

No. 708,813.

Patented Sept. 9, 1902.

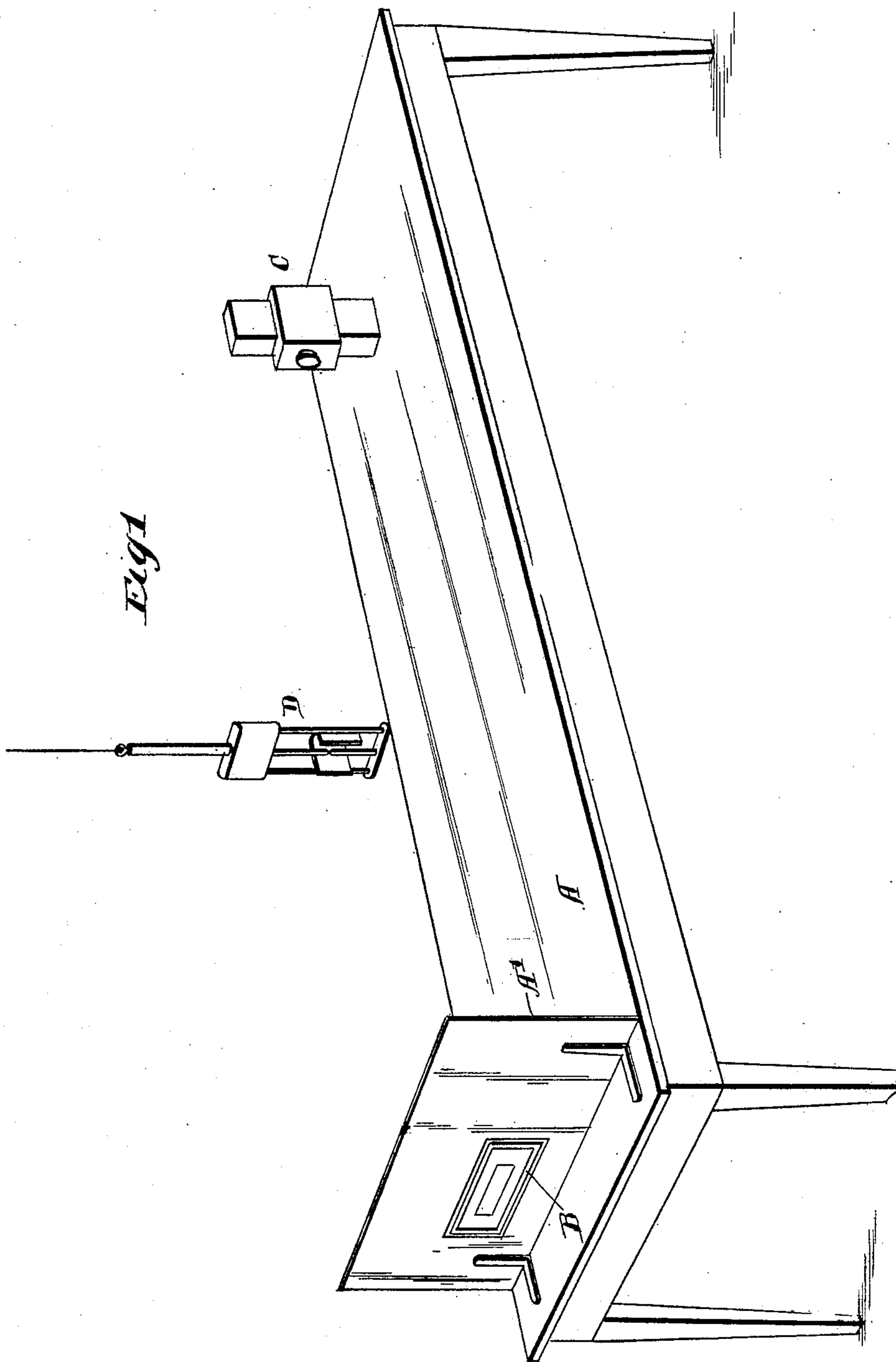
A. DE KHOTINSKY.

AUTOMATIC PHOTOGRAPHIC RECORDING APPARATUS.

(Application filed Nov. 8, 1901.)

(No Model.)

9 Sheets—Sheet 1.



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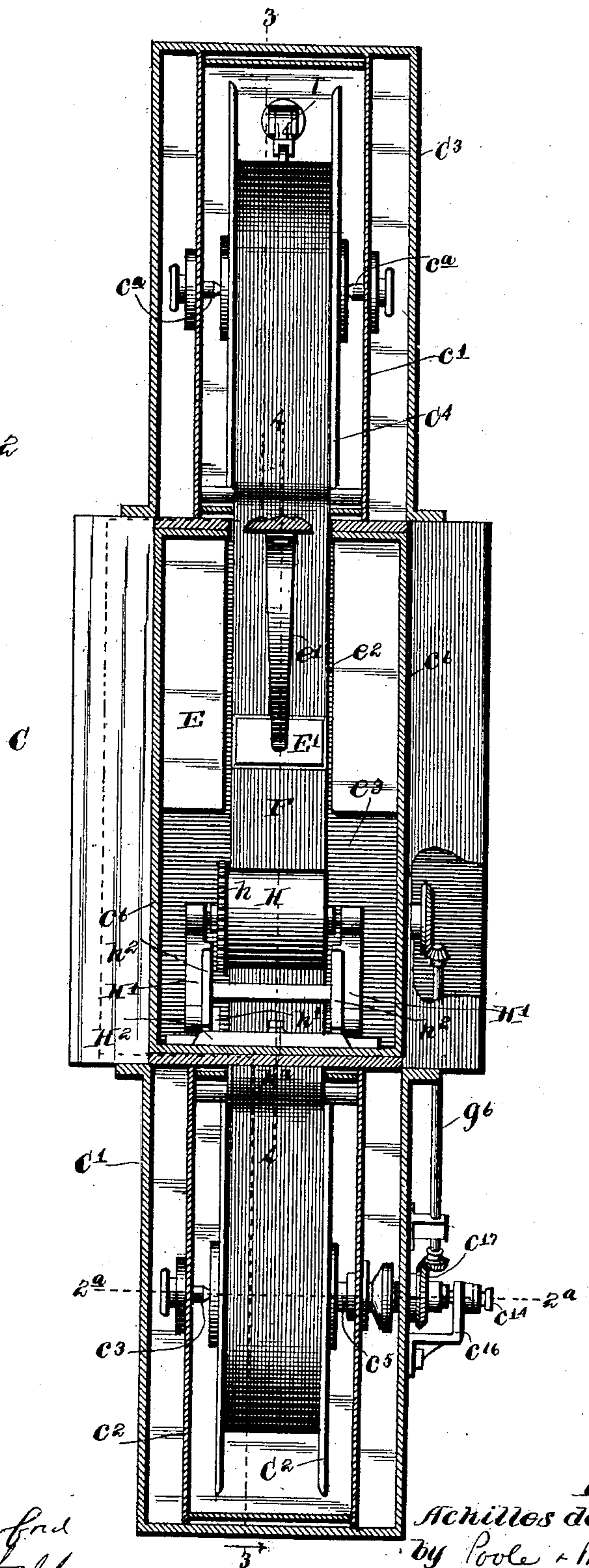
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9 Sheets—Sheet 2.

Fig 2



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Fig 8

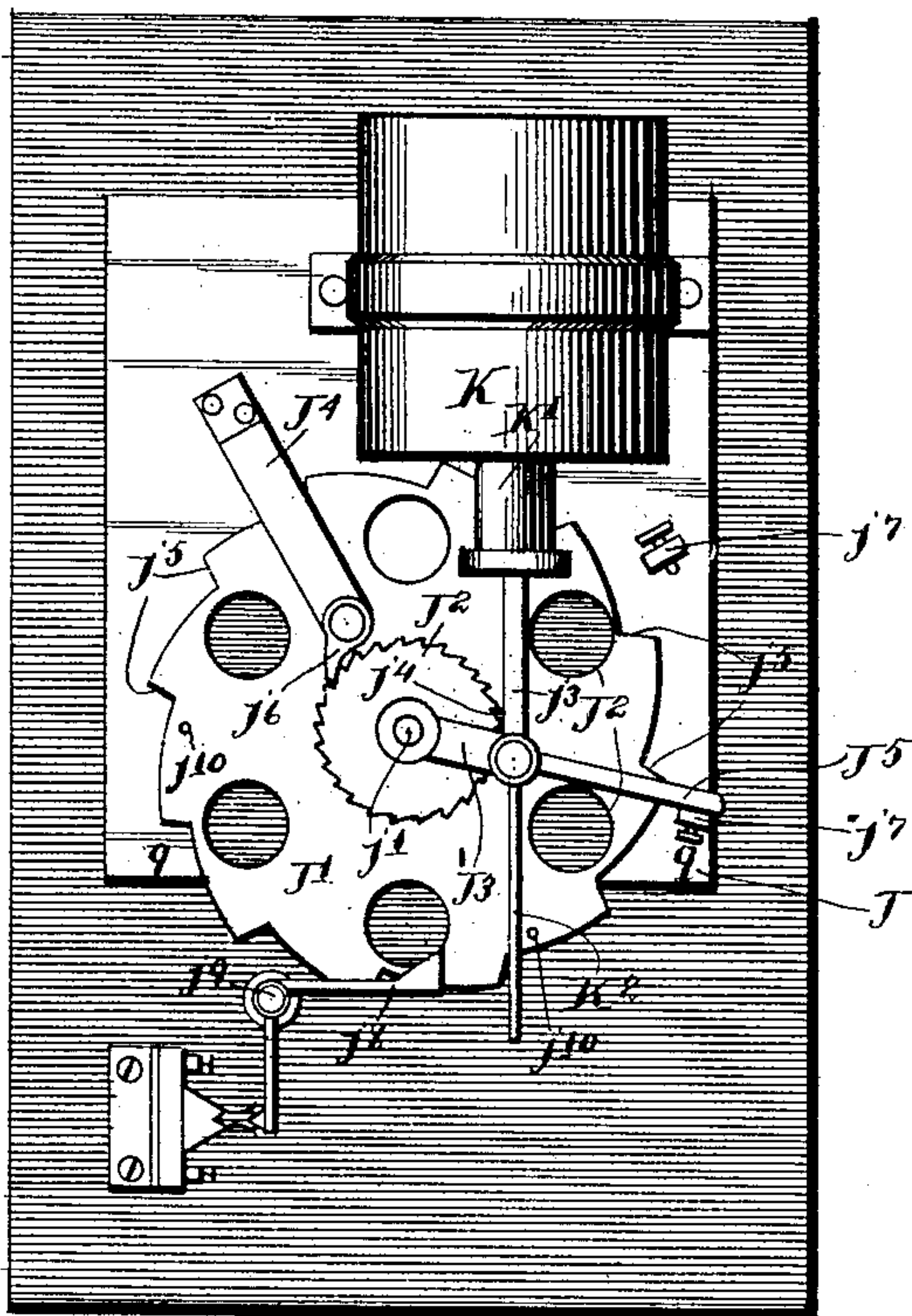


Fig 9

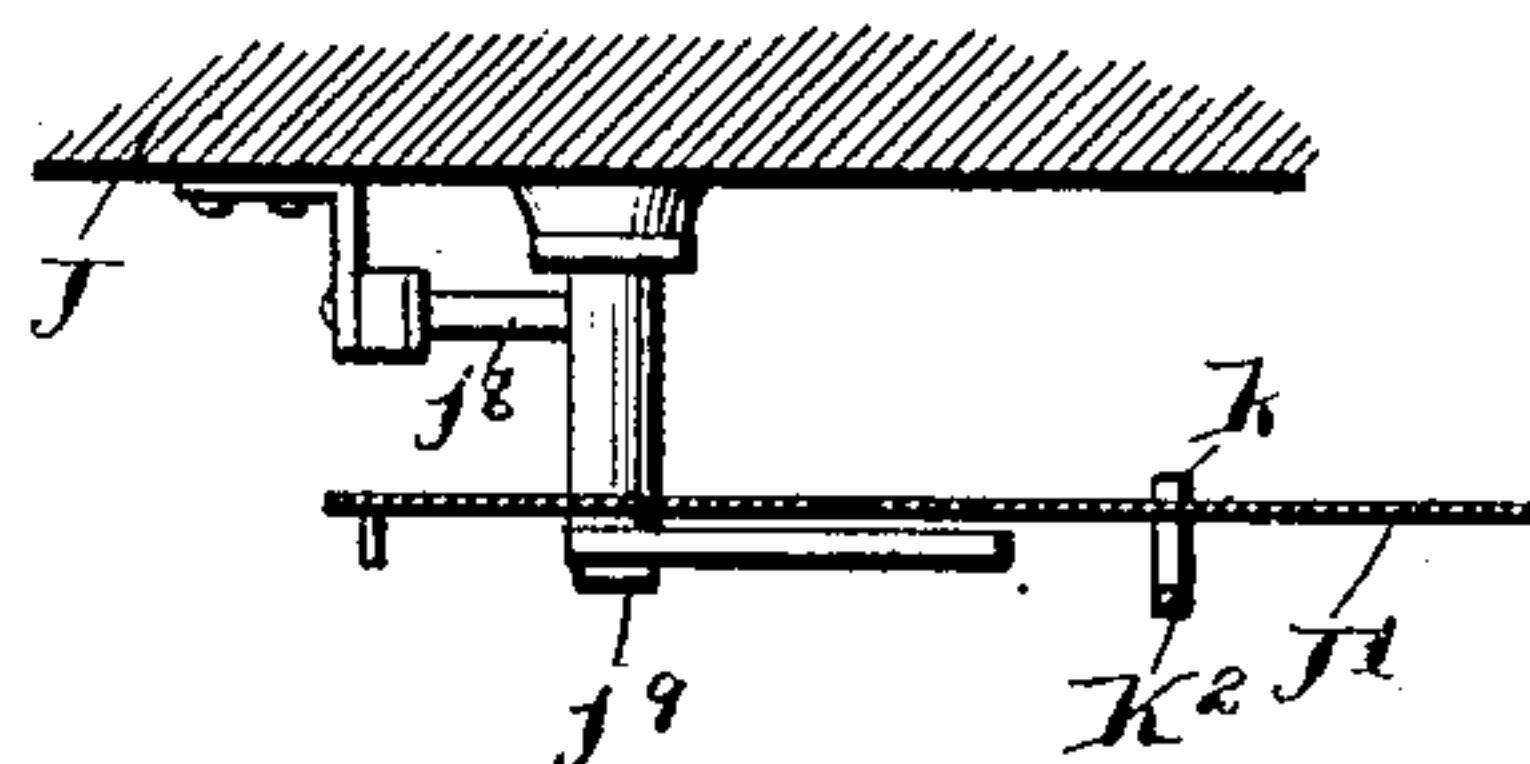


Fig 2^a

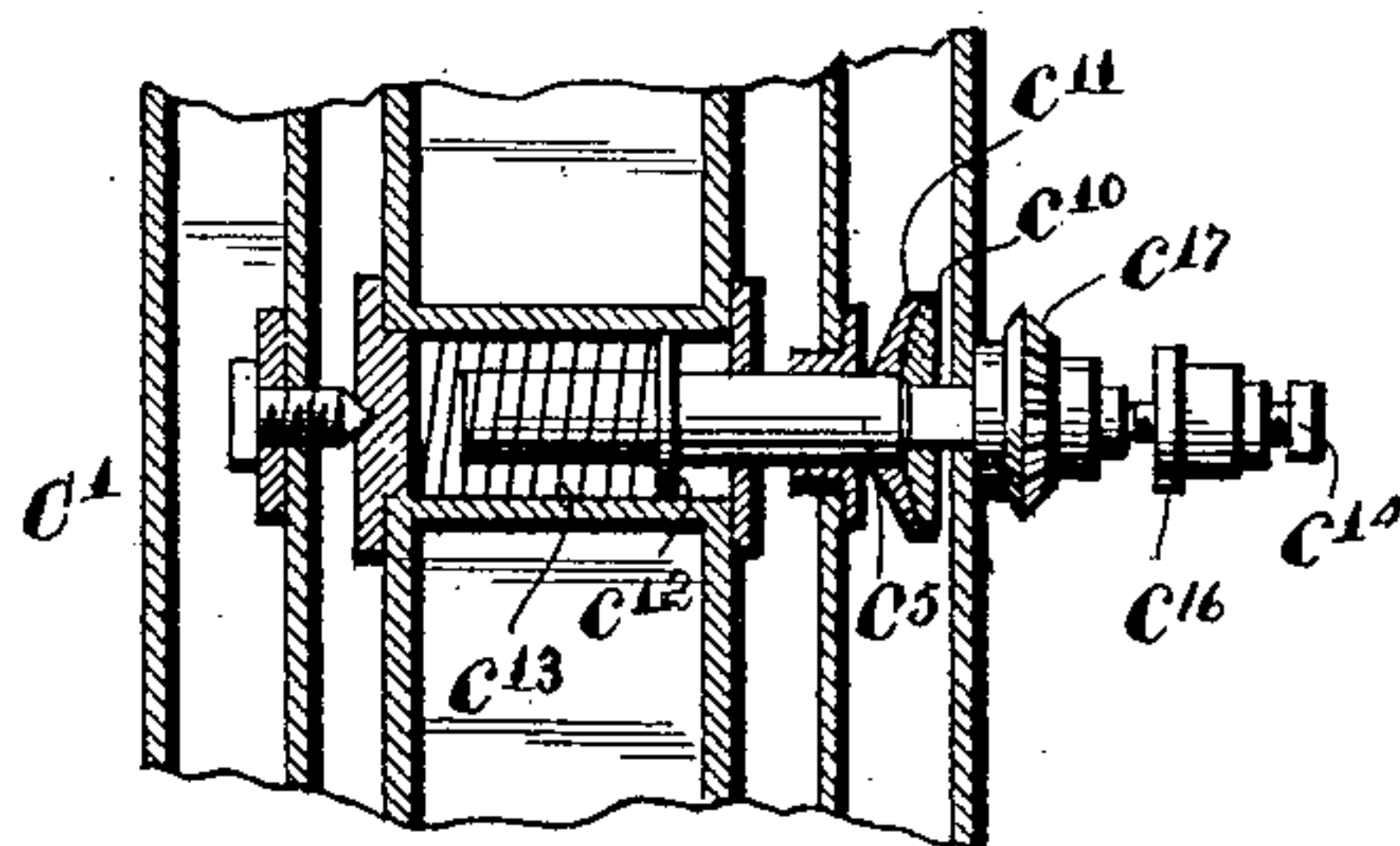
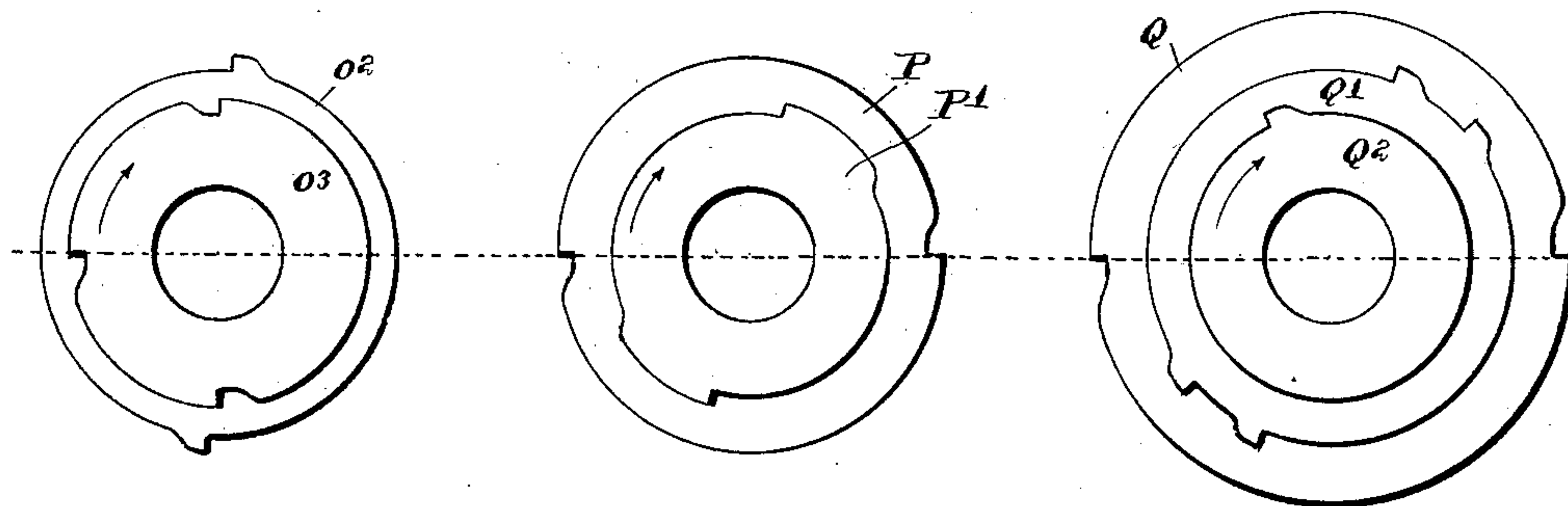


Fig 15



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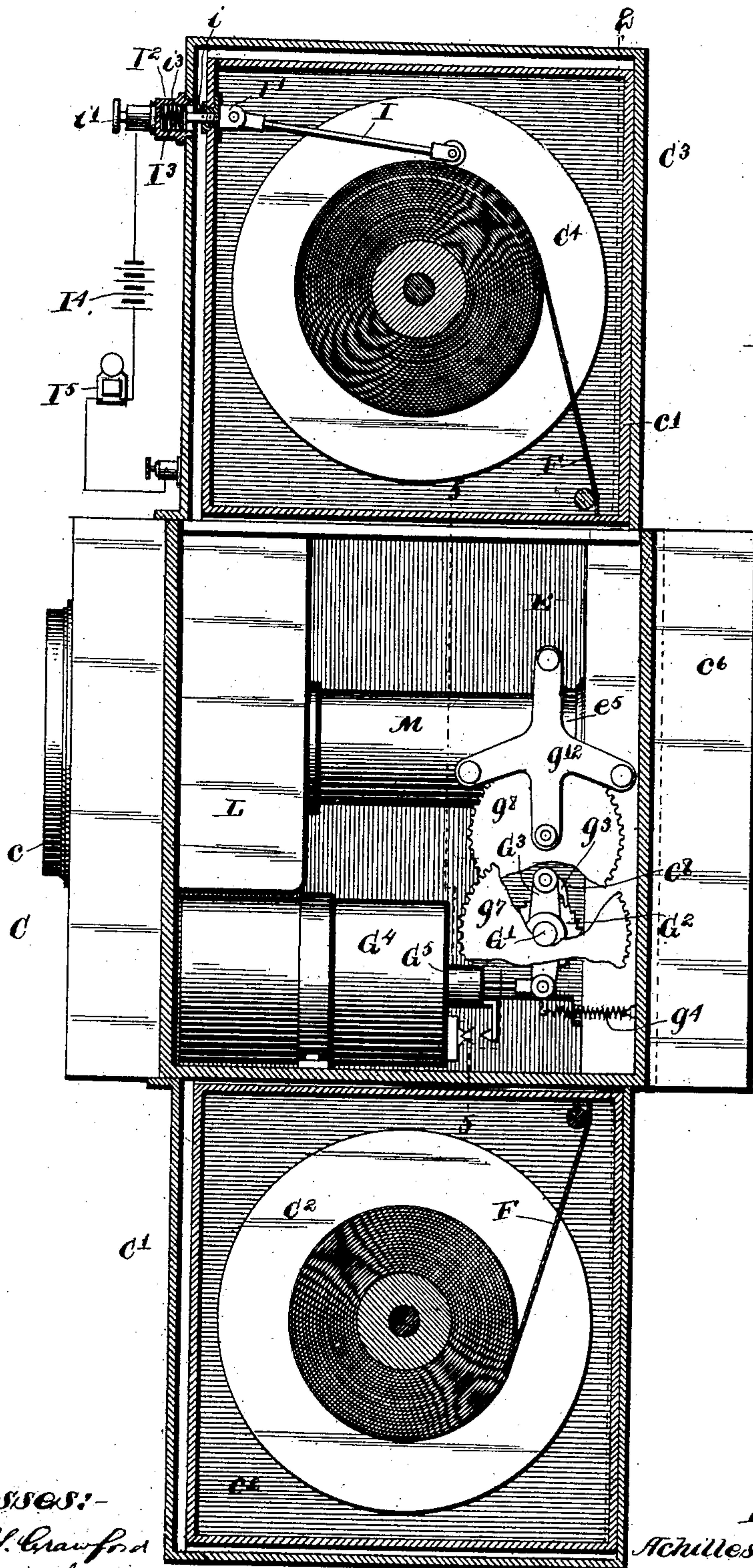
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9 Sheets—Sheet 4.



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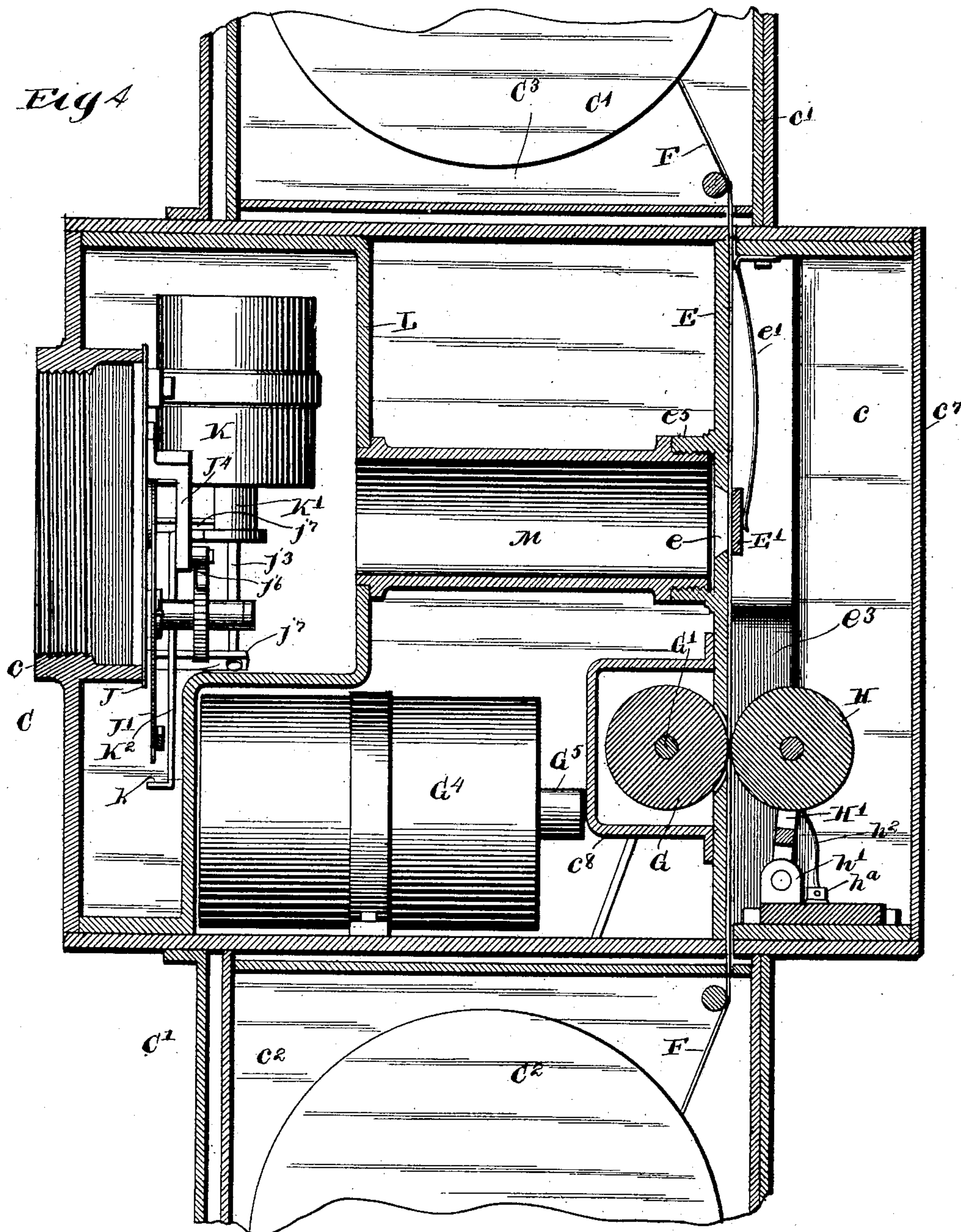
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Fig 5

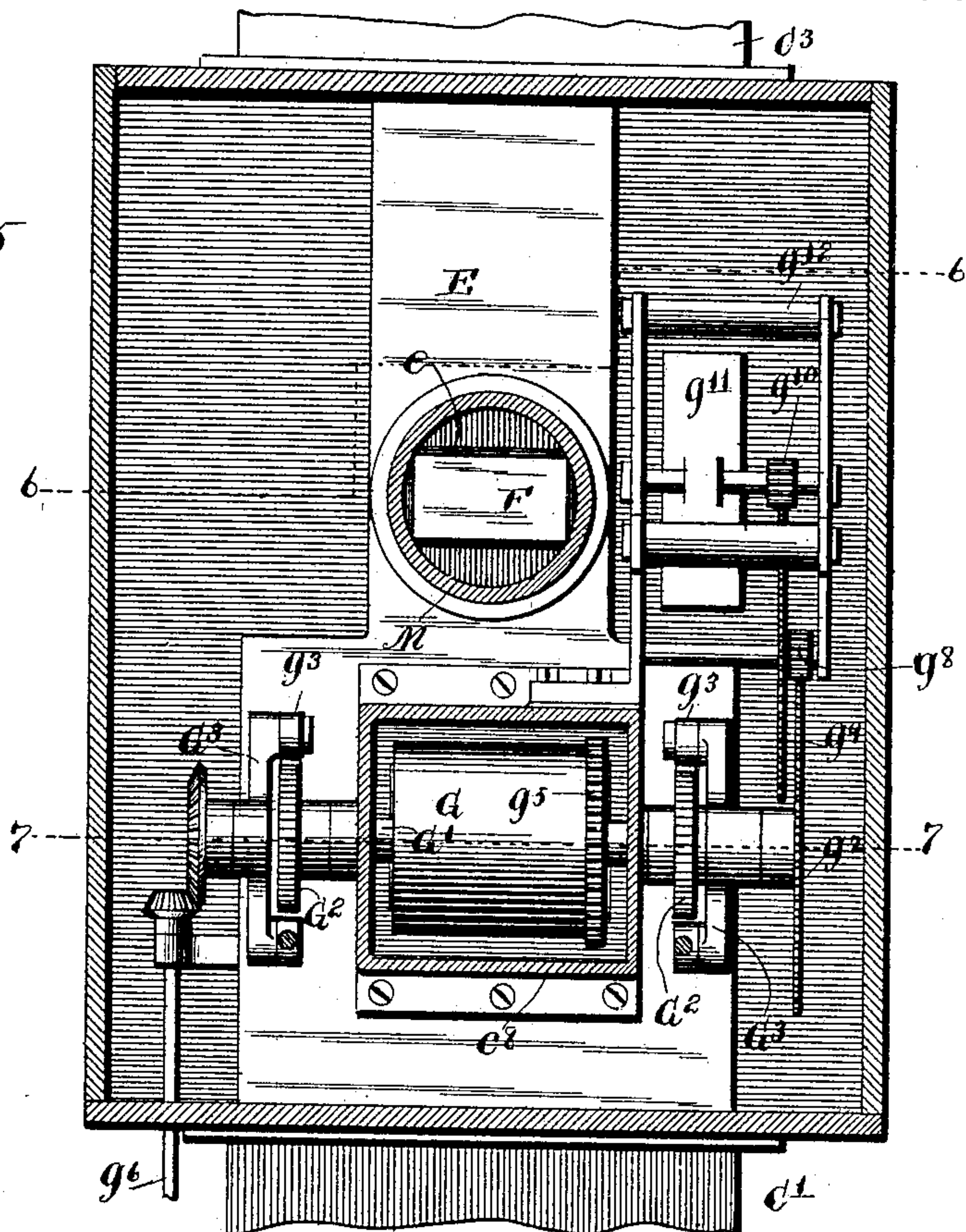


Fig 6

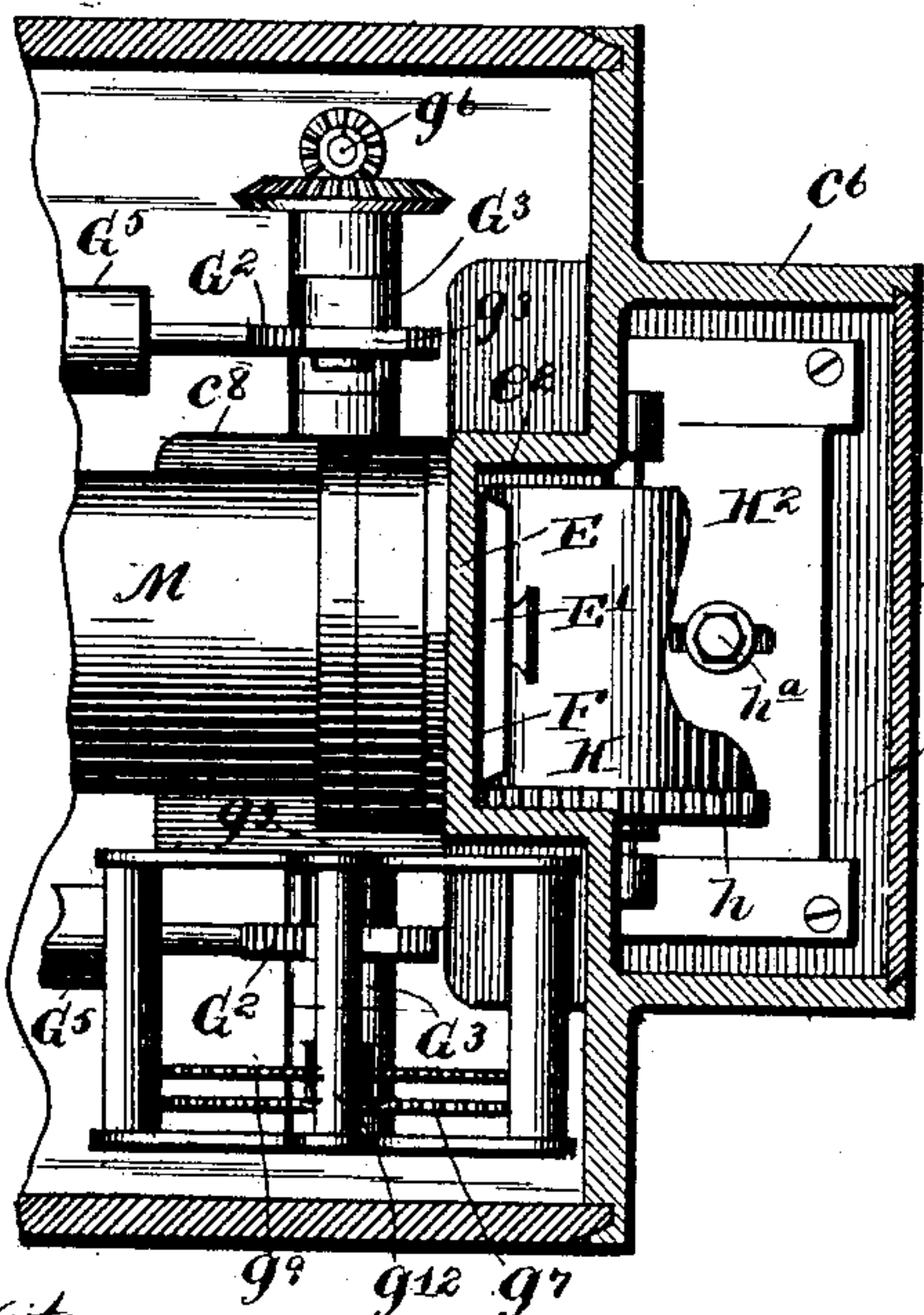
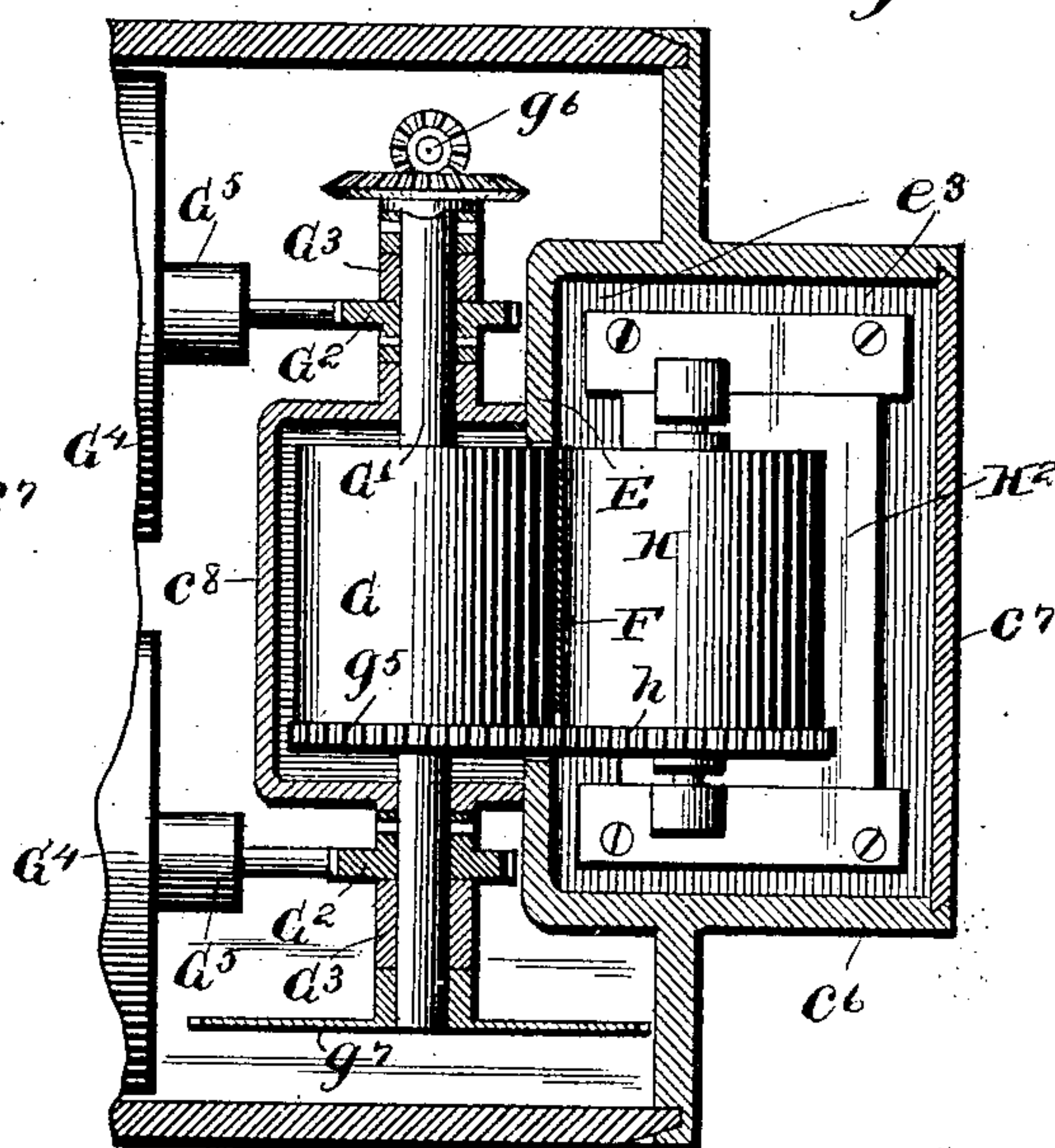


Fig 7



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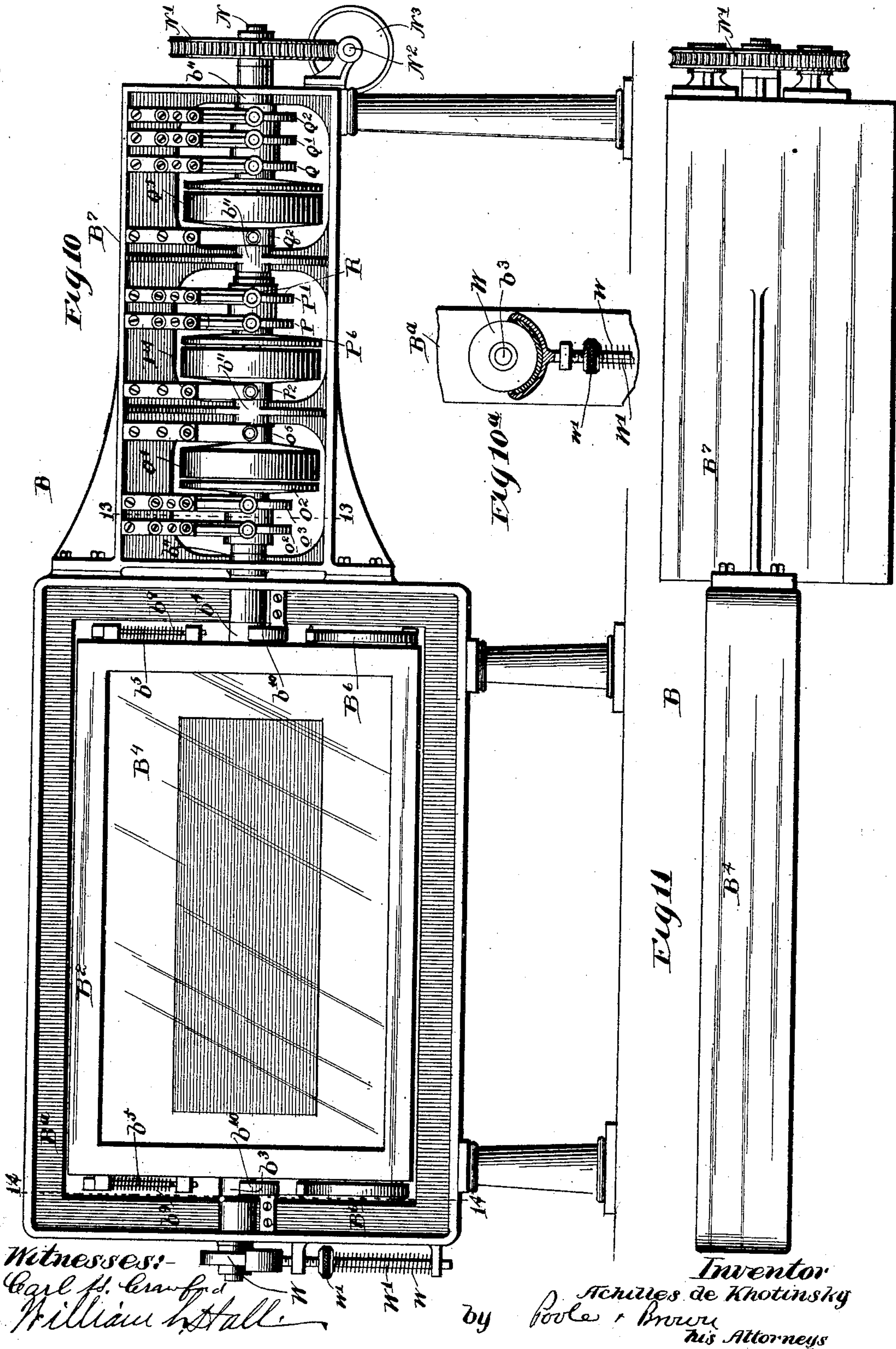
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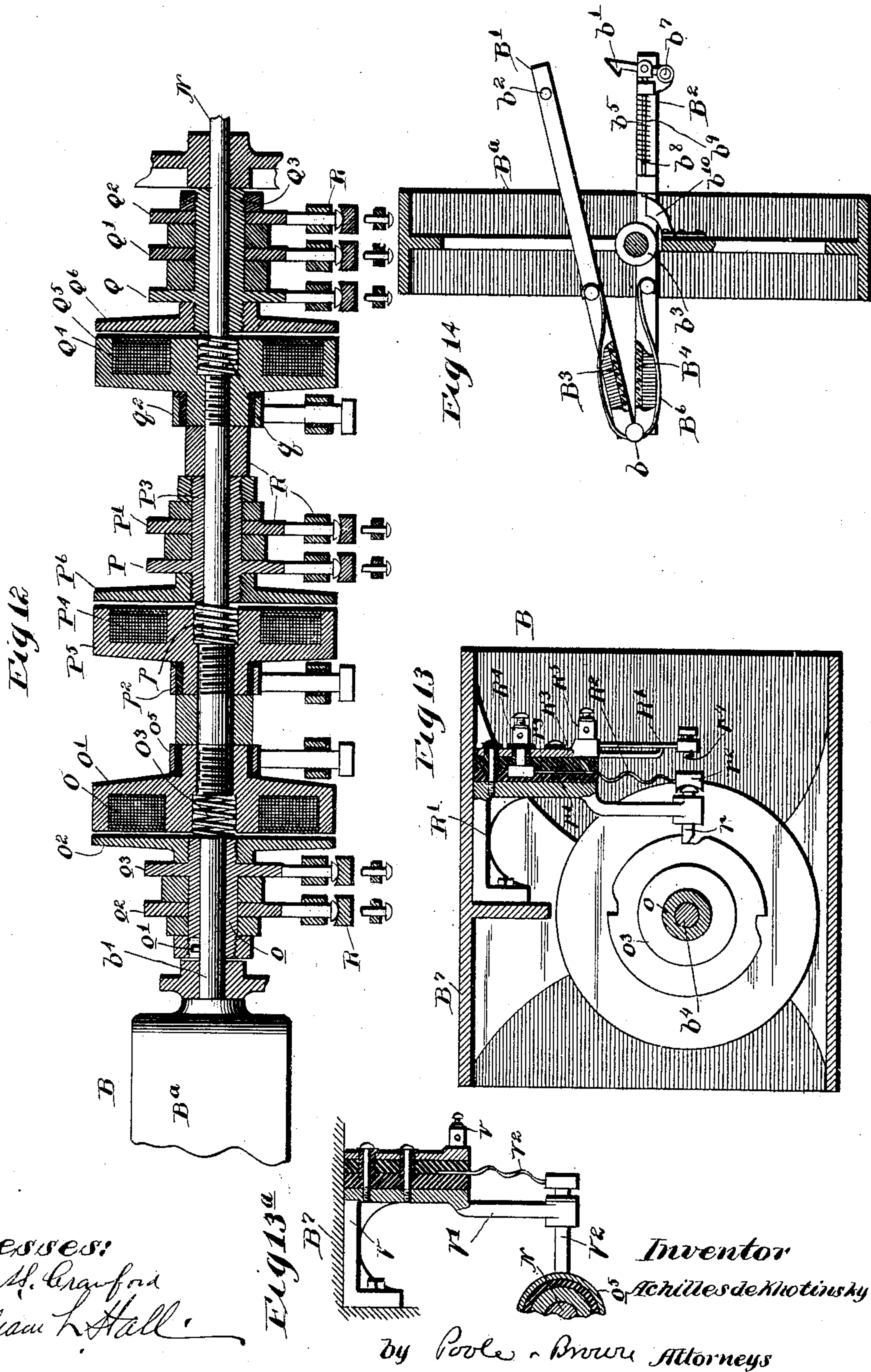
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(No Model.)

9 Sheets—Sheet 7.





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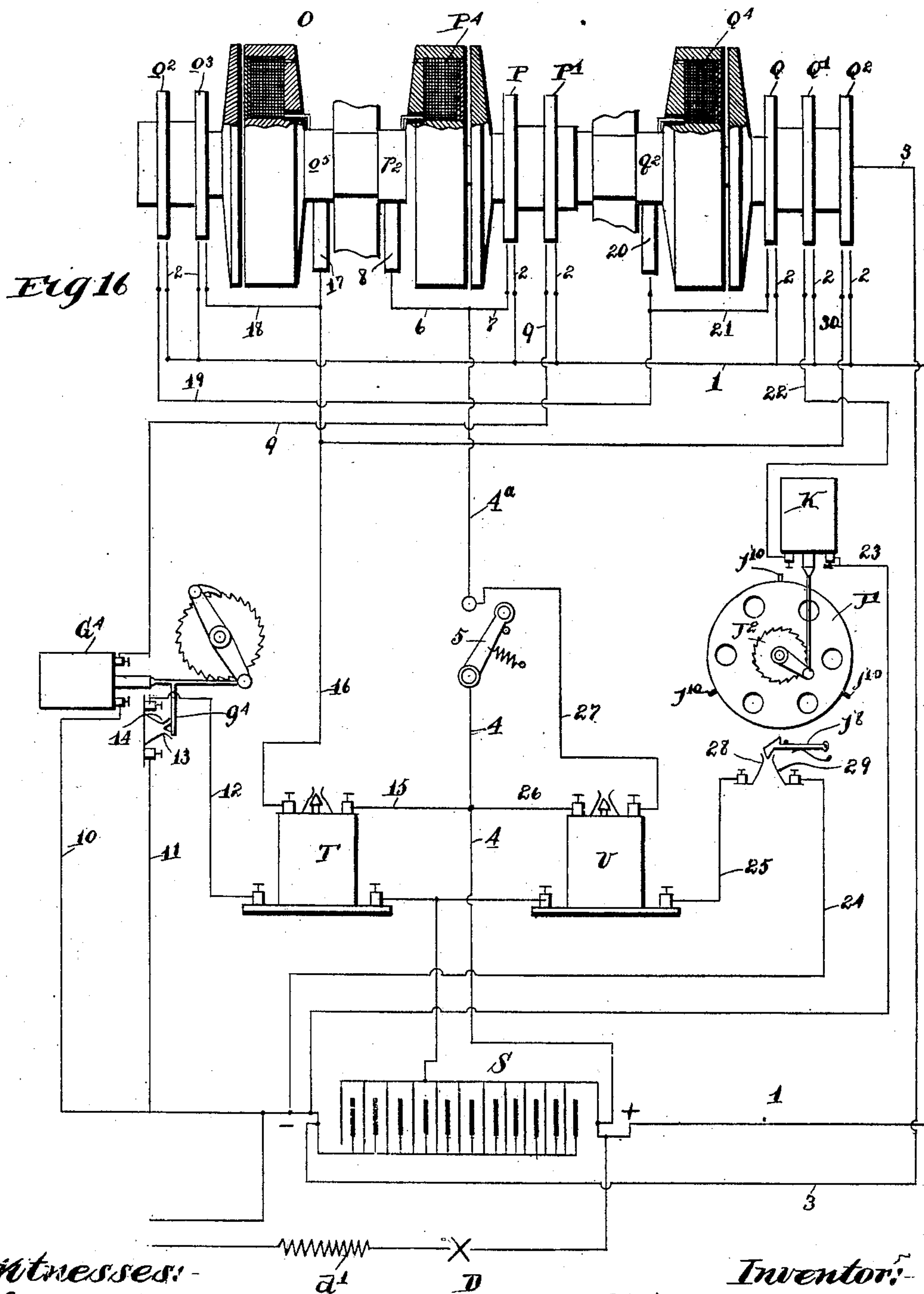
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(No. Model.)

9 Sheets—Sheet 9.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC PHOTOGRAPHIC RECORDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 708,813, dated September 9, 1902.

Application filed November 8, 1901. Serial No. 81,568. (No model.)

To all whom it may concern:

Be it known that I, ACHILLES DE KHOTINSKY, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Photographic Recording Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to an improved apparatus for recording checks, drafts, and like papers in such manner that the record shall show a facsimile of each paper to be recorded, a type of which is shown in the prior United States Letters Patent to Jansen *et al.*, No. 655,972, granted August 14, 1900, the apparatus being designed to afford means by which a bank or business house may keep an exact record of the papers which pass through such bank or house and which record may be retained and access had thereto after the original papers have passed out of the control of such bank or business house.

My improvements when employed in an apparatus for photographing papers which contain printing or writing on both sides thereof embrace a holder which acts to successively present both sides of the paper to be photographed to the camera.

Among the objects of the present invention is to simplify the construction of the apparatus and also to simplify and render more certain the various operations of the apparatus.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a perspective view of an apparatus embodying my invention. Fig. 2 is a vertical sectional view of the camera proper, taken on line 2 2 of Fig. 3. Fig. 2^a is a sectional detail taken on line 2 2 of Fig. 2. Fig. 3 is a vertical section thereof, taken on line 3 3 of Fig. 2. Fig. 4 is a vertical section of the camera on a larger scale than shown in Fig. 3, said view being taken on line 4 4 of Fig. 2. Fig. 5 is a detail vertical section taken on line 5 5 of Fig. 3. Fig. 6 is a fragmentary horizontal section taken

on line 6 6 of Fig. 5. Fig. 7 is a like section taken on line 7 7 of Fig. 5. Fig. 8 is a rear or inner face view of the shutter mechanism. Fig. 9 is a fragmentary horizontal section taken on line 9 9 of Fig. 8. Fig. 10 is a front elevation of the holder and its frame and showing also parts of the electromechanical devices for giving movement to said holder and to the film-feeding devices and shutter mechanism. Fig. 10^a is an end elevation of the lower half of the holder-frame, showing a friction-governor for controlling the movement of the holder. Fig. 11 is a plan view of the parts shown in Fig. 10. Fig. 12 is a longitudinal section taken axially through the cams and actuating devices therefor, by means of which the circuits for operating the various parts of the apparatus are controlled. Fig. 13 is a transverse section taken on line 13 13 of Fig. 10. Fig. 13^a is a detail transverse section on line 13^a 13^a of Fig. 10. Fig. 14 is a transverse section taken on line 14 14 of Fig. 10, showing the holder in its open position. Fig. 15 is a diagrammatic view illustrating the contours of the several circuit-controlling cams and also their relative positions in the starting of the machine. Fig. 16 is a view, principally diagrammatic in its nature, illustrating the several operative parts, the battery, the circuit-controlling devices, and the wiring connecting said parts.

As shown in Fig. 1 of said drawings, A designates a support or table on which the apparatus is located, and A' a vertical partition or screen having an opening in which is located the holder B, in which the papers to be recorded are held during the exposure thereof to the camera.

C designates the camera proper, which is supported on the table A in such manner that the lens-tube *c* is directed toward the holder, said holder being located in the optical axis of the camera.

D designates an electric-arc light located at one side of the camera and provided with a reflector arranged to illuminate the holder.

Beneath the camera C is located a box C', Figs. 2 and 3, which contains a spool C², adapted to receive the record strip or film after the record has been made thereon, and above said casing is a similar box C³, which

contains a supply-spool C^4 , from which the strip is drawn. Within the casing C of the camera are located two separate mechanisms—one a strip or film feeding device adapted to

advance or feed the sensitized strip or film intermittingly past the optical axis of the camera and the other a shutter and shutter-actuating mechanism for admitting light to and cutting it off from the sensitized strip.

In a machine made in accordance with my present invention the holder for the papers to be photographed, the film-feeding mechanism, and the shutter mechanism are operated from one source of electrical energy or main battery, and said parts are so connected with said battery that when the main operating-circuit is closed the film-feeding device is actuated to advance or feed a section of the film past the optical axis of the camera, the holder-actuating device is actuated to bring the holder into position for exposing one side of the check or paper to be recorded, and the shutter-actuating mechanism is thereafter actuated to open the shutter to expose the paper in the holder to the film, the three operations occurring in the order named without further attention on the part of the attendant. When both sides of the check or other paper is to be recorded, the electrically-actuated devices are so connected with the battery that the strip is advanced a second time, the holder turned half around, or one hundred and eighty degrees, to present the opposite side of the paper to the camera, and the shutter opened to effect a second exposure, after which the holder is turned a quarter-turn farther to bring it into position to remove therefrom the check or other paper and to substitute another therefor.

Referring to the strip-feeding mechanism, the same, as herein shown, is constructed as follows:

E , Fig. 4, designates a vertical stationary guide-plate located transversely of the camera-housing C , at the rear thereof or at right angles to the optical axis of the camera. In said plate in alinement with the object-lens is an opening e , through which the exposure of the sensitized film takes place. Said strip, which is indicated by F in the drawings, passes downwardly from the supply-spool C^4 in the upper box C^3 , through an opening in the top wall of the box C and along the rear face of the plate E in a vertical direction, and thence through an opening in the lower wall of the camera-housing to the receiving-spool C^2 of the lower box C' . The upper or feed spool is adapted to rotate freely on its axis, being journaled on pointed trunnions c^a , affixed in the side walls of a removable casing c' , in which said spool is supported. The lower spool is supported in a similar removable casing c^2 and is journaled in said casing by means of a pointed trunnion c^3 , passing through the side wall of said casing and engaging a central bearing-plate at one end of the spool and a two-part shaft,

(designated as a whole by c^5), affixed to one end of the spool and passing outwardly through and having bearing in the corresponding side walls of the casing c^3 and box c' in the manner shown in Fig. 2. Said two-part shaft includes a friction device, as illustrated in Fig. 2^a and hereinafter explained, whereby one part of the shaft may rotate relative to the other. Through said shaft rotary motion is imparted to said spool through mechanism hereinafter to be described. The strip or film passes over the exposure-opening e in the plate E and is held flat against said plate over said opening by means of a flat-faced presser E' , located behind the plate and strip and held in contact with the rear face of said strip by means of a suitable spring e' .

Devices are provided for advancing the strip or film step by step, as follows:

G is a feed-roller rotating with a horizontal shaft G' , located inside of the guide-plate E and projecting through an aperture in said plate in position for contact with the front face of the film which passes across said aperture. Said feed-roller acts against an opposing spring-pressed roller H , which bears against the rear face of the film. Said rollers are located below the exposure-opening e and act to feed said strip by drawing it downwardly past said opening. The guide-plate E is formed to provide a central vertical channel e^2 , through or along which the film passes, Figs. 2, 5, and 6, and said channel is widened at its lower end to form a chamber e^3 for the partial reception of the feeding-roller H and its support, said channel and chamber communicating with or forming part of a chamber formed between rearwardly-extending vertical walls $c^6 c^6$, which are closed at the rear thereof by a sliding removable wall c^7 , the removal of which permits access to the roller H and its appurtenances. The roller G is contained within a casing or chamber c^8 , affixed to and extending forwardly from the wall E , as shown in Figs. 4, 5, and 7. The shaft of the roller G is mounted in suitable bearings in the walls of the chamber c^8 . Motion is imparted to said feed-roller G through the means of the following mechanism:

$G^2 G^2$, Figs. 3, 5, 6, and 7, designate ratchet-wheels affixed one to each end of the shaft G' , and $G^3 G^3$ designate oscillatory levers provided with central openings or sleeves which fit loosely over said shaft outside of said ratchet-wheels. Said levers carry at their upper ends pawls g^3 , which coöperate with the teeth of the ratchet-wheels G^2 .

$G^4 G^4$ designate two solenoids located one in each side of the box C , parallel with each other and extending from front to rear of said box. The cores G^5 of said solenoids are connected by pitmen with the lower ends of the oscillatory levers G^3 , whereby when said solenoids are energized and the cores thereof drawn inwardly the levers are oscillated and act through the pawls and ratchet-

wheels to turn the roller G one step. Said parts are retracted when the solenoids are deenergized by means of springs g^4 , as shown in Fig. 3. Said roller G is provided at one end with an annular series of gear-teeth g^5 , adapted to mesh with corresponding gear-teeth h on the roller H, whereby said rollers move in unison, and movement of one is with certainty and positiveness imparted to the other and a correspondingly positive and certain feed or advance of the film F effected. The receiving-spool C^2 for the film is rotated from the shaft G' through the medium of an obliquely-arranged shaft g^6 , connected by bevel-gears with said shaft G' and the shaft c^5 of the said spool in the manner shown in Fig. 2. The friction device included in the shaft c^5 consists of a friction-disk c^{10} , attached to the outer part of the shaft and provided with a convex bearing-face which engages the concave bearing-face of a disk c^{11} , affixed to the inner part of the shaft. Said inner part of the shaft extends into the hollow interior of the spool C^2 and is provided with a flange c^{12} , which has bearing with the interior cylindric surface of said spool, and interposed between said flange and the opposite end of the bore of the spool is a spiral expansively-acting spring c^{13} , which surrounds said inner part of the shaft and acts to press the friction-disks together. The tension of said spring is varied and the friction resistance between said disks controlled by a conical-pointed adjusting-screw c^{14} , which has screw-threaded engagement with a bearing-bracket c^{16} , attached to the side of the camera-box, said screw bearing against the end of the outer part of the shaft c^5 . The bevel gear-wheel c^{17} on the shaft c^5 , meshing with a pinion of the oblique connecting-shaft, is splined to the shaft to permit the shaft to slip therethrough in adjusting the spring c^{11} . Said friction device of the shaft c^5 is so adjusted with respect to the pressure between the feed-rollers G and H that the spool will only be rotated in each operation of the film-feeding devices sufficiently to take up the length of the film-feed between the presser-rollers G and H, after which the friction between the disks c^{10} and c^{11} is overcome and the outer part of the shaft c^5 turns relatively to the inner part thereof and the spool. This construction is provided to insure that a given length of film will be advanced past the exposure-opening e in each operation of the film-feeding devices, as manifestly if the spool be positively driven from the shaft g^6 the amount of film wound upon the spool at each operation thereof would vary directly as the diameter of the roll of film varies. The movement of said film-feeding devices is controlled by means of a clockwork fan-wheel governor, Figs. 3, 5, and 6, embracing a gear-wheel g^7 on the roller-shaft G' , gear pinions and wheels g^8 g^9 g^{10} , and a fan g^{11} , mounted on horizontal shafts supported in a frame, (designated as a whole by g^{12}), sustained on the chamber c^8 , at one side thereof or in any other

suitable manner. To facilitate the insertion of the strip or film, the presser E' is made removable and the shaft of the pressed roller H is mounted on the upper ends of hinged arms H' , which are pivoted to lugs h' , rising from a base-plate H^2 , and said roller is pressed against the strip or film by means of flat leaf-springs h^2 , attached at their lower ends to said base and bearing at their upper ends against said arms H' . The base-plate H^2 is movable toward and from the film to provide variation of the pressure of one roller upon the other, said plate being for this purpose provided with a forwardly and rearwardly extending slot, through which extends an adjusting-screw h^3 , by which the plate is adjustably held in place.

An alarm device is provided which is so constructed and arranged with respect to the strip or film supply roller C^4 that when said film is completely unwound from said roller an electric alarm will be given to apprise the attendant of that fact. Said alarm device is shown more plainly in Fig. 3 and is made as follows:

I designates an arm which is pivoted at one end to a lug I' , affixed in the rear wall of the spool-frame c' . Said lug is insulated from said frame and the box and is provided with a pin i , which extends outwardly through said spool-frame and box-wall. The inner end of said arm is provided with an antifriction metallic roller, which engages the film or roller C^4 , as the case may be. I^2 designates an insulated sleeve which fits an opening in the box-wall in line with said pin i of the lug I' and provided at its outer end with a binding-screw i' . I^3 designates a spiral spring contained within said insulated sleeve, which presses a plate or follower i^2 against the end of the pin i of said lug I , and said spring is electrically connected with the binding-post i' . I^4 indicates a primary battery one pole of which is connected with the binding-screw i' and the other pole with the wall of the box. I^5 designates a suitable audible alarm, as an electric bell, included in said alarm-circuit. As a consequence of this construction when the roller of said arm I is in contact with the strip or film the alarm-circuit is open, but when the film is wound off the spool C^4 and the roller is brought into contact with the metallic spool the circuit is closed and an alarm is produced through the alarm-bell I^5 .

The shutter and shutter-actuating devices are shown more clearly in Figs. 4, 8, and 9 and are made as follows: The end of the lens-tube c is closed by means of a flat plate J, which is provided with an annular flange or rim which fits within the end of said tube. Said plate is provided centrally thereof with an exposure-aperture located in the optical axis of the camera.

J' designates a rotary shutter-disk which is journaled centrally thereof on a pin j' , located below the exposure-opening of the

plate J, and is provided with an annular series of openings j^2 , concentric with said pin j' , herein shown as six in number and which are adapted to be successively brought into alignment with the exposure-opening of the plate J. Said shutter-disk is actuated and locked in place after each step-by-step movement by the following mechanism:

J^2 designates a ratchet-wheel which is rotatively mounted on the shaft j' and rotates with the shutter-disk, and J^3 designates a radial arm which is loosely connected or pivoted to said shaft j' .

j^3 designates a pitman which is connected at one end with the core K' of a solenoid K, and at its other end is loosely connected with said arm J^3 . Said arm J^3 carries a pawl j^4 , which engages the teeth of the ratchet-wheel J^2 , and the parts are so arranged that when the core of the solenoid is drawn inwardly by the energizing of the solenoid said ratchet-wheel and the shutter-disk connected therewith are given a partial rotation sufficient to bring one of the openings of the shutter-disk in alignment with the exposure-opening of the plate J if when the device is started the shutter is closed or if the shutter be open at this time to move an imperforate part of the shutter-disk in alignment with said exposure-opening. In the practical operation of the shutter mechanism, therefore, beginning with the shutter closed, two distinct operations of the devices are required—one to move the shutter-opening into alignment with the exposure-opening of the plate J and the other to move said shutter-opening out of alignment with such exposure-opening, said openings remaining in alignment an interval to provide for a time-exposure. In order to stop said shutter-disk after it has been given the proper angular movement for the purposes above set forth, the core of the solenoid is shown as provided with a stop-arm K^2 , which is directed outwardly and downwardly from said core and is provided at its extremity with an outturned portion k , which passes under the margin of the shutter-disk. Said shutter-disk is provided in its periphery with a plurality of teeth or projections j^5 , which are approximately square on their advance margins or the margins thereof toward which the shutter rotates and tapered or inclined on their rear margins, as clearly shown in Fig. 8. Said projections are so arranged with respect to the stop-arm K^2 that when the core K' is moved to its innermost position and has rotated the shutter-disk J' through the pawl-and-ratchet connections described the stop-arm will be moved upwardly to bring the outturned extremity thereof into the path of one of the projections j^5 , so as to arrest the inertia of rotation of said shutter-disk. When the core of the solenoid and therefore the stop-arm K^2 , carried thereby, are again moved downwardly or depressed either by the action of a spring or by gravity, said outturned extremity k of said arm passes

below the widest part of the next adjacent tooth or projection, so that said projecting part k of said arm does not afford a stop to the initial movement of said shutter-disk. When the core and stop are again moved inwardly to turn said disk, said tooth or projection passes said stop projection k before the latter is raised into the path of said tooth, said stop acting upon the next adjacent tooth in the completion of the rotation of the shutter-disk to arrest the inertia of the same. In order to prevent the shutter-disk and ratchet-wheel moving backwardly when the core of the solenoid is dropped downwardly and when, therefore, the pawl j^4 is not in position to prevent such backward movement, a second pawl j^6 is provided, which is pivoted to the lower end of an arm or support J^4 , attached by screws or like means to the tube-closing plate J in the manner clearly shown in Figs. 4 and 8. Said auxiliary pawl j^6 bears the same relation to the teeth of the ratchet-wheel J^2 as does the pawl j^4 , so that when said pawl j^4 moves backwardly over said teeth in the descent of the core and pitman associated with said pawl the said auxiliary pawl acts to prevent the retractive or rearward movement of the shutter-disk. In order to be assured that the solenoid-core and the connected pawl be given a uniform movement at each operation of the solenoid, and, therefore, that the shutter-disk be maintained at a uniform relation with respect to the exposure-aperture in the plate J, the arm K^3 , which bears the actuating-pawl j^4 , is provided with an extension J^5 , which vibrates between upper and lower stops, having the form of set-screws j^7, j^7 , mounted in lugs which are formed on the closing-plate of the lens-tube in the manner shown in Fig. 8. The shutter mechanism is inclosed in a casing L, which is enlarged at its upper end to surround the solenoid K and is contracted at its lower end to give room for the solenoids G^4 for the film-feeding devices, as shown in Fig. 4, said last-mentioned solenoids extending at their forward ends below the enlarged part of said chamber L.

M, Figs. 3, 4, and 5, designates a light-tube which extends between the chamber L and the guide-plate E at the rear of the camera-box, said light-tube extending at its forward end through an opening in the rear wall of the chamber L and engaging at its rear end an internally-screw-threaded boss e^5 , surrounding the exposure-opening e in said plate E. Said tube M confines the light which enters through the shutter in its passage to the film and prevents light entering the interior of the camera through other means than the shutter passing to said film and injuring the same.

Next referring to the means for holding or sustaining the checks or the like while being photographed by the apparatus described, these parts are constructed as follows: The holding device, which is located in the screen

A' and indicated by the letter B in Fig. 1, as before mentioned, has the form of a rotative double frame consisting of two swinging leaves B' B², which are connected with each other at one side by hinges and are adapted to be spread apart or opened at their opposite edges and to be held together by suitable fastening devices, herein shown as having the form of spring-pressed latches b', hinged to one of said leaves and adapted to interlock with laterally-projecting lugs or pins b² on the other leaf. In said leaves B' B² are secured glass plates B³ B⁴, Fig. 14, the inner faces of which are adapted for contact with each other and between which are placed the checks or other written instruments or writings to be recorded. One of the leaves—in the instance shown the leaf B²—is rotatively mounted in a surrounding frame B^a, which is shown in Fig. 10 as supported on columns or posts B⁵. The manner of rotatively mounting said holder in the surrounding or inclosing frame B^a consists of a trunnion b³, rigidly attached to one end of the leaf B² and having bearing in one of the vertical members of the frame B^a, and a second trunnion b⁴, rigidly connected with the other end of said leaf and having bearing in the opposite vertical member of the surrounding frame. In this manner the holder may be and is rotated so as to present opposite sides of the paper held in the holder toward the camera. The holder described is adapted to be stopped at three positions in its rotation—to wit, in a horizontal position, as shown in Fig. 14, when the checks or other writings to be recorded are inserted thereinto in a vertical position or ninety degrees from the position shown in Fig. 14, at which time one side of the writing is exposed or photographed, and in a vertical position, with the opposite side of said paper exposed to the camera, or two hundred and seventy degrees from the position shown in Fig. 14. After such second exposure has been made the holder is again rotated into the position shown in Fig. 14 and the check removed and another inserted thereinto. As a further and separate improvement I have provided means for automatically opening the leaves of said holder when it has made a complete rotation and is brought to the horizontal position shown in Fig. 14. For this purpose said leaves of the holder are provided at each end thereof with opening-springs B⁶, herein shown as being of generally U shape and attached at its extremity to the end members of the leaves. The latches b' are pivoted between their ends to endwise-movable plungers or rods b⁵, which slide in guide-lugs on the end members of the leaf. Said latches b⁵ are pivoted at their ends to the leaf by means of bolts or screws b⁷, as shown in Fig. 14. Surrounding each rod or plunger b⁵ and located between one of the guide-lugs and a pin b⁸, extending transversely through said rod, is a spiral expansively-acting spring b⁹, which acts normally to thrust said rod in-

wardly, and thereby close the latch connected therewith. The vertical parts of the frames B^a are provided with cam projections b¹⁰, which are located in position to engage the inner ends of said endwise-movable rods or plungers b⁵ just before the holder assumes the horizontal position shown in Fig. 14, thereby moving said latches out of engagement with the lugs b² and allowing the leaf B' of said holder to rise or open under the influence of the opening-springs B⁶. In this manner the said holder is automatically opened at the completion of its rotation to permit a check to be removed therefrom and another inserted thereinto.

As before stated, all of the operations required for actuating the film-feeding devices, the shutter mechanism, and the holder in the manner described are automatically accomplished in sequence by the closing of the main operating-circuit. The mechanical devices and electrical connection by which this result is secured are shown more clearly in Figs. 10 to 16, inclusive, and are made as follows: Projecting from the holder-frame B^a is an extension-frame B⁷, which is shown as supported at its projecting end upon a column or standard. The trunnion b⁴, upon which the holder-leaves rotate, extends through and has bearing in the adjacent end of the extension-frame, as shown in Fig. 10. N, Figs. 10 and 11, designates a rotative shaft located in axial alinement with the trunnion b⁴ and mounted in vertical bearing members b¹¹ in said extension-frame, with its end adjacent to the end of said trunnion. Said shaft N is continuously rotated through the medium of a worm-gear mechanism comprising a worm-wheel N', Figs. 10 and 11, affixed to the end of the shaft outside of the extension-frame B⁷, a worm-shaft N², mounted in bearings in said frame and engaging said worm-wheel, and a pulley N³, affixed to the worm-shaft and through the medium of which power is applied from any suitable source to operate the device. Said trunnion b⁴ is adapted to be at intervals locked to and rotate said shaft, whereby the holder is at such times rotated by said shaft. For the purpose of locking said shaft and trunnion together an electrical clutch device is provided, which consists of an electromagnet O, contained in a casing O', which is affixed to said shaft, and a flange O², connected with said trunnion in a manner to turn therewith, but being adapted to slide toward and from said magnet. As herein shown, said flange is attached to the end of a sleeve o, which is endwise movable but non-rotative on the trunnion by means of a radial pin o' in the trunnion, which engages a short longitudinal slot in the sleeve o, as shown in Fig. 12. The flange moves toward the magnet by the electromagnetic force of the magnet when the latter is energized and moves away therefrom when the magnet is deenergized under the influence of a spring O³ within the casing O'

and bearing outwardly against said sleeve o , as shown in Fig. 12. Attached to or formed on said sleeve o , so as to rotate therewith, are two cams $o^2 o^3$, which form parts of a circuit-controlling device, as will hereinafter more fully appear. Located on said shaft outside of the holder-clutch device described are two sets or groups of cams which are normally free on the shaft, but adapted to be locked thereto to rotate therewith. One set or group of cams comprises two individual cams $P P'$, which rotate with a sleeve P^3 , loosely mounted on said shaft. Said sleeve P^3 is adapted to be locked to said shaft by means of an electrical clutch device made like the holder-clutch device heretofore described and consisting of a magnet P^4 , contained in a casing P^5 , affixed to said shaft, and a flange or disk P^6 , affixed to the sleeve, said disk when the magnet is energized being locked to and rotating with the magnet, and thereby causing the cams to rotate therewith, and being moved away from the magnet when the latter is deenergized by a spring p , acting in the manner of the spring O^3 described. The last-described clutch is associated with the operation of the film-feeding devices and is hereinafter termed the "film-feed" clutch. A third group of cams is located at the end of the shaft N and embraces three individual cams $Q Q' Q^2$, which rotate with a sleeve Q^3 , loosely mounted on the shaft. Said cams are adapted to be locked in the shaft to rotate therewith by means of an electrical clutch device like those heretofore described, embracing an electromagnet Q^4 , contained within a casing Q^5 , affixed to and turning with the shaft, a disk or flange Q^6 , attached to the sleeve Q^3 , and a spring q , tending to hold separated the magnet and disk. Said last-mentioned clutch and cams effect the operation of the shutter mechanism and is hereinafter termed the "shutter-clutch." The hubs o^4 , p' , and q' of said casings of the clutches are provided with metallic collector-rings $o^5 p^2 q^2$, respectively, each of which is insulated from its casing and is connected with one terminal of its associated magnet, the other terminal of said magnet being connected with the casing and there-through with the shaft. The shaft is electrically connected, through its bearings, with the extension-frame B^7 . Said cams constitute parts of a circuit-closing device, and each co-operates with a circuit-closer or switch. (Designated as a whole by the letter R and shown in detail in Fig. 3.) Said circuit-closer consists of a bracket R' , which is attached to the upper member of the extension-frame B^7 and projects downwardly therefrom, there being one circuit-closer for each cam and each circuit-closer being located in line with its cam. The lower end of the bracket R' is provided with an aperture, through which extends a plunger r , adapted to bear against the periphery of the adjacent cam.

R^2 designates a metallic spring strip or wire, which is embedded in a block of insulation r' ,

attached to the bracket R' and carrying at its outer end a contact-piece r^2 . R^3 designates a metallic plate, which forms the outer face of said bracket and is mounted on a block of insulation r^3 . Passing through said plate through the blocks $r' r^3$ of the insulation and insulated from said plate in the usual manner is a binding-post R^4 , which is connected at its inner end with the strip R^2 .

R^5 designates a second binding-post attached to the plate R^3 , and connected with the inner end of said second binding-post is a strip R^6 , which is provided at its outer end with a contact-piece r^4 , adapted for contact with said piece r^2 . The parts of the device are held together by screws suitably insulated from the parts, as shown in said Fig. 13. Said cams $o o^2 P P' Q Q' Q^2$ are provided on their peripheries with notches or depressions and elevations, and when the plunger r of one of said circuit-closers R engages one of the notches of one of said cams the spring R^2 acts to separate the contact-pieces $r^2 r^4$ and open the circuit at this point. When, on the other hand, said plunger engages or rides over the wider portion or projection of said cam, the contact-pieces are brought together and the circuit closed between the same. The contours of the cams are shown in Fig. 15, the cams being shown in their natural groups and certain of the cams of each group being enlarged for the purpose of showing the elevations and depressions on the peripheries thereof in proper relation with respect to each other. In order to designate said cams with respect to their functions and to facilitate reference thereto hereinafter, the following names are given to said cams: cam o^2 , "starter-cam for shutter-cam;" cam o^3 , "holder stop-cam;" cam P , "film stop-cam;" cam P' , "film-feed cam;" cam Q , "stop-cam;" cam Q' , "shutter-cam," and cam Q^2 , "starter-cam for holder." The horizontal line passing axially through the groups of cams (shown in Fig. 15) indicates the starting-line of the cams or, in other words, the relative position of said cams before the device is started into operation. From this diagram it will be observed that all of the plungers r of the circuit-closers R are prior to the beginning of the operation of the device engaged with the depressed or lowest portions of the cams, so that all the circuits are open.

In Fig. 16 is illustrated diagrammatically the manner of connecting the various parts described with the source of energy, whereby is automatically accomplished the various operations necessary to photographing two sides of a writing contained within the holder. In said diagram, S is a battery, herein shown as a storage battery, and which is charged from the same source which furnishes current for the arc-light D . In said arc-light circuit is included a resistance-coil d' , and a portion of the energy not required for the light is stored in the battery S and employed as energy to effect the various operations of

the device. One pole—the positive pole—of said battery is connected by wire 1 and branch wires 2 with one of the binding-posts of each of the circuit-closers R. The other pole of the battery is connected by wire 3 with the frame B⁷, in which the shaft N is mounted, and constitutes a common return-wire.

4 and 4^a designate parts of a normally open wire, closed by a push-button or spring-retracted switch 5, and said wires lead from the positive pole of the battery and are provided with branches 6 and 7, the former being connected with a brush 8, having contact with the collector-ring *p*² of the film-feed clutch.

9 is a wire leading from one of the binding-posts of the circuit-closer R, associated with the film-feeding-device cam to the solenoid or solenoids G⁴ for actuating the film-feeding devices, and 10 a wire leading from said solenoid to the negative pole of the battery.

11 and 12 are wires of a relay-circuit, which include a part of the battery S and broken at terminals 13 and 14, and said circuit includes a solenoid T of a relay-circuit, which latter comprises wires 15 and 16, the former connected with the positive pole of the battery and the latter to a brush 17, which has contact with collecting-ring *o*⁵ of the holder-clutch device and provided with a branch 18, which leads to one of the binding-posts of the current-closer associated with the holder stop-cam *o*³. Said relay-circuit, embracing the wires 11 and 12, is closed by means of a switch *g*⁴, attached to the core of the solenoid G⁴, and which switch is moved into contact with the terminals 13 and 14 when said core is moved inwardly to actuate the film-feeding devices.

19 is a wire leading from one binding-post of the circuit-closer associated with the starter-cam for shutter-cam *o*² to brush 20, which moves in contact with collector-ring *q*² of the shutter clutch device, and 21 is a branch of wire 19, leading to one of the binding-posts of the circuit-closer associated with shutter stop-cam Q. 22 is a wire leading from one of the binding-posts of the circuit-closer associated with the shutter-cam Q' to the solenoid K, which operates the shutter, and 23 is a wire leading from said solenoid K to the negative pole of the battery S. Wires 24 and 25 constitute a local circuit, in which are included a portion of the cells of battery S and which includes also a solenoid U of a relay-circuit, which latter embraces a wire 26, connected with wire 4 and therethrough to battery S, and a wire 27, connected with wire 4^a and therethrough to wires 6 and 7. The local circuit, embracing wires 24 and 25, is broken at terminals 28 and 29 and is adapted to be closed by means of a pivoted switch-lever *j*⁸, (see Figs. 8 and 9,) having essentially the structural form of a bell-crank lever, which is pivoted on a pin *j*⁹, projecting inwardly from the front wall of the camera-box. Said switch-lever is oscillated to close said local circuit by means of pins or projections *j*¹⁰ on the shutter-disk, of which there are three

disposed symmetrically about the shutter-disk.

30 is a wire leading from one of the binding-posts of the circuit-closer associated with the starter-cam for holder Q² to wire 16 and thence to brush 17 of the holder-clutch.

The operation of the apparatus thus constructed is as follows: In the beginning all the circuits are opened, the plungers of the closing devices occupying the depressed portions of the cams. The main actuating-circuit is closed by means of the push-button or switch 5 from the positive pole of the battery through wires 4 4^a, thence to brush 8, collector-ring *p*², magnet P⁴, shaft N, back by wire 3 to the negative pole of the battery. The closing of the circuit energizes the magnet P⁴ of the film-feed clutch and causes the sleeve P³ and cams P P' to rotate with the shaft N so long as said clutch-magnet is energized. Said shaft N is continuously rotated, and when the film-clutch is operated the sleeve P³ and cams P P' rotate with the shaft. The first effect of turning said cams is to actuate the circuit-closer R associated with the stop-cam film P, the plunger *r* of said closer riding upon the elevated part of said cam and closing a circuit through wire 7 and brush 8 to one pole of the battery and one of the branch wires 2 and wire 1 to the other pole of the battery. The film-clutch-operating circuit is closed through push-button 5 momentarily only and for the purpose of establishing the circuit through circuit-closer R, associated with stop-cam for film P. The notches in this cam are short and located at diametrically opposite points in the periphery thereof, whereby said circuit will remain closed and the clutch locked during one-half of the rotation of said shaft. Shortly after the cam P begins its rotation the film-feeding cam P', which rotates therewith, actuates the circuit-closer R associated therewith and closes the film-feed circuit through wire 9, solenoid G⁴, wire 10 to one pole of battery and branch wire 2 and feed-wire 1 to the other pole of battery. The closing of this circuit energizes solenoid G⁴ and actuates the feed-rollers G and H in the manner described. The film-feed cam P' is provided with two diametrically-opposed projections and closes the film-feed circuit twice in each operation of the machine to present a fresh section of the film for each of the two exposures of the paper in the holder. The retraction of the core of the solenoid G⁴, which occurs when said film-feeding devices are operated, acts through the circuit-closing lever *g*⁴ to close the relay-circuit consisting of wires 11 and 12 and terminals 13 and 14 and energize the relay-solenoid T and therethrough close the holder-clutch circuit through wires 15 and 4 to battery and wire 16, brush 17, and collector *o*⁵ to magnet O of said clutch, thence by return-wire 3 to the other pole of battery. At this time the holder occupies a horizontal position, as shown in Fig. 14, and the circuit-

closer R, associated with the holder stop-cam o^3 , occupies the intermediate notch in said cam. The holder-clutch operates when energized by the closing of the circuit in the manner described to lock the sleeve o and cams o^2 o^3 to rotate with the shaft N. The holder-clutch circuit through the solenoid T is closed only long enough to start the rotation of the cams o^2 o^3 when it is opened by the opening of the relay-circuit at terminals 13 and 14. Before said holder-clutch circuit is opened the holder stop-cam o^3 has rotated sufficiently to act on its associated circuit-closer R to establish a circuit through wire 18, brush 17, collector-ring o^5 , magnet O, and return-wire 3 to one pole of battery and branch wire 2 and feed-wire 1 to other pole of battery. This circuit is closed until rotation of the holder-stop cam brings the first notch in advance of said intermediate notch of said cam in line with the plunger of its associated circuit-closer R, when said circuit is opened at this point and the holder is stopped. This occurs when the holder has reached a vertical position and is ready to present one side of the inclosed paper for exposure. The next mechanical operation to be performed, the film and holder being in proper position for exposure, is to actuate the shutter mechanism to make an exposure therethrough. Just prior to the opening of the holder-clutch circuit in the manner described the starter-cam for the shutter-cam o^2 operates, through its associated circuit-closer R, to close the shutter-clutch circuit through wire 19, brush 20, collector-ring q^2 , magnet Q^4 , and return-wire 3 to one pole of the battery and one of branch wire 2 and feed-wire 1 to other pole of battery. The closing of this circuit is effected by the short projections on the periphery of cam o^2 , which are located in advance of the notches of the cam o^3 , as shown in Fig. 15. The closing of this circuit is momentarily, but is of sufficient duration to lock the cams Q Q' Q^2 to rotate with the shaft through the shutter-clutch and to establish a current through wire 21, connected with the circuit-closer associated with cam Q , brush 20, collector-ring q^2 , magnet Q^4 , back to one pole of battery through return-wire 3 and to the other pole of the battery through feed-wire 1 and branch 2. Said cam Q is provided with diametrically-opposed peripheral notches, so that the circuit controlled thereby is closed during one-half of the rotation of the shaft. The shutter-cam Q' is provided in rear of each notch of the cam Q with two projections, separated by a short intervening depression, the pairs of projections being located at opposite sides of said cam. Shortly after the shutter-clutch is operated, therefore, to rotate said cams Q Q' Q^2 one of said projections of the shutter-cam Q' acts on its associated circuit-closer R to close the shutter-actuating circuit through wire 22, solenoid K, and wire 23 to one pole of battery and one of branch wires 2 and feed-wire 1 to other pole of bat-

tery. The projections and notches on shutter-cam are arranged to actuate the shutter for time-exposure. The movement effected in the shutter by the first closing of the circuit is to bring one of the shutter-openings j^2 into line with the exposure-opening of the plate J, after which the circuit is opened, and the shutter remains in this position while the plunger r of the associated circuit-closer is traversing the notch or depression between the projections of said cam. When the second notch engages said plunger, the circuit is again closed and the shutter is moved to close the exposure-opening in the plate J. One complete operation of recording one side or face of the writing in the holder has thus far taken place, and in a machine for effecting the automatic recording of both sides or faces of the paper means independent of the push-button 5 are provided for closing a circuit through the film-feed clutch, which repeats the operations just described. Such closing of the film-feed-clutch circuit is effected through the medium of the relay-circuit, embracing wires 24 and 25, terminals 28 and 29, and solenoid U. Said relay-circuit is closed at the terminals 28 and 29 by means of the switch-lever j^8 , which is actuated by the pins j^{10} on the shutter. The energizing of the solenoid through said relay-circuit closes the film-feed-clutch circuit through wire 26, leading to and connected with wire 4, and wire 27, connected with wire 4^a, said wires taking the place of the push-button, which was originally employed to close said circuit. The operation of the film-feeding devices and the holder is the same as previously explained, with the exception that the holder is moved in its second operation through one hundred and eighty degrees, or from one vertical position to an opposite vertical position. A further variation of the second part of the operation of the apparatus is that at the close of the second operation of the shutter the relay-circuit, which immediately preceding such operation acted through the solenoid U to close the film-feeding-clutch circuit, is not closed by the shutter-actuated switch j^8 . This is due to the fact that before another sequence of operations shall take place to record the two sides or faces of a paper held in the holder it is necessary that the paper just recorded be removed and another inserted in its place. It is necessary, therefore, to operate the holder by independent means to bring it from the second vertical position in which the second side or face of the paper was photographed to a horizontal position, as shown in Fig. 14, to permit the recorded paper to be removed and another inserted thereinto. For this purpose but three pins j^{10} are provided on the shutter. Said shutter moves in each complete operation thereof one-sixth of a revolution, so that if the parts be in the position shown in Fig. 16 at the beginning of the operation one of the pins j^{10} will act in the first operation of the shutter to close the

relay-circuit and therethrough to start the second part of the operation of the apparatus. In the next operation of the shutter, however, the succeeding projection j^{10} of the shutter does not come into contact with the switch-lever j^8 , so that said film-feed-clutch circuit is not closed thereby. In order to close the holder-clutch circuit to turn said holder to a horizontal position to recharge said holder before the series of operations are again started, the cam Q^3 is provided, having a single projection which is adapted, through its associated circuit-closer R and subsequently to the second operation of the shutter, to close a circuit through the holder-clutch embracing a wire 30, leading to wire 16, and a branch wire 2, leading to feed-wire 1. Said circuit is closed and the holder rotated until the intermediate notch of the holder-stop cam is brought in line with the plunger of its associated circuit-closer, when said circuit is opened and the holder stopped in a horizontal position. At this time it will be seen that all the circuits are open, and the operations described are repeated by substituting another paper in the holder and closing the film-feed-clutch circuit by means of the push-button 5.

A convenient form of the brushes and supports therefor (designated as 8, 17, and 20 in Fig. 16) is shown in Fig. 13^a. As therein shown, V designates a bracket similar to the brackets of the circuit-closers R and attached in a similar manner to the extension-frame B^7 . Said bracket is provided with a downwardly-extending arm V' , which is apertured for the passage of a carbon-brush V^2 , which bears against the collector-ring of its associated clutch, said brush being insulated from said arm in the manner shown.

v is a binding-post attached to and entering a plate 21, forming a part of the bracket V and insulated from the main body of said bracket in the manner shown, and 22 is a wire or strip connected with the binding-screw and with the carbon brush V^2 . Said strip or wire acts as a spring to press or hold the brush in contact with its collector-ring. Desirably a friction-brake is applied to the holder to overcome the inertia of its rotation at the time the holder-clutch is released, and thereby preventing said holder moving past its position of rest a distance to again close the holder-clutch circuit. The friction device is shown in Figs. 10 and 10^a and is made as follows:

W designates a friction-disk attached to the outer end of the holder trunnion or shaft b^3 , in its part extending past the frame. W' designates an endwise-movable rod or plunger located below said disk, which slides in bearing-lugs formed on the holder-frame, and said rod is constructed at its upper end to form a shoe which coöperates with said disk. The shoe is desirably faced with a material different from that of the disk W . If, for instance, said disk be even, the facing of the shoe will be wood. The shoe is pressed against the disk

W by means of a spiral expansively-acting spring w , which surrounds said rod and bears at one end against one of the bearing-lugs for said rod and at its other end against a nut w' , which has screw-threaded engagement with the rod. This construction enables the tension of the spring to be varied and the frictional resistance of the brake controlled as desired.

It is obvious that many changes may be made in the details of construction without departing from the spirit of my invention, and I do not wish to be limited to such details except as hereinafter made the subject of specific claims.

I claim as my invention—

1. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a power-driven part normally independent of the holder and means operated by said power-driven part for effecting the operations of said strip-feeding device, the shutter and the holder.

2. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, electrically-actuated devices for operating said strip-feeding and shutter mechanisms and the holder, and circuit-controlling means embracing a switch for starting one of said parts, the operation of the other parts being automatically accomplished in sequence.

3. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a power-driven part, electrically-operated actuating devices for operating said strip-feeding mechanism, the shutter mechanism and the holder, and circuit-controlling means actuated by said power-driven part for bringing into operation said actuating devices.

4. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a power-driven shaft, electrically-actuated operating devices for operating said strip-feeding mechanism, the shutter mechanism and holder, and circuit-controlling means, embracing cams on said shaft, for bringing into operation said actuating devices.

5. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a shaft with which said holder rotates, a power-driven shaft, an electromagnetic clutch for locking said power-driven shaft to the holder-shaft, electrically-operated actuating devices for said strip-feeding and clutch mechanisms and circuit-controlling means operated by said shafts for bringing into operation said clutch and said actuating devices.

6. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a shaft with which said holder rotates, a power-driven shaft, electrically-operated actuating devices for the strip-feeding and shutter mechanism, an electromagnetic clutch for locking said holder-shaft to the power-driven shaft, and circuit-controlling means, embracing cams on said shafts, for bringing into operation said clutch and actuating devices.

7. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a shaft with which said holder rotates, a power-driven shaft, electrically-operated actuating devices for the strip-feeding and shutter mechanisms, an electromagnetic clutch for locking said holder-shaft to the power-driven shaft, a group of cams which rotate with the holder-shaft, groups of cams loosely mounted on the power-driven shaft, an electromagnetic clutch for locking each of said last-mentioned groups of cams to said power-driven shaft, and circuit-controlling devices operated by said cams for bringing into operation said strip-feeding and shutter mechanism and said clutches.

8. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a rotary holder for the papers to be recorded, a shaft with which said holder rotates, a power-driven shaft, an electromagnet-clutch for locking said power-driven shaft to the holder-shaft, electrically-actuated operating devices for said strip-feeding and clutch mechanisms, circuit-controlling devices operated by said shafts for bringing into operation said actuating devices for the strip-feeding and shutter mechanisms, and means actuated by the strip-feeding mechanism for controlling the circuit through the holder-clutch.

9. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a power-driven shaft, electrically-actuated devices for operating said strip-feeding mechanism, the shutter mechanism, and holder, circuit-controlling means on said shaft for bringing into operation said actuating devices for effecting the operations to photograph one side of the paper, and circuit-controlling means actuated by the shutter mechanism for effecting a repetition of the operations of the several mechanisms to photograph the other side of the paper.

10. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, a power-driven shaft, electrically-actuated devices for operating said strip-feeding mechanism, the shutter mechanism and holder, circuit-controlling means on said shaft for bringing into

operation the said actuating devices for effecting the operations to photograph one side of the paper, means actuated by the shutter mechanism for effecting a repetition of the operation of the several mechanisms to photograph the other side of the paper, and circuit-controlling means operated by said shaft for operating the holder-actuating devices to turn the holder from its second-exposure position to a horizontal position.

11. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism embracing a rotary disk provided with peripheral teeth or projections, an actuating solenoid, a pawl-and-ratchet mechanism connected with the core of said solenoid for rotating said shutter-disk, and a stop-arm connected with said core and provided at its free end with a stop projection adapted, when the core is drawn inwardly, to rotate the cam and to be brought into the path of one of said teeth or projections.

12. The combination with a photographic camera, of means for feeding a sensitized strip step by step, and a rotative holder embracing two leaves hinged together at one margin thereof and provided with locking means at the other margin thereof, and means for automatically opening said holder at a point in its rotation.

13. The combination with a photographic camera, of a holder for the papers to be recorded comprising two leaves which rotate on a horizontal axis, a hinge joining said leaves at one side of the holder, means for detachably locking the leaves together, means for stopping said holder in two vertical positions, and in a horizontal position, and means for automatically opening said holder as it approaches its horizontal position or point of rest.

14. The combination with a photographic camera, of a holder for the papers to be recorded comprising two leaves which rotate on a horizontal axis, a hinge joining said leaves at one side of the holder, a spring applied to separate or open said leaves, means for detachably locking said leaves together, comprising a latch pivoted to one of said leaves, and a lug on the other leaf adapted for interlocking engagement with said latch, means for stopping said holder in two vertical positions and in a horizontal position, and a cam for releasing said latch when the holder reaches its horizontal position or point of rest.

15. The combination with a photographic camera, of a holder for the papers to be recorded comprising two leaves which rotate in a horizontal axis, a hinge joining said leaves at one side of the holder, a spring applied to separate or open said leaves, means for detachably locking the leaves together comprising a latch pivoted to one of said leaves, and a lug on the other leaf adapted for interlocking engagement with said latch, and a cam for releasing said latch when the

holder completes its rotation to permit the holder to open under the influence of its opening-spring.

16. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a shutter mechanism, a movable holder for the papers to be recorded, electrically-actuated means for operating said strip-feeding and shutter mechanisms and the holder, circuit-controlling means embracing a switch for starting one of said parts, the operation of the other parts being automatically accomplished in sequence, and a friction-brake for arresting the movement of the holder.

17. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a movable paper-holder, shutter mechanism, electrically-operated actuating devices for operating said strip-feeding mechanism, the holder and the shutter mechanism, circuit-controlling means for bringing into operation the actuating devices for the strip-feeding, shutter and holder actuating mechanisms, and means controlling the movement of the holder, embracing a relay-magnet, and a switch in the relay-magnet

circuit which is closed and opened by the movement of the strip-feeding mechanism.

18. The combination with a photographic camera, of means for feeding a sensitized strip step by step, a movable paper-holder, shutter mechanism embracing a rotative disk, electrically-operated actuating devices for operating said strip-feeding mechanism, the holder and the shutter-disk, circuit-controlling means for bringing into operation the actuating devices for effecting the apparatus to photograph one side of the paper, and means for effecting a repetition of the operation of said several mechanisms for photographing the other side of the paper comprising a relay-magnet, a switch in the relay-magnet circuit and pins carried by the disk and acting on said switch.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 5th day of November, A. D. 1901.

ACHILLES DE KHOTINSKY.

Witnesses:

C. CLARENCE POOLE,
BERTHA A. PRICE.