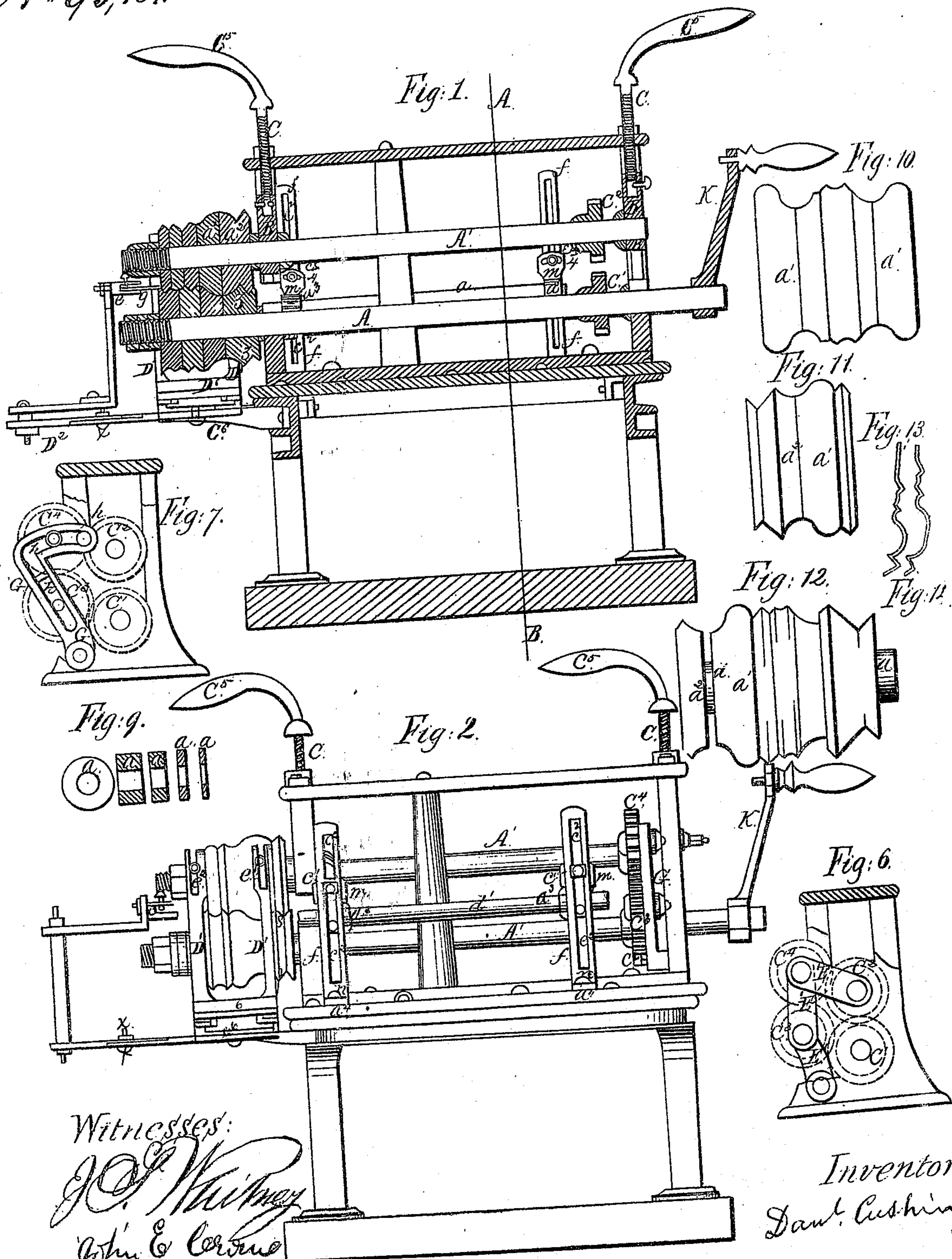


Sheet 1, 2 Sheets.

D. Cushing.
Sheet Metal Working.

Patented Aug. 3, 1869.

No 43,181.



Witnesses:

J. P. Whitney
John E. Corne

Inventor.

Danl. Cushing

D. Cushing.
Sheet Metal Working.

No 93, 181.

Patented Aug. 3, 1869.

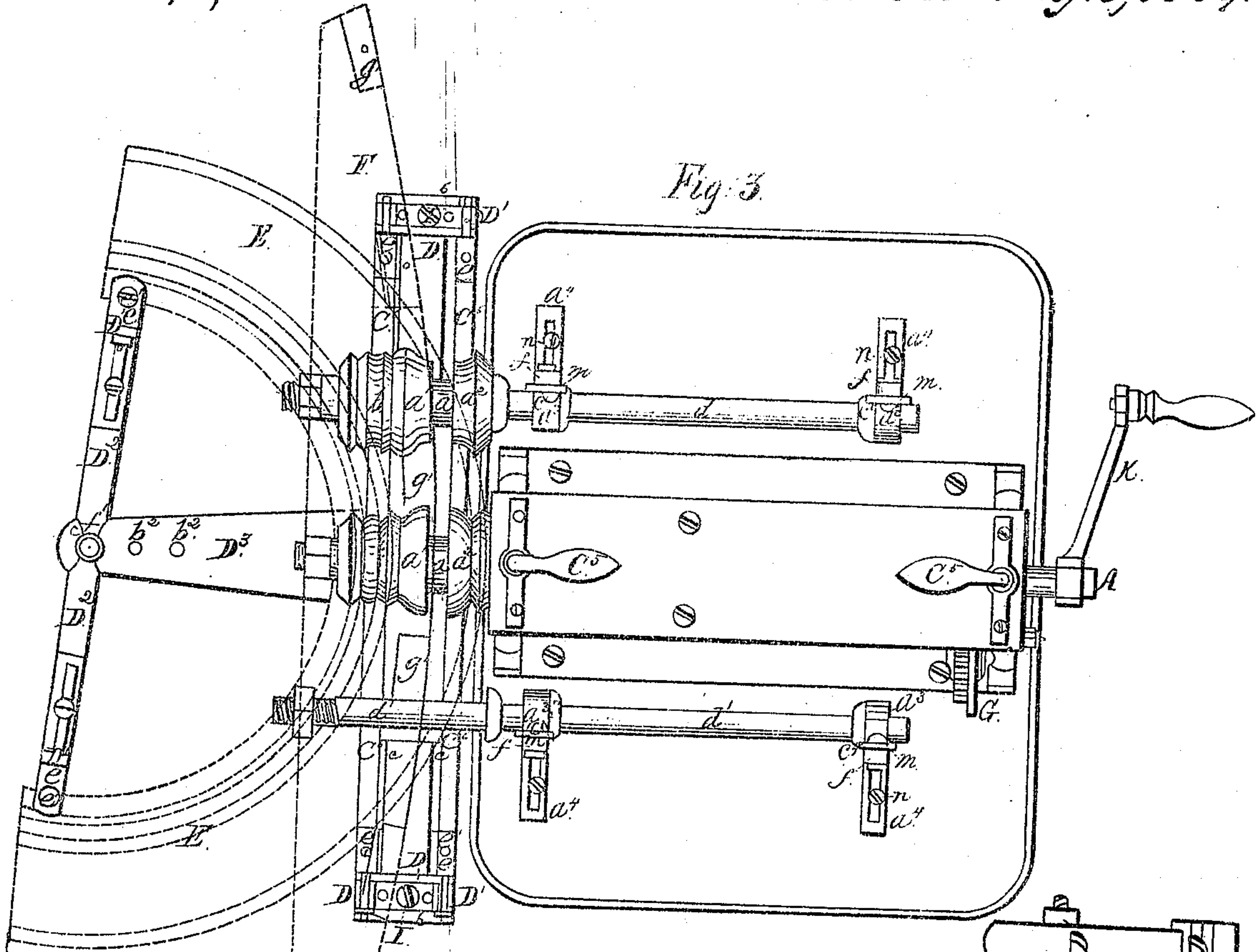


Fig. 3.

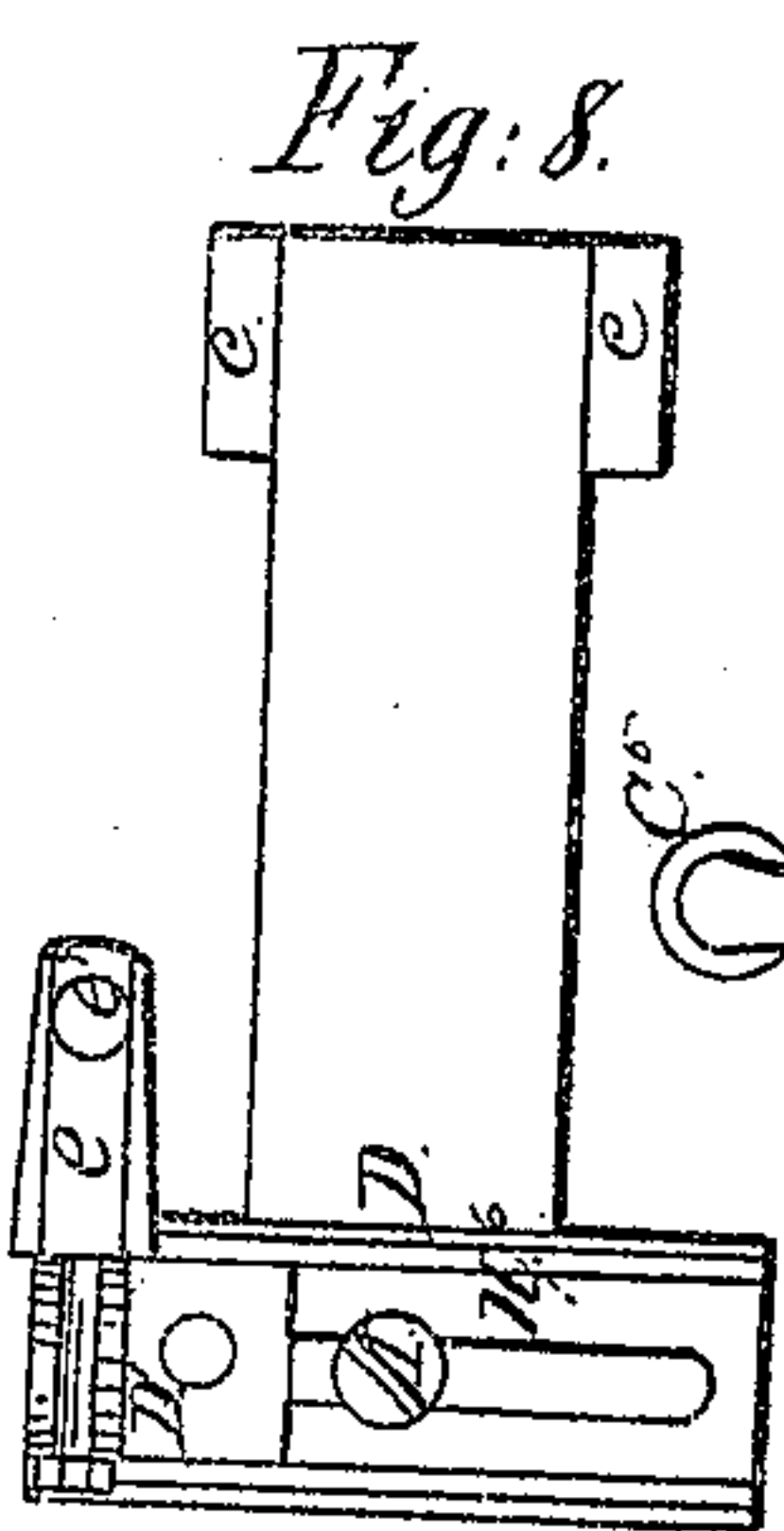


Fig. 8.

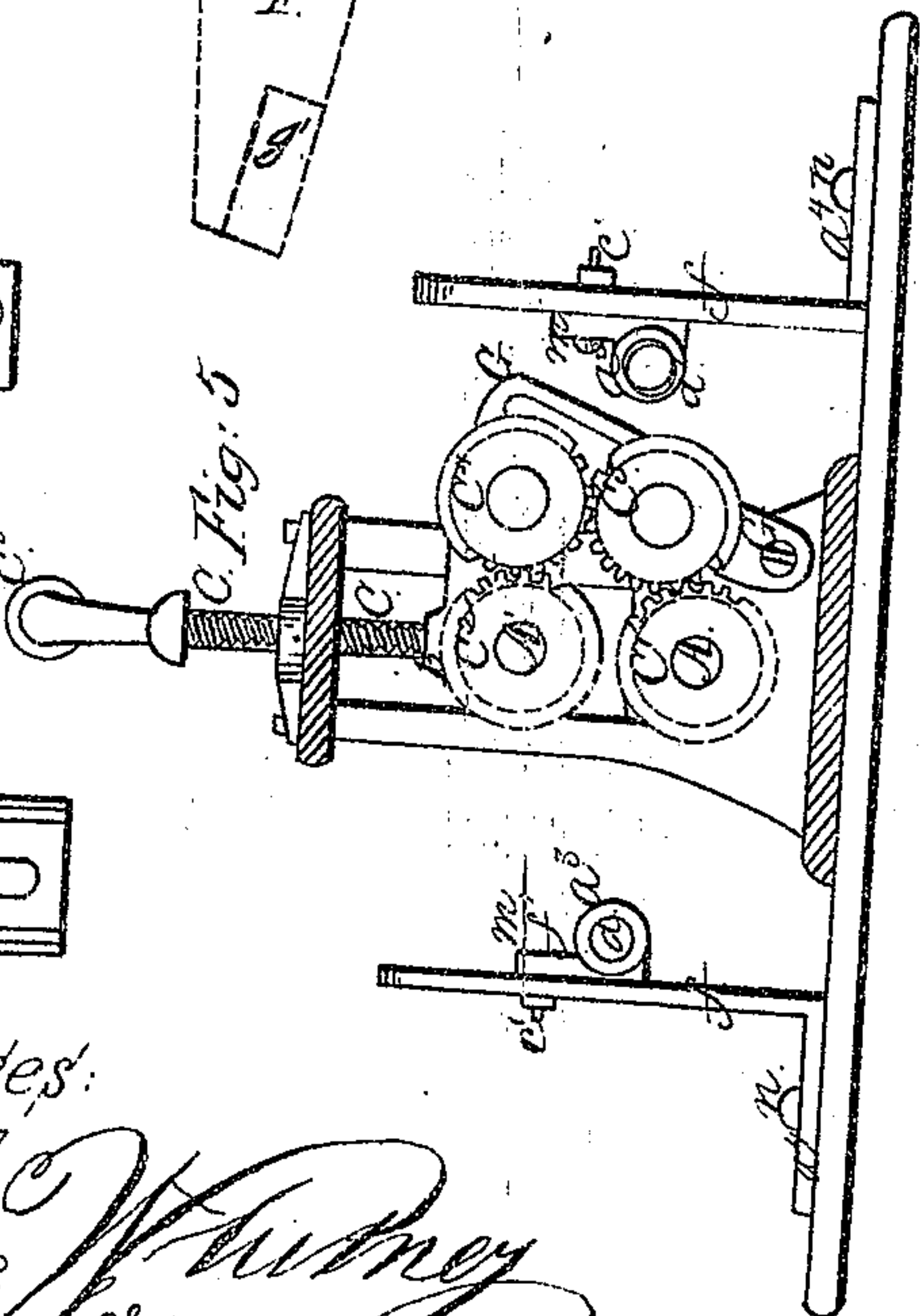


Fig. 5.

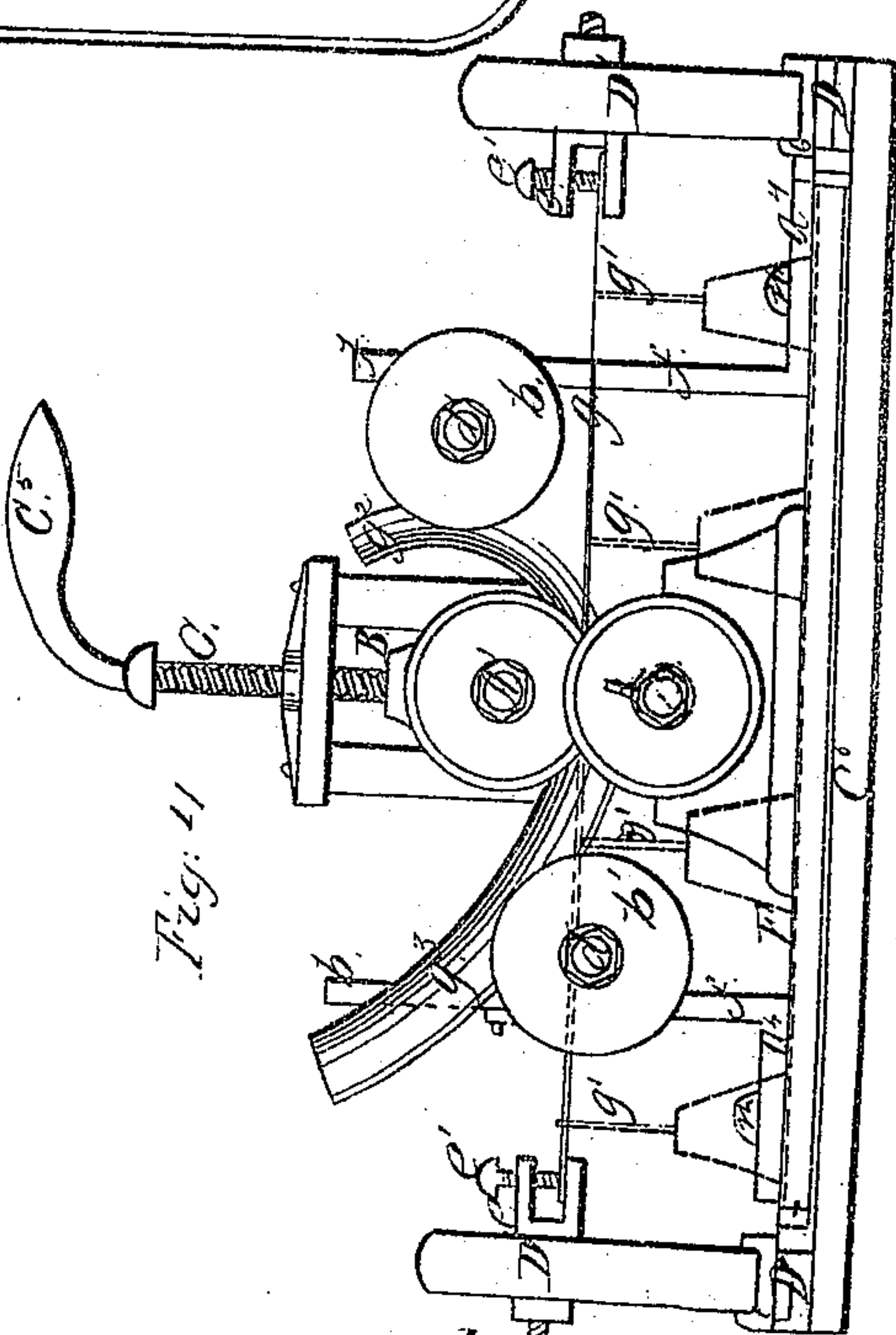


Fig. 11.

Witnesses:
J. S. Whitney
John E. Crane

Inventor:
D. Cushing

United States Patent Office.

DANIEL CUSHING, OF LOWELL, MASSACHUSETTS, ASSIGNOR TO HIMSELF, GEORGE W. SMITH, AND FRANKLIN SMITH.

Letters Patent No. 93,181, dated August 3, 1869.

IMPROVED MACHINE FOR CURVING AND SHAPING SHEET-METAL.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, DANIEL CUSHING, of Lowell, in the county of Middlesex, and State of Massachusetts, have invented certain new and useful Improvements in Machines for Forming Straight and Curved Sheet-Metal Mouldings, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 represents a central vertical longitudinal section;

Figure 2, a side elevation; and

Figure 3, a plan or top view.

Figure 4 represents a front-end view of that portion of my machine above the supporting-frame.

Figure 5, a transverse section of such upper portion on the line A B of fig. 1.

Figures 6 and 7 represent each a portion of the rear end of the head-stock, the operating-gears, and the means of connecting and adjusting them.

Figure 8 is a top view of one of the slides or carriages D, shown in figs. 1, 2, 3, and 4, with one of the stands D¹ detached, showing the adjusting-slot H.

Figure 9 shows a plan and several sections of rings, or washers, which are used between the sections or parts of the forming-rolls, to change or alter the shape, or so as to produce mouldings of different form with the same rolls.

Figures 10, 11, and 12, represent sectional rolls of different form, but made up of the same, or some of the same parts or sections, showing in what manner the different sections or parts of such rolls can be adapted for forming mouldings in extensive variety.

Figures 13 and 14 represent end elevations of two different mouldings formed with the same rolls.

My invention and improvements in machines for forming straight or curved sheet-metal mouldings consist, in connection with changeable sectional rolls, of rings or washers, *a*, for setting and holding the different sections apart, thereby extending and changing the form of the roll or rolls, and consequently the form or shape and the width of the moulding.

My invention also consists in a combination with forming-rolls of elongated slides, guides, or ways C⁶, arranged and supported on the front end of the machine directly under the forming-rolls, said ways being provided with grooves or guide-ways, or carriages D, which have removable stands, D¹, and removable and adjustable clamps or dogs *e*, arranged in the slotted upper ends of the stands, each clamp *e* being provided with a set-screw, *e*¹, to retain the sheet-metal *g*, (see fig. 4,) which is held up and guided to and from the rotating forming-rolls by the clamps, stands, and slides, or carriages, which are moved longitudinally with and in or upon the slides, guides, or ways.

These last-named devices are used when forming

straight mouldings, and these, like the curved mouldings, are formed by first raising the upper shaft A' and the forming-roll thereon considerably above the lower roll, placing the sheet-metal between the two rolls, securing the ends of the sheet-metal with the clamps *e*, alternately screwing the upper roll down into the metal, and rotating both rolls, and passing the metal between them, passing the sheet-metal between the rolls in one direction, then screwing down the upper roll, then passing the sheet-metal between the rolls in the opposite direction, and again screwing down the upper roll, and so on, until, by the action of the rolls, the moulding is formed.

In forming one kind of a curved moulding, and of medium or small dimensions, a segment or semicircular piece, E, as shown in red lines in fig. 3, is cut from a sheet of thin metal.

Two of the clamps are removed from stands D¹, or the clamps and stands together are removed from a slide, D, and attached to arms D², which are pivoted to the outer end of a beam, D³, projecting from the ways or table C⁶, where it is securely fastened.

The pivot *f*' of the arms D² represents the centre or radius of the segmentary plate, and this centre may be changed by changing the pivot *f*' into another hole, *b*², in the beam, or by moving the stands in slots *c*², made in the opposite ends of the arms D².

The segmentary plate E is placed between the lower and the upper raised roll, and the clamps set and adjusted on the edge of the plate, the rolls rotated, and the top one screwed down, and the plate swung round between them, first in one direction, then in the opposite direction, each time screwing down the upper shaft and roll, until, by the action of the rolls, the curved moulding is finished.

A semicircular moulding thus formed, and of suitable dimensions, is used for a window-head, or for the face of an archway, or for any other purpose, and the straight mouldings formed by the same rolls will match the curved moulding and form the sides of the window or archway.

A straight moulding, like that shown in fig. 13, is formed by the rolls when the sections are put together, as shown in figs. 1 and 2, and by placing a ring, *a*, between the parts or members *a*¹ and *a*², as shown in fig. 3, a wider moulding, like that shown in fig. 14, will be formed by the rolls.

In this way the horizontal cornice and the rake or raking cornice used for ornamental finish on buildings, are both formed with the same rolls and with the same parts or sections, simply by placing rings of suitable thickness between the different parts or members of the sectional rolls.

In forming deep mouldings, it is very important and sometimes necessary to set the most prominent members of the rolls apart until the more prominent mem-

bers of the moulding are partially formed. The rings or washers are then removed and sometimes thinner ones substituted and the partly-formed moulding again rolled a few times, and then the thinner washers removed, the sections of each roll brought together, and the moulding finished.

This process of gradually drawing the metal into form and then bringing the parts of the rolls together, relieves and prevents undue strain upon the metal and any abrasion or other injury thereto, besides relieving the rolls and all the operating-parts of the machine, and allowing the whole operation to be performed with much less power, wear, and friction.

In forming curved mouldings, as before described, but on large or very large circles, which would carry the pivoting of the arms D^2 so far from the rolls as to make the process and operation impracticable, I employ a bed, F , with guide-rods g^1 rising from its upper side, as shown in figs. 3 and 4. The sheet-metal of which the moulding is to be formed, or the outer edge thereof, is cut on the same circle or curve of the curved row of pins.

This bed F is secured to the top of the ways C^6 , first removing or raising the supplementary rolls and shafts, and the previously-prepared sheet-metal passed between the rolls, with its outer edge against the pins, which guide the curved sheet of metal in its passage between the rolls.

If a deep moulding is to be formed, the same rule should be observed as in the smaller curve, or the straight mouldings, viz, to put in the ring or rings while partially forming the prominent members of the moulding.

In forming curved mouldings, as last above described, and with the pins g^1 for guides, after the outer edge of the curved metal plate has been turned downward as over the section 3 of the roll, (see figs. 1 and 2,) the groove or curved indentation thus formed may be placed on the tops of the pins, and thus the metal guided between the rolls.

In forming curved mouldings for the interior or exterior of rounded corners, or for tubular or semi-tubular mouldings, or for any portion or segment thereof, a straight piece of sheet-metal is provided like that for the straight mouldings. In this case, the supplementary rolls b and b^1 are brought into action, each or either of such rolls, and its shaft being raised and secured in position, as clearly shown in figs. 3 and 4, and one roll higher than the other, or both on the same level, or according to the curve to be formed.

The supplementary rolls should be raised gradually a little at each time the metal passes between the forming-rolls, so as to form the curve while forming the moulding, and this whether the moulding is formed on a sharp curve, g^2 , or on a flatter curve, g^3 , seen in fig. 4, and this will be clearly understood by those skilled in the art to or for which my improvements pertain.

By the arrangement of the shaft A and A' , and by the suspending and adjusting-screws O , and the sliding boxes B , and the gears C^1 and C^2 , and the intermediate gears C^3 and C^4 , the latter being adjustable with and to the former, as before described, I am enabled to use forming-rolls of large or small diameters, which are necessary or quite important in forming mouldings on quick, or sharp, or on flat curves, and in fact, mouldings in extensive variety. The smaller the diameters of the forming-rolls, the sharper may be the curve of the moulding.

Forming-rolls may be used which are so small in diameter, as to bring the gears C^1 and C^2 into contact, as shown in fig. 6, or larger rolls, which necessitate the rising of the upper shaft A and roll, so as to carry the upper gear away from the lower one, as shown in figs. 1, 5, and 7. This brings the intermediate gears into action, and these are adjusted to the gears on the

forming-roll shafts, by being movable on a stand, G , or in the curved slot h thereof, or by means, and in a manner equivalent thereto, and shown in fig. 6, which consists of links E^1 , which allow of any reasonable adjustment of the upper shaft A , and by which means the latter and the intermediate gears may be connected, and these caused to follow the upper shaft-gear in all the adjustments thereof.

The stands f , which support the shafts of the supplementary rolls, have boxes a^3 , in which the shafts rotate.

These boxes, or bearings are adjustable vertically, to raise and lower the shafts and their rolls, by means of bolts c^1 passing through the slot c^2 of each stand, and through the upper curved slot 4 in the plate m .

This curved slot allows the box or bearing to swing, and thus provide for raising or lowering one end of either shaft d , without disturbing the opposite end, which is convenient when forming curved mouldings in the manner shown in fig. 4, and this is of considerable importance in giving some member of the supplementary roll a better bearing against the surface of the partially-formed moulding, during the rolling or forming-process.

The stands f are also adjustable laterally by screws n passing through the slotted feet a^4 . Either of these stands may be moved without moving the other, (except to swing it slightly,) or both stands may be moved at the same time, and thus either supplementary roll and shaft be carried nearer to or further from the forming-rolls, as well as higher, or on a level with or below said rolls, so as to aid in forming curved mouldings, as shown in fig. 4, or so as to allow the metal plate to pass beneath or above either of the supplementary rolls, as at g , in fig. 4, below the roll b .

In figs. 10, 11, and 12, I have shown in each a roll of different form, but made up of the same or some of the same parts or sections, placed in different relative positions.

Each of such rolls must have a partner-roll to match it, the parts, sections, or members of which would be the reverse of each roll shown in these figures, and each of such pair of rolls would form a different-shaped moulding.

These sectional rolls are capable of numerous like changes, thereby producing straight or curved mouldings, as described, in extensive variety of form and with the same parts or sections. This obviates the necessity, and, consequently, the expense of a pair of forming-rolls, and the corresponding supplementary rolls for each particular form of moulding, and makes a great saving in the cost of the machine.

The supplementary rolls not only aid in forming curved mouldings, and curve the plate previous to forming the moulding, as shown in fig. 4, but they support the plate or the partially-formed straight moulding, while in the rolling or forming-process, as it is carried or drawn between the forming-rolls by their rolling action, or by the movement of the slides or carriages, and the stands and clamps therewith connected.

Instead of changing the pivot f' of the arms D^2 , the beam D^3 may be made adjustable by lapping one part into the other, and by a bolt, x , as clearly shown in figs. 1 and 2.

The stands D^1 , which carry the clamps e , are movable and adjustable by a screw, I , passing through a slot, H , in the ground-plate G , resting on the top of each slide or carriage, and this adjustment is at times important to bring the clamps into the right position, to secure and retain the end of the plate or the partially-formed moulding, each clamp being so arranged in the slotted top of the stand as to be turned to any angle, thereby rendering such clamps capable of holding contact with any part of the end-portion of the plate or of the partially or fully-formed moulding.

Power is applied to operate the forming-rolls in either direction, by a crank, *k*, on the end of the lower roll-shaft A, or a clutch, pulley, or gears of common construction may be applied in the place of the crank, and the machine driven or operated by steam or other power.

I am aware that a pair of whole or solid rolls has been used for beading sheet-metal cylinders, such as stove-cylinders and pipe.

I am also aware that a patent was issued to W. H. Peckham, April 28, 1868, for a machine for forming rings, watch-case centres, &c., and where solid forming-rolls were used, but not rolls made in sections and capable of numerous changes, so as to form a variety of mouldings, or mouldings of various forms, with the same rolls or sections, parts or members of such sectional rolls as shown and described in my case, and which is one of the principal novelties in my invention. I disclaim the whole or solid rolls.

I claim as my invention, and desire to secure by Letters Patent—

1. The combination of rings or washers *a* with the sectional dies of forming-rolls, constructed and operating together, substantially as and for the purpose specified,

2. The combination of the forming-rolls, constructed and operating as herein described, with the supplementary rolls, all adjusted, arranged, and operated substantially in the manner described.

3. The combination of elongated ways *C*⁶, slides *D*, stands *D*¹, clamps *e*, bed *F*, and rods *g*¹, or their equivalents, with the forming-rolls, all constructed and operating as shown and set forth.

4. The combination of the slotted arms *D*², swivelled on beam *D*³, and clamping-device, with the forming-rolls, all arranged and operating together as described.

DANL. CUSHING.

Witnesses:

J. S. WHITNEY,
JOHN E. CRANE.