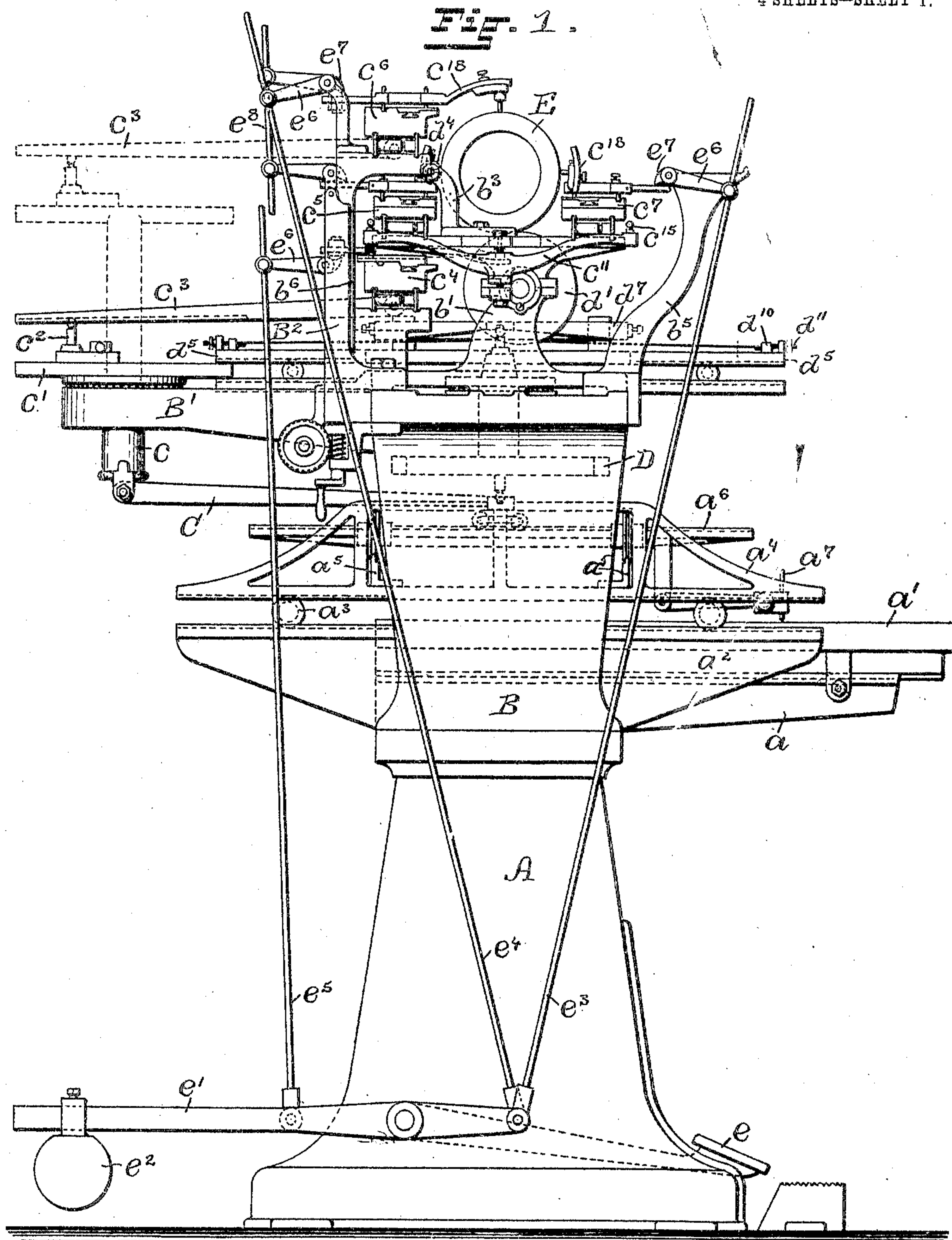


No. 789,495.

PATENTED MAY 9, 1905.

J. HOPE & J. HOPE, JR.
PANTOGRAPH ENGRAVING MACHINE.
APPLICATION FILED JUNE 3, 1898.

4 SHEETS—SHEET 1.



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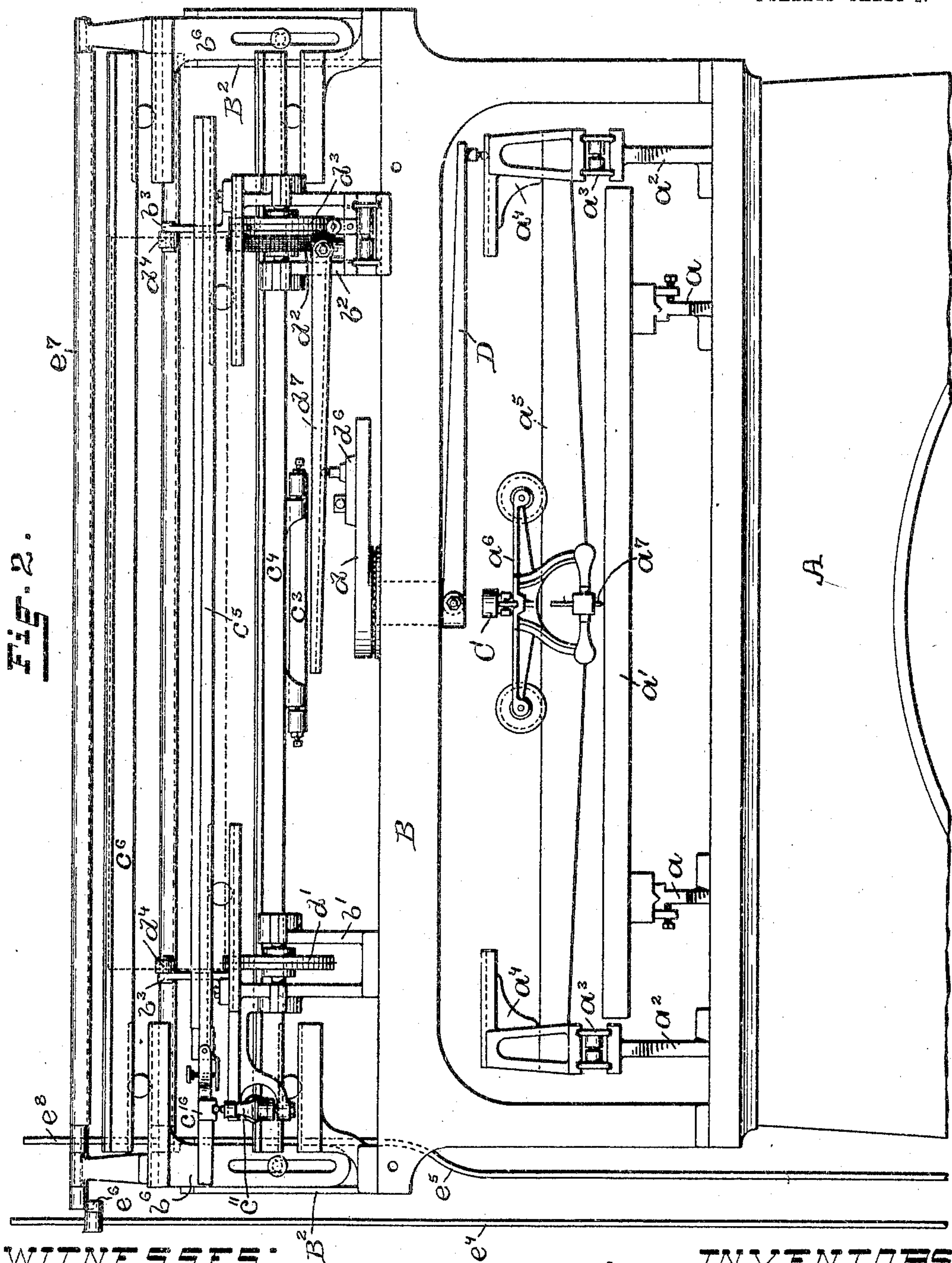
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 3.

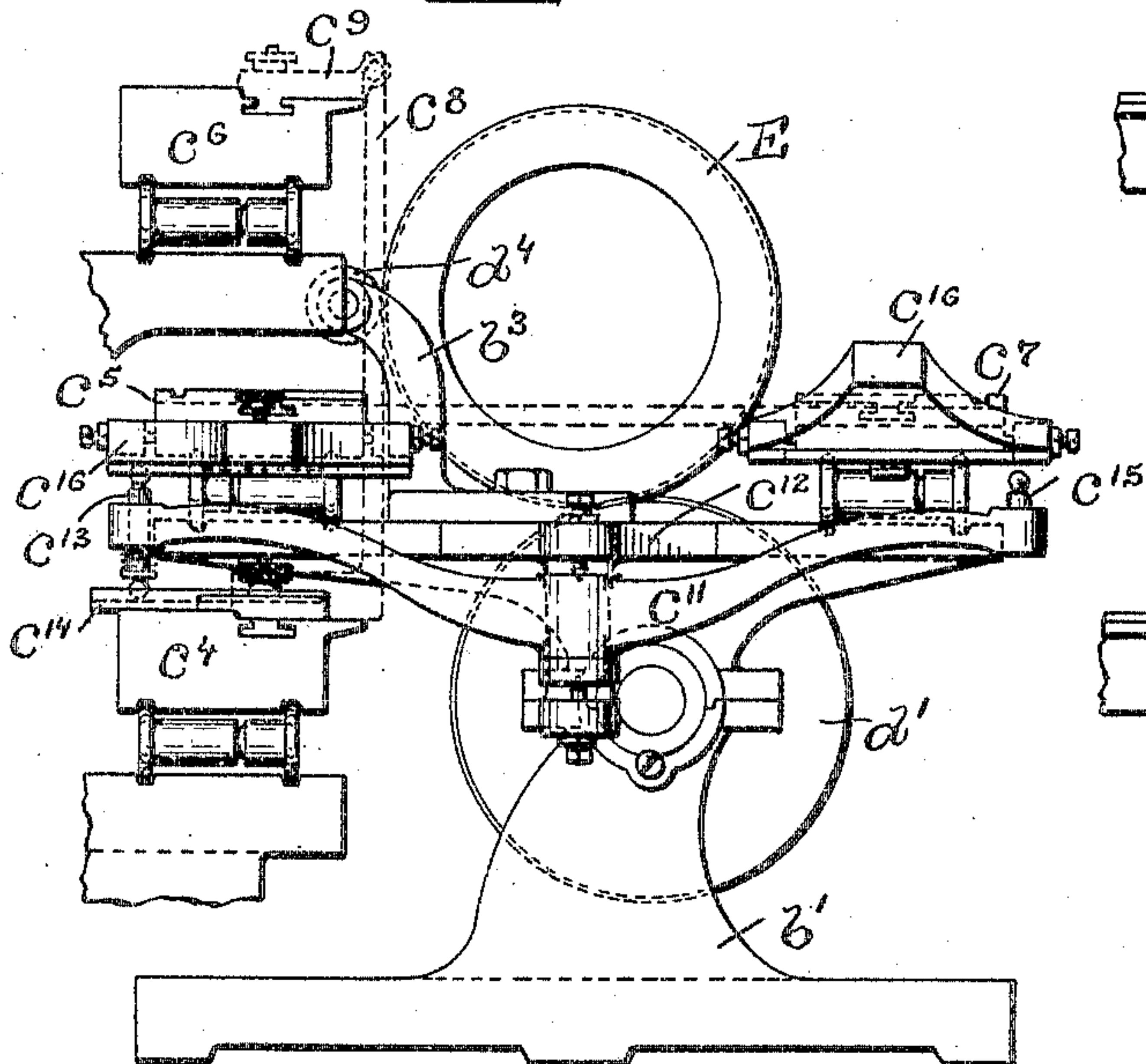


Fig. 6.

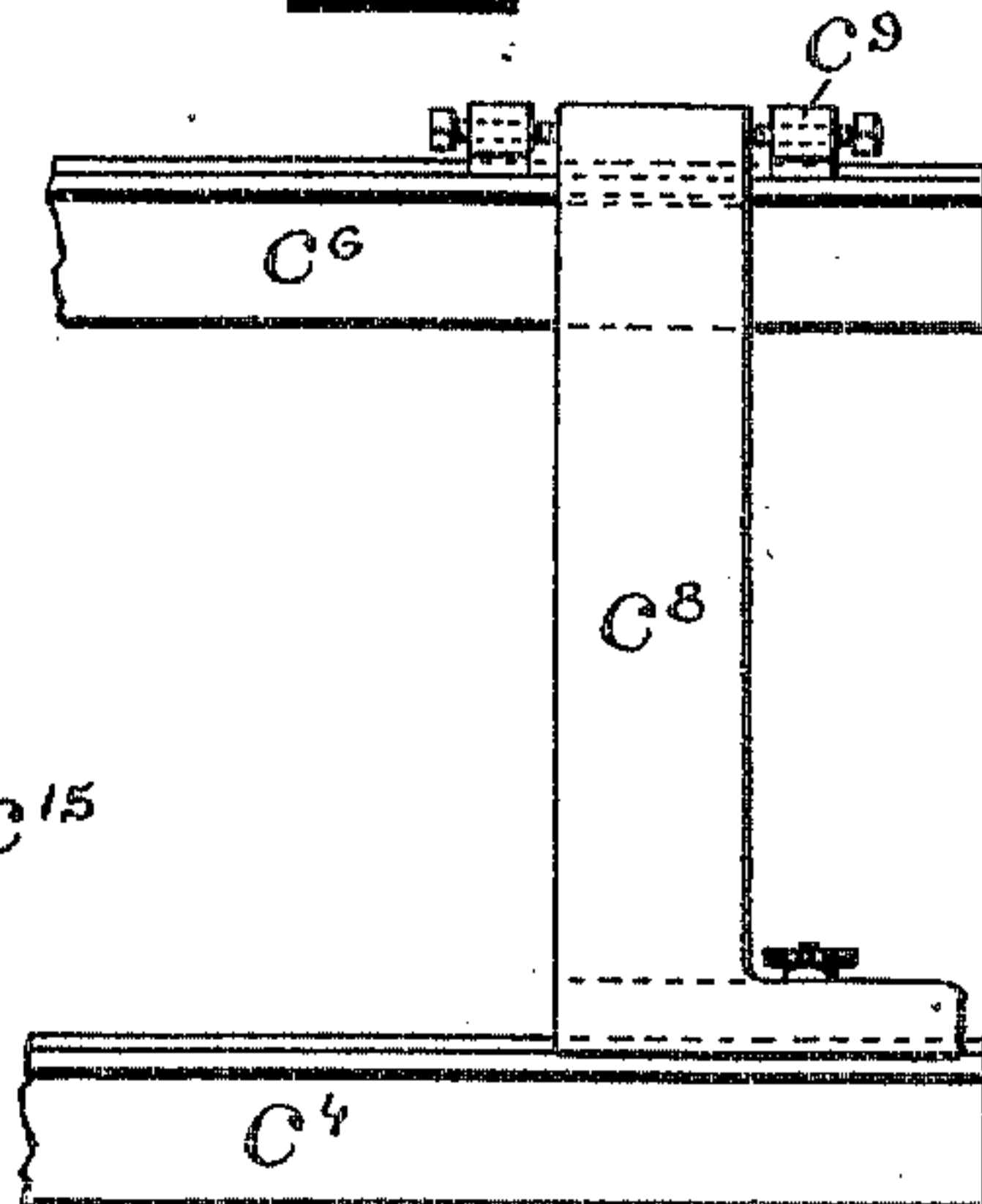


Fig. 5.

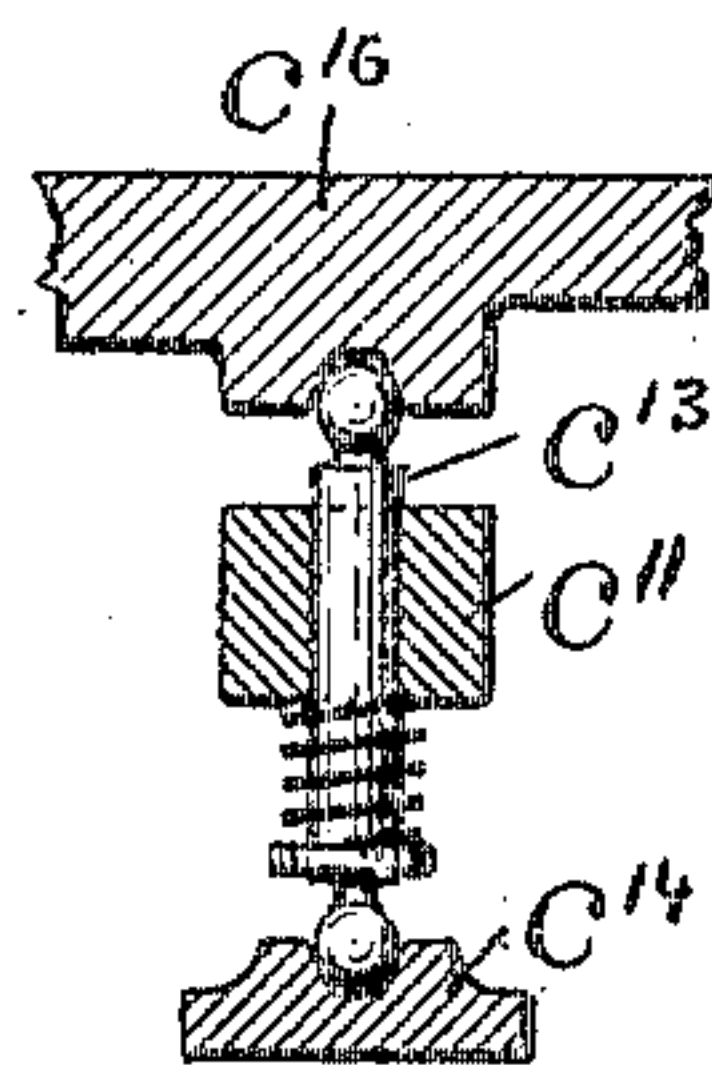
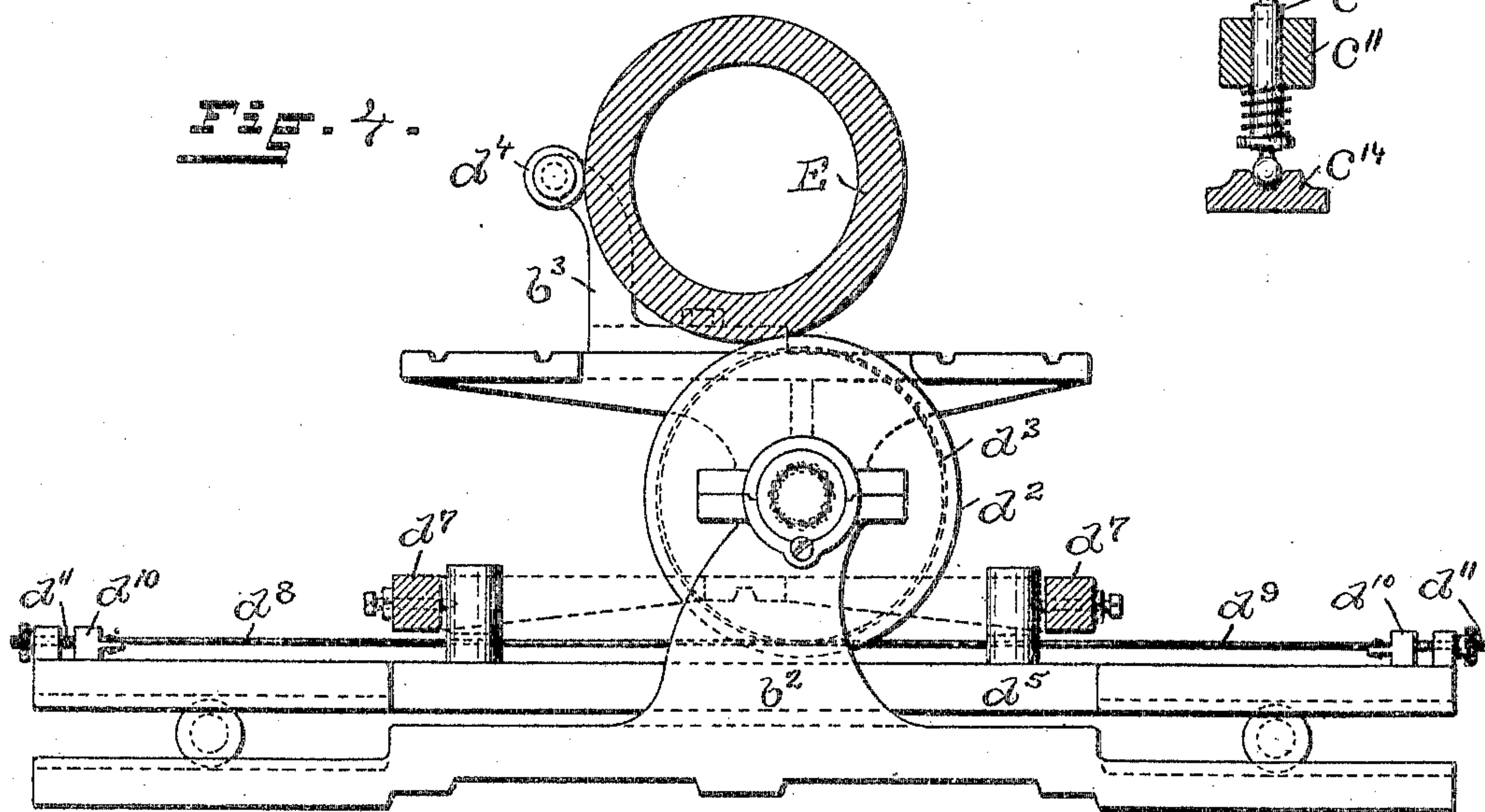


Fig. 4.



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4 SHEETS—SHEET 4.

Fig. 7.

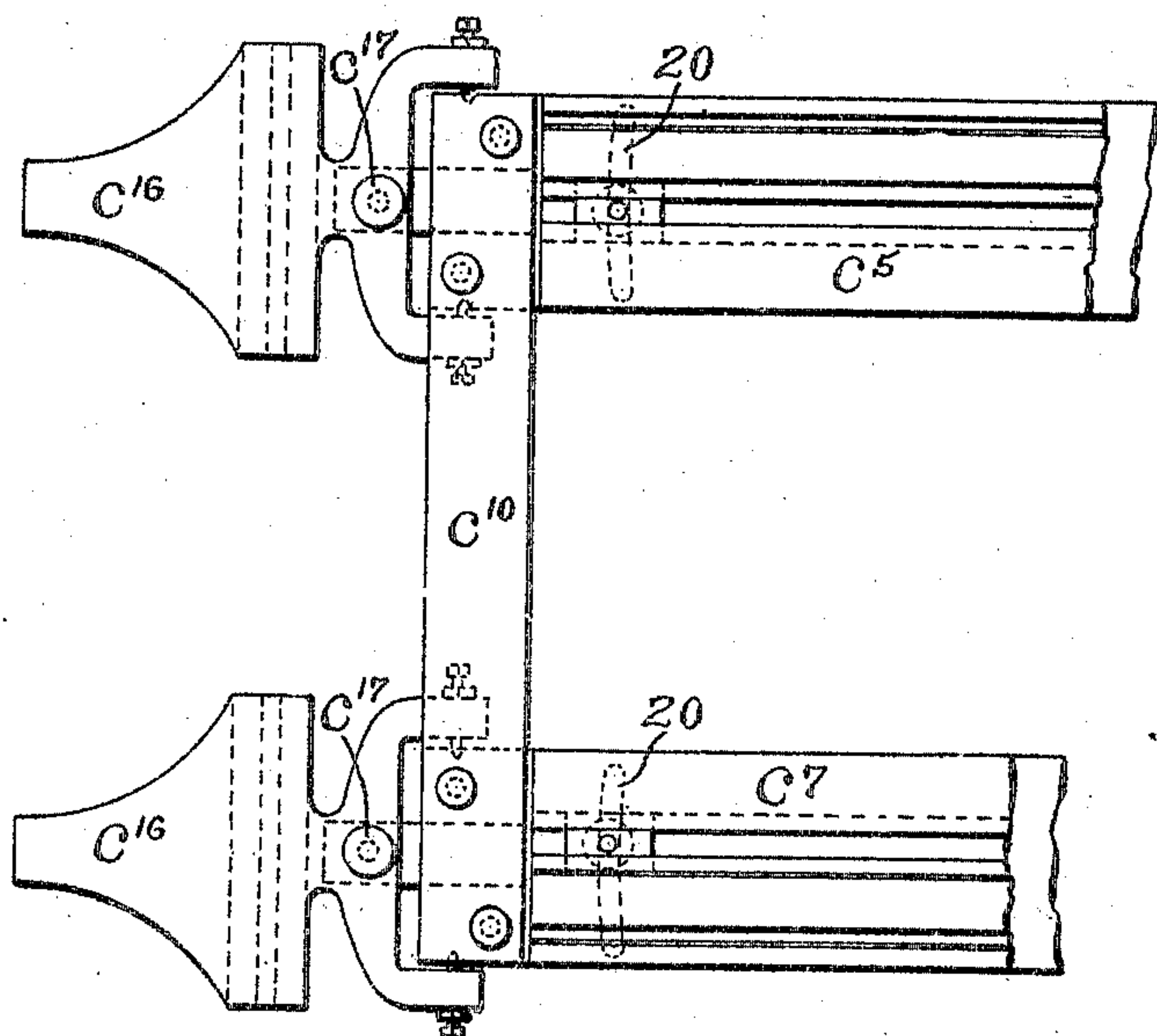


Fig. 8.

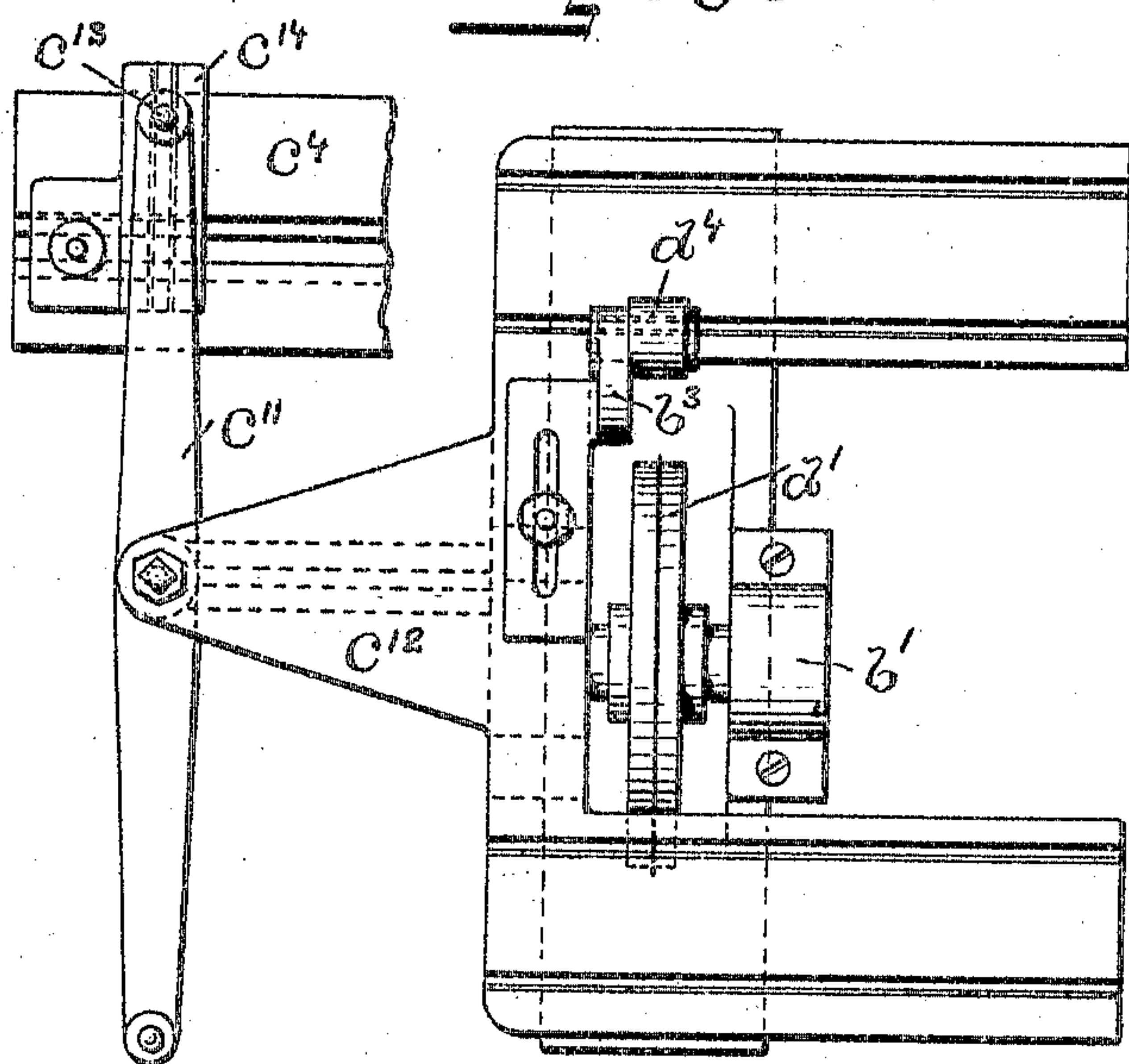
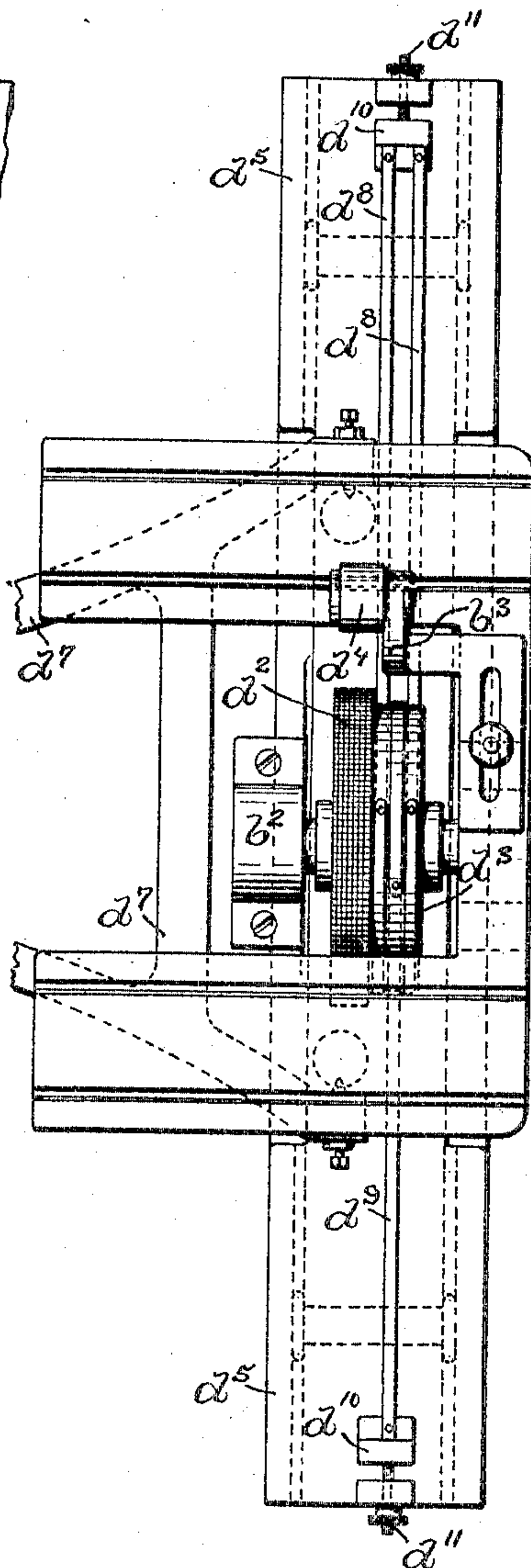


Fig. 9.



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UNITED STATES PATENT OFFICE.

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PANTOGRAPH ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 789,495, dated May 9, 1905.

Application filed June 3, 1898. Serial No. 682,428.

To all whom it may concern:

Be it known that we, JOHN HOPE and JOHN HOPE, JR., of Providence, in the county of Providence and State of Rhode Island, have
5 invented a new and useful Improvement in Pantograph Engraving-Machines; and we hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to improvements in the class of pantograph engraving-machines used for engraving cylinders by tracing with a stylus an enlarged pattern and
15 reproducing one or more reduced patterns on the roll or cylinder. In this class of engraving-machines a partial rotary motion is imparted to the cylinder and a longitudinal motion to the graters by the movement of the stylus as it is moved over the enlarged pattern. The cylinders in these machines as
20 heretofore constructed were supported at each end on a pair of disks having milled peripheries, and the graters were supported on carriages moving on fixed ways. One of each of the two pairs of supporting-disks was connected with a carriage moving transversely to the cylinder and controlled by the stylus. In these prior machines the cylinder to be
30 engraved, being supported at each end on two disks, had four points of contact on the two pairs of disks and two straps for rotating the cylinder, which straps with the most careful adjustment were liable to draw unevenly on the milled disks and produce defects in the engraving by an apparently slight backlash in the carriage or the straps. A type of the most improved pantograph engraving-machines of this old construction is shown in the
40 United States Patent No. 462,874, granted to John Hope November 10, 1891, for improvements in pantograph engraving-machines. Another defect in these machines is that the bars and carriages supporting graters were,
45 owing to the space taken up by the supporting-disks, at such a distance from the cylinder to be engraved that the diamond or graver holders were required to be long, some of

them of complicated construction and liable to spring, thereby producing defective de- 50 signs on the cylinder.

One object of the invention is to simplify the construction of the machine.

Another object of the invention is to support the graters closer to the work. 55

The invention consists in the peculiar and novel construction and the combination of the parts, as will be more fully set forth hereinafter.

Figure 1 is an end view of our improved 60 pantograph engraving-machine. Fig. 2 is a front view of the same. Fig. 3 is an enlarged end view of the cylinder to be engraved supported at one end on the disk, the longitudinally-reciprocating carriages and the swing- 65 ing arm operating the same. Fig. 4 is a transverse sectional view of the cylinder, showing the supporting-disk connected with the transversely-moving frame by which the cylinder is rotated. Fig. 5 is a view, partly 70 in section, showing the bar connecting two adjacent carriages with the swinging arm. Fig. 6 is a side view of a detail, showing the arm by which two carriages are connected to reciprocate together. Fig. 7 is a top view 75 showing the ends of one of the rear carriages connected with the front carriage and the end ways pivotally secured to the carriages, whereby either or both may be connected with the swinging arm. Fig. 8 is a top view 80 showing the support for one end of the cylinder and the swinging arm connected with one of the rear carriages. Fig. 9 is a top view showing the milled disk supporting the opposite end of the cylinder and the connection 85 with the frame by which it is operated.

Similar marks of reference indicate corresponding parts in all the figures.

In the drawings, A indicates the standard forming the support for the machine; *a*, ways 90 secured to the top of the standard A and forming the support of the table *a'*, on which the enlarged pattern is secured; *a''*, transverse ways secured to the standard A, supporting the rollers *a''' a'''*, on which rest the end frames 95 *a⁴ a⁴*, connected by the rails *a⁵ a⁵*, on which

the stylus-carriage is supported. The stylus a^7 is secured in a bracket hinged on the stylus-carriage a^6 and provided with handles. The operator, usually a woman having good eyesight and steady hands, moves the stylus along the lines of the enlarged pattern and in doing so moves the stylus-carriage a^6 on the rails $a^5 a^5$ and through the end frames $a^4 a^4$ on the ways a^2 , thereby producing in tracing any oblique or curved line. For the purpose of simplifying the specification the parts indicated by the letter a , so far described, will be referred to hereinafter as the "stylus-frame." The longitudinal movement of the stylus is transmitted from the stylus-carriage by the arm C, the free end of which is connected by a pin to the stylus-carriage and the transverse motion by the arm D, the free end of which is connected with the end frame a^4 by means of a post projecting from the arm and having a ball-shaped end sliding in a groove extending in a longitudinal direction, as shown in Fig. 2. Every movement of the stylus-frame in tracing the enlarged pattern is transmitted by the arm C to the carriages and the gravers carried longitudinally by the same and by the arm D to the milled disk supporting and operating the cylinder to be engraved, so as to partially rotate the same.

The arched frame or standard B is secured at the opposite ends to the standard A. It extends upward and over the stylus-frame and is provided with the rearwardly-extending bracket B'. The standard B is of a substantial and rigid construction and forms the support of the cylinder to be engraved and for the operative parts by which the engraving of the cylinder is affected.

The arm C is pivotally connected with the vertical shaft c , secured to the plate c' . This plate c' is provided with a way, usually a groove of dovetail section, extending across the axial center of the vertical shaft c . The post c^2 extends upward from a carriage which slides in the way of the plate c' and may be secured at any desired distance from the axial center of the vertical shaft c either outwardly or inwardly from this center. The relative distance of the post c^2 from the center of the vertical shaft c to the point of the arm C in contact with the pin on the stylus-carriage determines the proportion the engraved pattern on the cylinder bears to the engraved pattern traced by the stylus in one direction. The vertical shaft c and the plate c' are preferably supported on ball-bearings, as is indicated in Fig. 1. The post c^2 enters a groove in the arm c^3 . This arm is bifurcated at the end where it is pivotally connected with the carriage c^4 , as is shown in Fig. 2, at a considerable distance apart to secure rigidity, for by means of the arm c^3 reciprocating motion is imparted to all the carriages by which the gravers are supported and operated. The carriages c^4 , c^5 , and c^6 are supported on rollers

running in the grooves of ways, adjustably secured at their opposite ends to the end frames B² B² at the rear of the cylinder E to be engraved, and the carriage c^7 is similarly supported in front of the cylinder E. The carriages c^4 and c^6 are connected by means of the brackets c^8 , as shown in Fig. 6 and indicated in broken lines in Fig. 3. The lower ends of these brackets c^8 are adjustably secured by a T-bolt sliding in a longitudinal way of the carriage, and the upper end is held between two adjusting-screws in the clamp c^9 , also secured by a T-bolt to the upper carriage, as is indicated in Fig. 3. The carriage c^7 may be connected with the carriage c^5 near the opposite ends by means of the connecting-bar c^{10} , as is shown in Fig. 7, so that all the carriages move together and are operated simultaneously by the arm c^3 .

It is at times desirable to move one or all the carriages c^4 , c^5 , and c^6 in one direction and move the carriage c^7 on the opposite side of the cylinder E in the opposite direction. To this end the bar c^{10} is removed and the swinging arm c^{11} is pivotally supported at its center on the bracket c^{12} , as shown in Figs. 1, 3, and 8. On one end of the swinging arm c^{11} the post c^{13} , having globular ends, is held by a spiral spring in contact with a groove in the bracket c^{14} , secured to the carriage c^4 , and a rigid post c^{15} , having a globular upper end, is secured at the opposite end of the swinging arm c^{11} , so that the posts c^{13} and c^{15} will move through exactly the same distance, but in opposite directions. The carriages c^5 and c^7 are provided at one end of each with the plates c^{16} , having on their under side grooves extending transversely to the ends of the carriages, as is indicated in broken lines in Fig. 7. The plates c^{16} are each provided with a set-screw c^{17} , having a milled head. The ends of these screws bear on the carriages or a projecting part of the same and sustain the plates c^{16} in the raised position when disconnected. By turning these screws c^{17} the plates may be connected with the posts c^{13} and c^{15} on the swinging arm c^{11} , and when so connected the carriages c^4 and c^5 will move together in the same direction, and the carriage c^7 will move with them, but in the opposite direction.

The gravers are secured to the arms c^{18} , which are supported on and move with the carriages. The arms c^{18} are provided with tailpieces acted on by mechanism, more fully described hereinafter, to control the gravers.

The cylinder E is supported at one end on the disk d' , journaled in suitable bearings in the frame b' , secured to the top of the arched standard B, and at the other end on the milled disk d^2 , journaled, with the adjacent disk d^3 of somewhat smaller diameter, in bearings formed in the frame b^2 , also secured to the arched standard B. The cylinder E is supported on the disks d' and d^2 slightly to the rear of the perpendicular center of these

disks, so as to bear on the rollers $d^1 d^1$ at the opposite ends. The rollers $d^1 d^1$ are journaled in the brackets $b^3 b^3$, which are adjustably secured to the frames b^1 and b^2 . In the prior construction, owing to the disposition of the weight of the cylinder, two milled disks had to be connected with and operated by a frame connected with the milled disks at both ends of the cylinder E, which frame, owing to its length and comparatively short traverse, was liable to produce errors or inaccuracies in the partial rotation of the cylinder, all of which is remedied by the present construction, in which a long narrow slide moving transversely operates only one milled disk, on which one end of the cylinder E rests, the other end resting on a smooth disk.

The forward-and-backward movement of the stylus in tracing the pattern moves the stylus-frame, and with it the free end of the arm D, inward and outward. The arm D is secured to and extends from the arm d , supported on the arched standard B, preferably on roller-bearings, as is indicated in Fig. 2. A slide d^6 , provided with a post having a globular end, is adjustably secured to the arm d , usually by a T-bolt sliding in a groove, such as is shown in the carriages in Fig. 3. The inward-and-outward movement of the stylus-frame is transmitted by the arm D to the post on the arm d on a reduced scale corresponding with the difference in the distance of the respective posts on these arms from the axial center on which they swing. The arm d^7 has a longitudinal groove in which the globe-shaped end of the post on the slide d^6 enters. The arm d^7 has its bifurcated ends connected with the carriage d^5 , as is shown in Fig. 9. The steel bands $d^8 d^8$ are secured to the adjustable clip d^{10} on one end of the carriage d^5 and to the peripheral face of the disk d^3 , and the steel band d^9 is secured to the clip d^{10} on the other end of the carriage d^5 and to the peripheral surface of the disk d^3 . By the thumb-nuts d^{11} , which engage with screw-threaded stems on the clip d^{10} , the tension on the steel bands may be adjusted. By moving the carriage d^5 inwardly or outwardly the motion is transmitted to the disk d^3 and the disk d^2 , having the milled peripheral surface, and by the same to the cylinder E, resting on the milled surface of the disk d^2 , and by means of the arms D, d , and d^7 the forward-and-backward movement of the stylus and stylus-frame is communicated to the carriage d^5 and through the steel bands and the disks d^2 and d^3 transmitted as rotary motion to the cylinder.

The graters are controlled by the foot of the operator through the foot-treadle e to the pivotal shaft on which the lever e' is secured, counterweighted by the weight e^2 . The rods e^3, e^4 , and e^5 are pivotally secured to the lever e' . The rod e^3 is connected near its upper end with the lever e^6 , which is secured to a rocking bar e^7 , pivoted in the brackets b^5 , one of

which is secured to each end of the arched frame B. The rocking bar e^7 bears on the tailpiece of the arm or arms e^{18} , to which the graver is secured. The rod e^4 is also secured to a lever e^6 , connected with a longitudinal rocking bar supported in brackets $b^6 b^6$ at the rear of the machine. Two rocking bars are shown in Fig. 1 connected by the rod e^8 , so as to be operated together. The rod e^5 is connected with a lever e^6 , which is connected to a rocking bar placed below the tail end of the arm supporting the graver, so that by raising the rear end of the supporting-arm the graver is moved away from the roll E. The weight e^2 acts on the lever e' by gravity to keep the foot-treadle e in the raised position and holds the graters off from the cylinder E to be engraved. The operator by pressing on the foot-treadle e brings all the graters into contact with the cylinder E while the stylus is moved to trace the pattern, whereby the pattern is engraved on the roll at a reduced scale.

The arm e^3 may be connected with the upper carriage e^6 by extending two arms, one from either side of the plate e' , and uniting them in a plate at the top, as is indicated in broken lines in Fig. 1, sufficient space being left between the two arms to allow of the movement of the lower arm e^3 .

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a pantograph engraving-machine for engraving cylinders, the combination of the following instrumentalities: two disks, supported in journal-bearings one near each end of the machine, and which form the vertical support of the cylinder to be engraved, two brackets, one near each end of the machine, provided with rollers forming the side support of the cylinder to be engraved above the contact-point of the cylinder to be engraved with the disks, carriages upon which are mounted the graters, a pattern-table for the support of the pattern, a stylus-frame moving with the stylus in tracing the pattern, actuating mechanism connecting the stylus-frame with the carriages, and actuating mechanism connecting the stylus-frame with one of the disks supporting the cylinder to be engraved; whereby the pattern traced by the stylus is reproduced on the cylinder, as described.

2. In a pantograph engraving-machine for engraving cylinders, in combination, a standard forming the support of the pattern-table and the stylus-frame, an arched frame supported at opposite ends on the standard, two disks one near each end of the machine journaled in bearings supported on the arched frame and upon which the cylinder to be engraved rests, brackets one near each end of the machine having rolls forming the side supports of the cylinder to be engraved above

the line of contact of the cylinder to be engraved with the disks, carriages carrying gravers, and actuating mechanism controlled by the stylus; whereby the carriages are reciprocated and the cylinder rotated, as described.

3. In a pantograph engraving-machine for engraving cylinders, the combination with two disks journaled in suitable bearings and upon which the cylinder to be engraved rests, of two rolls journaled in suitable bearings to form the side support of the cylinder to be engraved above the line of contact of the cylinder to be engraved with the disks, as described.

4. In a pantograph engraving-machine for engraving cylinders, the combination with the frame of the machine, of the two disks one near each end of the machine upon which the cylinder to be engraved rests, two brackets one near end of the machine provided with rollers forming the side support of the cylinder to be engraved above the line of contact of the cylinder to be engraved with the disks, carriages supporting gravers adapted to engrave the upper and lower part of the cylinder, mechanism connected with one of the disks for rotating the cylinder to be engraved, and a stylus-frame for operating both mechanisms, as described.

5. In a pantograph engraving-machine for engraving cylinders, the combination with two disks d' d^2 journaled in suitable bearings, one near each end of the machine, and the adjustable brackets b^3 b^3 having the rollers d^4 d^4 located above the highest points of the disks, of the carriages supporting the gravers, and adjustable supports for the carriages, whereby the carriages and the cylinder may be relatively adjusted, as described.

6. In a pantograph engraving-machine for engraving cylinders, in combination, two carriages on opposite sides of the cylinder, a swinging arm, posts in the opposite ends of the swinging arm, and grooved plates secured to the carriages; whereby the longitudinal motion of one carriage is transmitted to move the other carriage in the opposite direction, as described.

7. In a pantograph engraving-machine for engraving cylinders, the combination with the carriages on opposite sides of the cylinder to be engraved and the graver-holders on the carriages, of the centrally-pivoted swinging arm e^{11} , the posts e^{13} and e^{15} on the arm, and the plates e^{16} e^{16} pivotally connected with the carriages and adapted to connect the carriages with the swinging arm; whereby the two carriages are caused to reciprocate in opposite directions, as described.

8. In a pantograph engraving-machine, the combination with the carriages c^4 and c^6 , of the brackets c^8 adjustably secured at opposite ends to the two carriages; whereby the carriages are connected to move together or disconnected from each other, as described.

9. In a pantograph engraving-machine, the combination with the carriages c^5 and c^7 located on opposite sides of the cylinder to be engraved and of the end bars c^{10} c^{10} ; whereby the two carriages may be connected together to reciprocate in unison, as described.

10. In a pantograph engraving-machine, the combination with the disk d' , the disk d^2 having a milled peripheral surface, the said two disks forming the sole vertical support of the cylinder to be engraved, of the disk d^3 , the transversely-sliding table d^5 , and the steel straps d^8 d^8 and d^9 each secured at one end to the table and at the other end to the disk d^3 ; whereby the cylinder to be engraved is operated at one end by the disk forming the sole support of that end, as described.

11. In a pantograph engraving-machine, the combination of the following instrumentalities: a standard forming the support of the pattern-table, ways for the support of the stylus-frame, an arched frame supported at opposite ends on the standard and extending over the stylus-frame, two disks journaled in bearings supported on the arched frame and forming the sole vertical support for the cylinder to be engraved, adjustable brackets having rolls forming the side support of the cylinder to be engraved, carriages moving on ways adjustably secured to the end frames, arms supporting the gravers carried on the carriages, a stylus-frame, a stylus-carriage on the stylus-frame, a transversely-moving table connected with and operating one of the supporting-disks for rotating the cylinder being engraved, mechanism connecting the stylus-frame with the transversely-moving table, mechanism connecting the stylus-carriage with the graver-carriages and the mechanism connecting the foot-treadle with the rocking bars controlling the gravers; whereby the carriages supporting the gravers may be placed closer to the cylinder being engraved to form a more rigid support for the gravers and the cylinder being engraved is controlled at one end, as described.

In witness whereof we have hereunto set our hands.

JOHN HOPE.
JOHN HOPE, JR.

Witnesses:

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