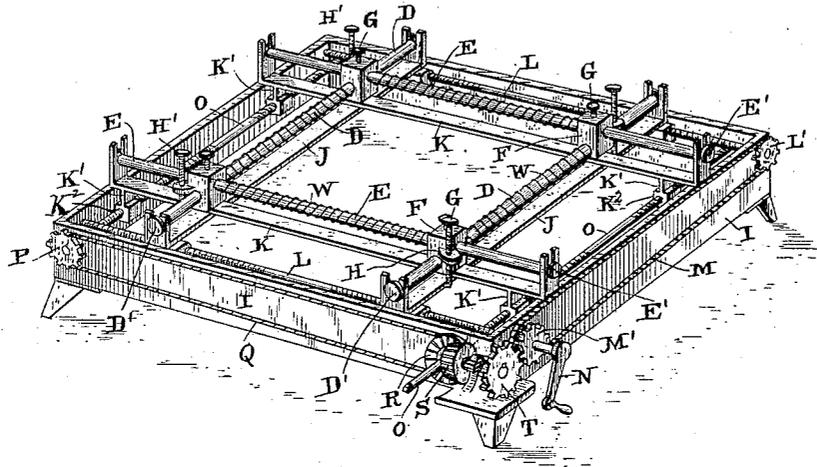
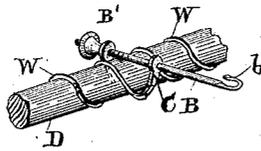


FIG. 5.



Attest:

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# UNITED STATES PATENT OFFICE.

AUGUSTE FOUGEADOIRE, OF PARIS, FRANCE.

## APPARATUS FOR ENLARGING AND REDUCING DRAWINGS.

SPECIFICATION forming part of Letters Patent No. 333,737, dated January 5, 1886.

Application filed December 4, 1883. Serial No. 113,506. (No model.) Patented in France April 3, 1877, No. 117,855, and in England November 29, 1878, No. 4,871.

*To all whom it may concern:*

Be it known that I, AUGUSTE FOUGEADOIRE, of Paris, France, have invented a new and Improved Apparatus for Enlarging and Reducing Drawings, &c., of which the following is a full, clear, and exact description.

The object of my invention is to provide a new and improved apparatus for enlarging and reducing drawings, designs, &c., of all kinds very accurately and in a very short time.

In my apparatus I employ a frame formed of two pairs of parallel rods, the rods of one pair crossing the rods of the other, which frame can be held in another frame also formed of two pairs of parallel rods, the latter frame being provided with screw-spindles for drawing the rods of the frame toward or from each other, whereby an expansible sheet held on the first-mentioned frame on which sheet the drawing is produced can be enlarged or decreased by turning the screw-spindles.

My invention consists in a special construction of adjustable frames and in special parts and details, and in combinations of the same, as will be fully described and set forth hereinafter.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of my improved apparatus for enlarging and reducing drawings, &c. Fig. 2 is a longitudinal sectional elevation of the same on the line *x x*, Fig. 1. Fig. 3 is a detail longitudinal elevation of the clamps for holding the rubber plate. Fig. 4 is a perspective view of my improved apparatus with the rubber sheet and clevises removed. Fig. 5 is a detail of one of the rods with the springs and clevises attached.

The drawing to be enlarged or reduced is printed on a rubber sheet, A, provided along its edges with a series of equidistant eyes or loops, *a*, the edges of which are protected by suitable rings, through which rings hooks *b* are passed, which are formed on the ends of rods B, having their outer ends screw-threaded, on which screw-threaded ends nuts B' are screwed. The hook-rods B are passed through the eyes on the ends of U-shaped

clevises C, surrounding the rods D and E. By turning the nut B' the hook end of the rod B will be drawn toward the rod D or E, and thereby the rubber sheet will be stretched. The U-shaped clamps or clevises C can be arranged to have their open ends at the top or bottom of the rods D, as may be desired. As shown, the clevises C on the rods D are bent or bowed downward, and those on the rods E are bent or bowed upward. The rods D E pass at their intersection through boxes F, the rods E being above the rods D, which boxes are provided with binding-screws G, by means of which the rods E can be clamped in position in the boxes, and the rods E can be pressed on the rods D to hold them in place. Each box F is provided with a wing, H, in which a vertical screw, H', is held.

The two bars D and the two bars E with the box F form a frame provided with adjustable legs consisting of the screws H'. A frame is formed of two bars, J, parallel to each other, and two bars, K, also parallel to each other and crossing the bars J at right angles, all of which bars have their ends turned upward and have notches formed in the ends, which notches are adapted to receive the ends of the rods D and E, the said rods D and E being provided at the ends with heads D' and E' to hold them in the notched ends of the said bars J K. On each end of each bar J a nut, J', is held on the under side, through which nut a screw-spindle, L, passes, which spindle has its ends threaded in opposite directions, both rods L being threaded in the same manner. On the corresponding ends of the spindles a toothed wheel or sprocket-wheel, L', is mounted, over which a driving-chain, M, passes. On the ends of one of the spindles L a cog-wheel, M', is mounted, and the said end of the said spindle is squared, as shown, to receive the key N. The ends of the spindles L O are journaled in a base-frame, I. The bars K are provided with downward projections K', provided at their lower ends with nuts K<sup>2</sup>, through which screw-spindles O pass, which have their opposite ends screw-threaded in opposite directions. On the corresponding ends of the spindles O sprocket-wheels P are mounted, over which a chain, Q, passes, one of the spindles O having mounted on its

end a beveled cog-wheel, R, made integral with the sprocket-wheel P, the said end of the spindle O being squared to receive the key N. With the beveled cog-wheel R a beveled cog-wheel, S, engages, which is mounted loosely on a spindle, S', on the opposite end of which is mounted a cog-wheel, T, engaging with the cog-wheel M'. On the spindle S' a spring, V, is formed, the free end of which is adapted to pass into an aperture in the rear surface of the beveled cog-wheel S, for the purpose of locking the said cog-wheel on the spindle. The said spring V can be folded into a longitudinal groove in the spindle S', to permit of pushing back the wheel S to disengage it from the wheel R. Spiral springs W are coiled on each rod D and E, and the clevises span both the rods and the springs, the latter serving to hold the clevises in place.

The operation is as follows: The drawing, design, &c., to be enlarged or reduced is printed on the rubber sheet A. The rubber sheet is then held to the rods D E by means of the hook-rods B, and is drawn taut by means of the nuts B', and then the frame formed of the rods D E is placed on the frame formed by the bars J K, the ends of the rods D E being passed into the notched ends of the upwardly-projecting parts of the bars J K. Then one of the spindles L is rotated by means of the key N, whereby the other spindle L will be rotated in a like manner by the chain M. By means of the cog-wheel T the beveled cog-wheels R and S and the chain Q the spindles O O are revolved, whereby the rods D D and the rods E E will be moved from each other, and the rubber sheet A will be stretched uniformly in all directions. The springs W expand as the rods are moved from each other, for if the rods are moved from each other the points of intersection of the rods D E will be brought farther from each other. The expanding springs W always hold the clevises or clamps C the same distances apart. After the rubber sheet has been stretched sufficiently, the rods D E are locked in position by means of the nuts G in the boxes F. Then the frame formed of the rods D E and the rubber sheet stretched in the said frame are lifted from the bars J K, are placed over a lithographic stone, and are raised or lowered by means of the screws H' until the rubber sheet rests on the stone, and the design, drawing, &c., produced on the rubber sheet can be printed on the stone. If the design is to be reduced instead of being enlarged, the spindles are turned in such a manner as to permit the rubber sheet A to contract. If the rubber sheet is to be expanded or contracted more in one direction than the other, the beveled cog-wheels R and S are disconnected and only the spindles L or the spindles O are revolved, as may be desired.

I prefer to make the frame formed of the rods D E removable from the frame formed of the bars J K; but, if desired, they can be connected, and I prefer to use the hook-rods

B and the clevises or clamps C for holding the rubber sheet; but any other suitable devices can be used for holding the rubber sheet to the rods D E.

Having thus fully described my invention, I claim as new, and desire to secure by Letters Patent—

1. In an apparatus for enlarging and reducing drawings, &c., the combination, with two pairs of parallel rods, one pair crossing the other at right angles, of spindles each having right and left hand screws and passing through nuts in the bars, which support said rods for the purpose of drawing the rods of each pair toward or from each other, substantially as herein shown and described.

2. In an apparatus for enlarging and reducing drawings, &c., the combination, with two pairs of parallel rods each extending across the machine, and the rods of one pair crossing those of the other pair, of screw-spindles for moving the rods of each pair toward or from each other, and of means for operating the spindles of both pairs together, substantially as herein shown and described.

3. In an apparatus for enlarging and reducing drawings, &c., the combination, with two pairs of parallel rods, the rods of one pair crossing the rods of the other, of screw-spindles for moving the rods of each pair toward or from each other and of the described means for clamping the crossing rods together at their intersections, substantially as herein shown and described.

4. In an apparatus for enlarging and reducing drawings, &c., the combination, with two pairs of parallel rods, the rods of one pair crossing the rods of the other, of hook-rods held on the said rods by suitable devices and provided with nuts and of means for moving the rods of each pair toward or from each other, substantially as herein shown and described.

5. In an apparatus for enlarging and reducing drawings, &c., the combination, with two pairs of parallel rods, the rods of one pair crossing the rods of the other, of means, substantially as described, for moving the rods of each pair toward or from each other, means, substantially as described, for locking the rods to each other at their intersections, and of screw-standards for supporting the frame formed of the said rods, substantially as herein shown and described.

6. In an apparatus for enlarging and reducing drawings, &c., the combination, with the two pairs of parallel rods D D and E E, of the clevises C on the said rods, the hook-rods B, passed through the clevises, and the nuts B' on the hook-rods B, substantially as herein shown and described.

7. In an apparatus for enlarging and reducing drawings, &c., the combination, with the two pairs of parallel rods D D and E E, of the clevises C on the said rods, the hook-rods B, passed through the clevises, the nuts B' on the hook-rods B, and of the spiral springs W,

surrounding the said rods D E, substantially as herein shown and described.

8. In an apparatus for enlarging and reducing drawings, &c., the combination, with the  
5 crossing bars J K, extending across the machine, of the screw-spindles L O, and the rods D E, substantially as herein shown and described.

9. In an apparatus for enlarging and reducing drawings, &c., the combination, with the  
10 crossing bars J K, extending across the machine, having their ends turned upward and recesses formed in the upturned ends, the screw-spindles L O, the rods D E, resting in  
15 the notches or recesses of the bars J K, and of means for holding a rubber sheet, A, to the rods D E, substantially as herein shown and described.

10. In an apparatus for enlarging and reduc-

ing drawings, &c., the combination, with the  
20 crossing bars J K, extending across the machine, of the rods D E, the screw-spindles L O, the sprocket-wheels L' and P, and the chains M Q, substantially as herein shown and described.

11. In an apparatus for enlarging and reducing drawings, &c., the combination, with the  
25 bars J K, of the rods D E, the screw-spindles L O, the sprocket-wheels L' and P, the chains M O, the cog-wheel M, the spindle S', the cog-wheel T, the beveled cog-wheels R S, and the  
30 spring V on the spindle S', substantially as herein shown and described.

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Witnesses:

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