(No Model.) 7 Sheets—Sheet 1.

J. P. WRIGHT.

BOX FILLING MACHINE.

No. 595,233. Patented Dec. 7, 1897.

Fig. 1.

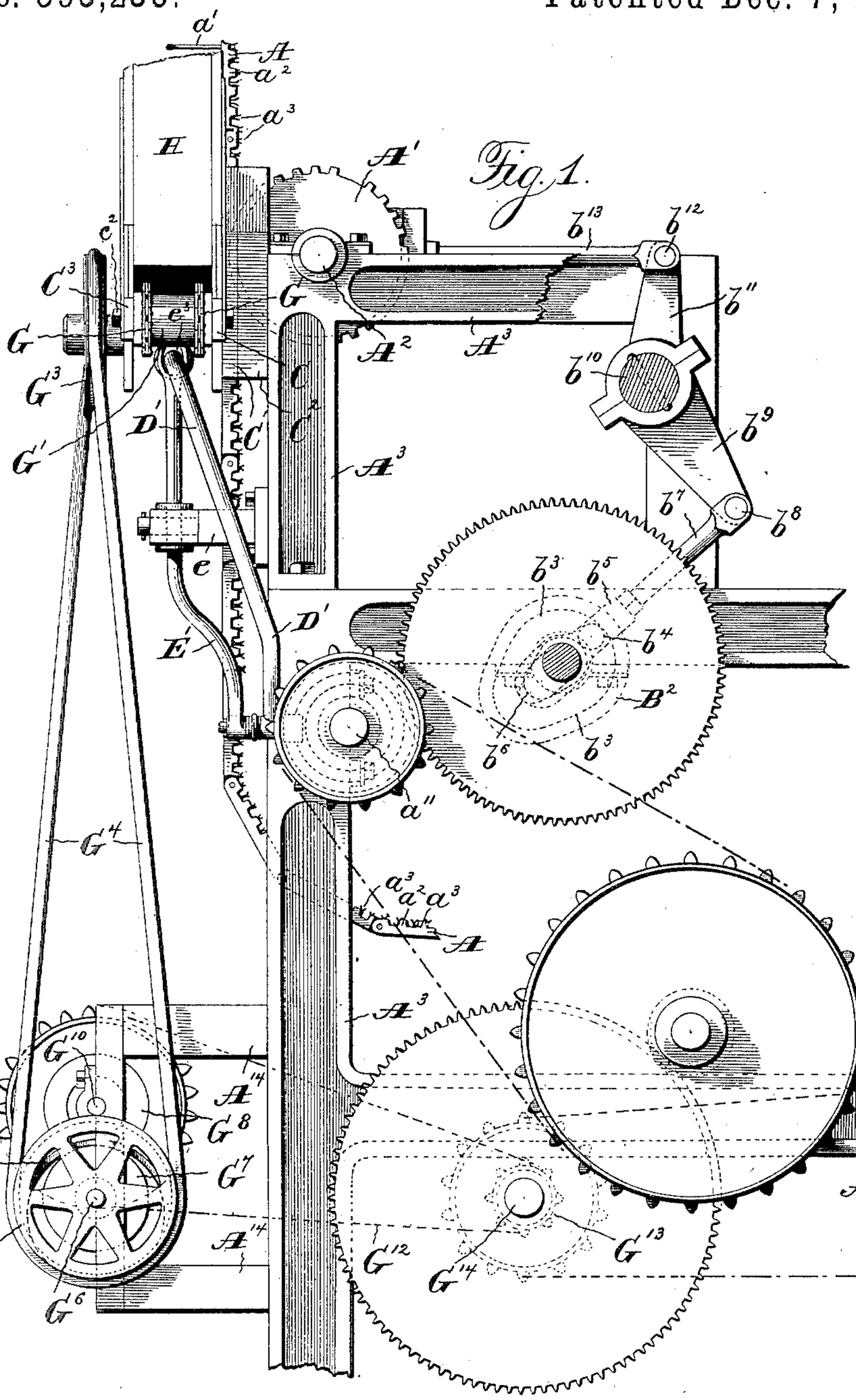

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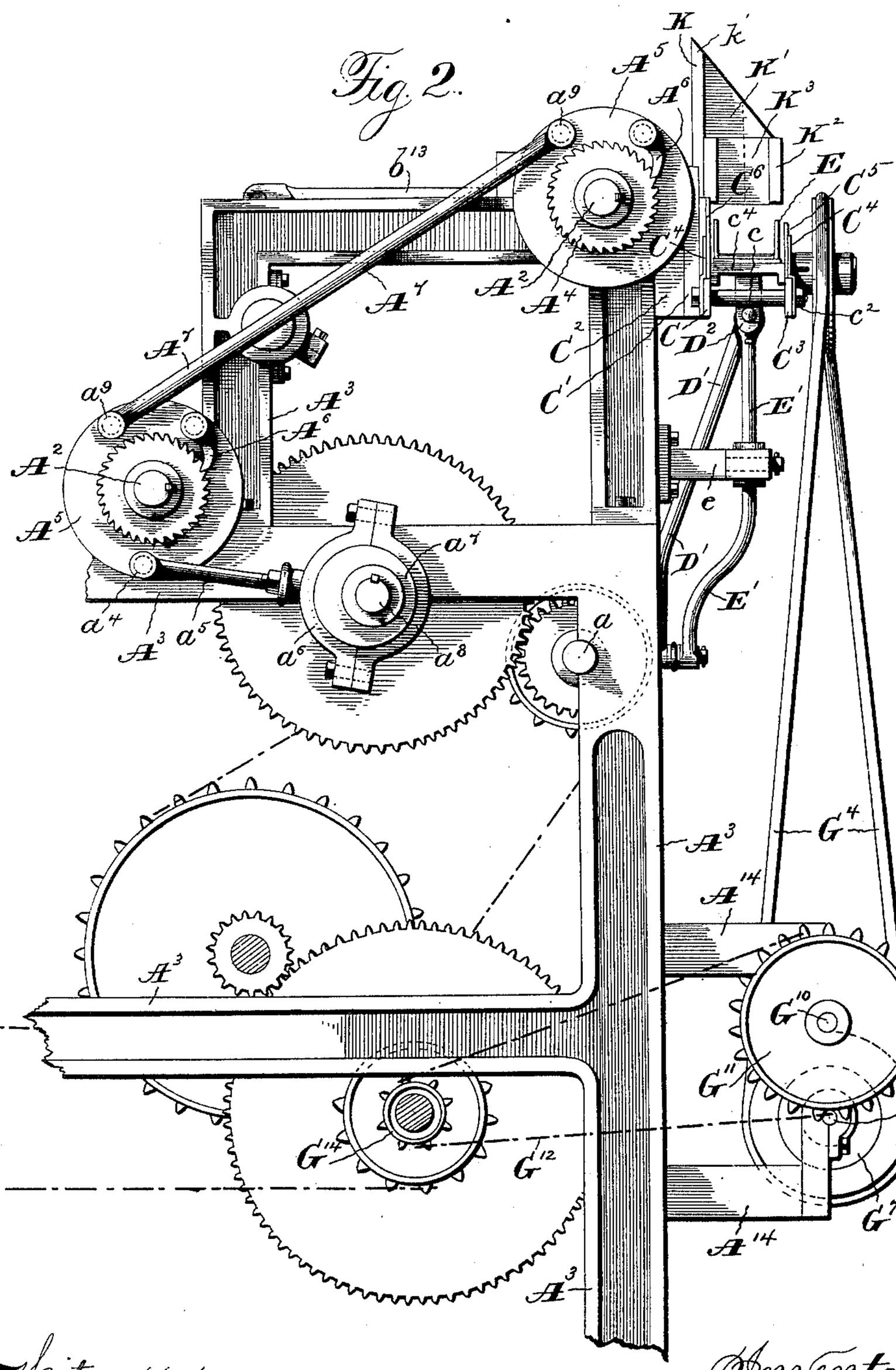
Fig. 2.



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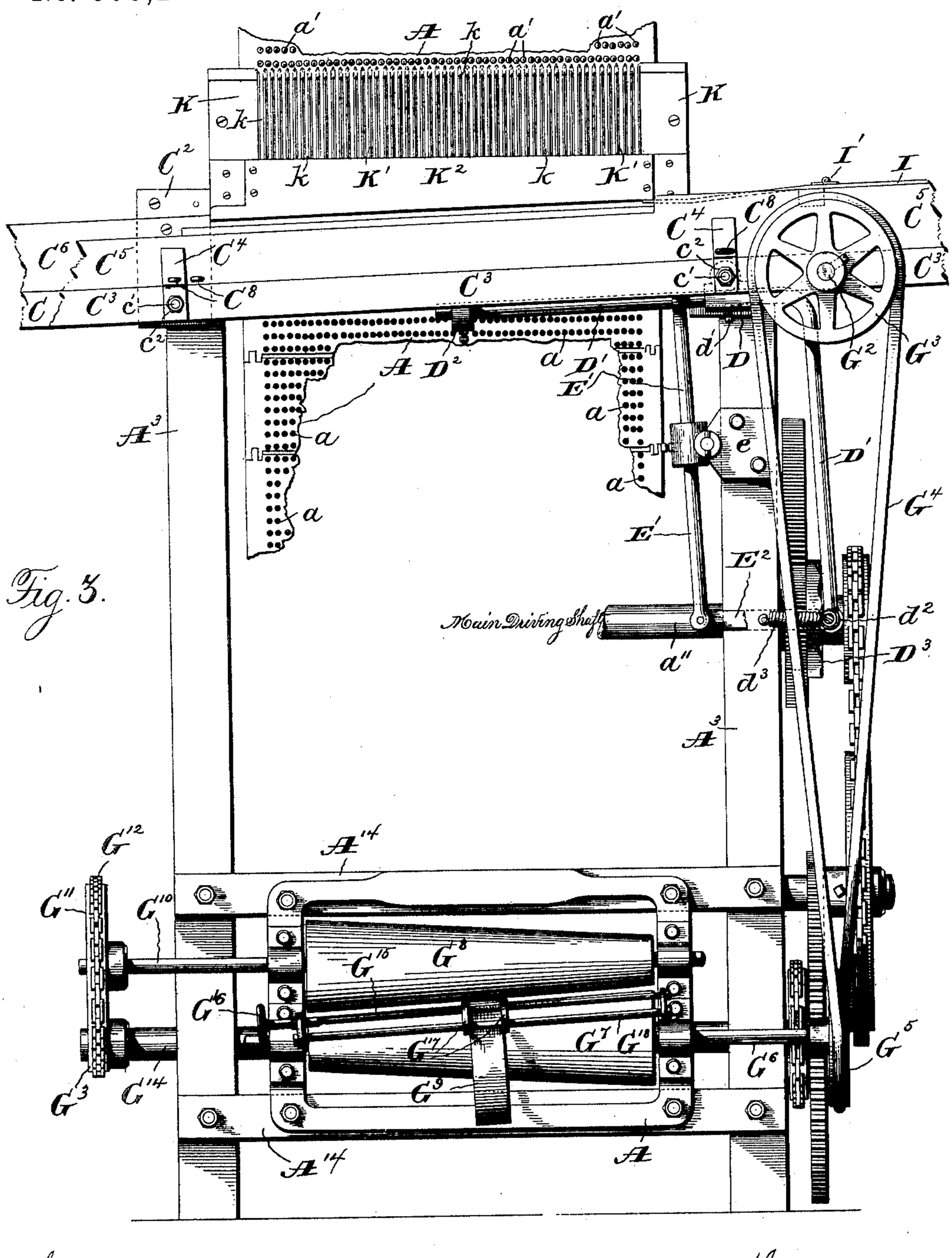

Fig. 3.

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Fig. 4.

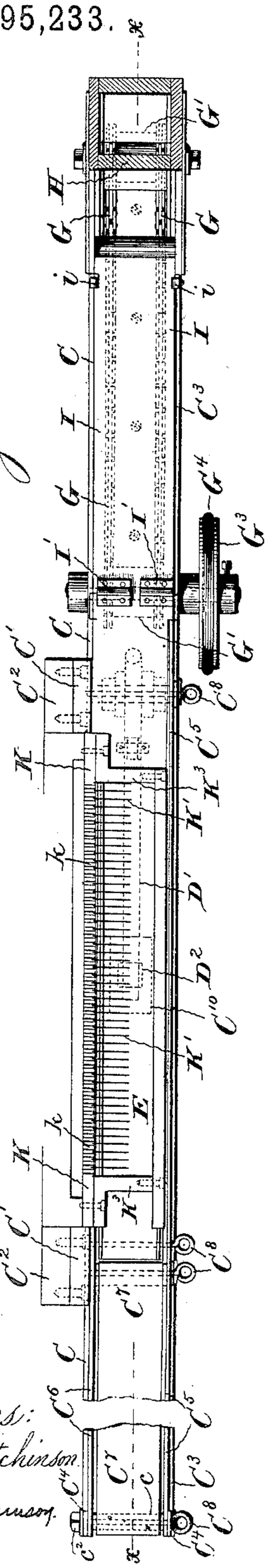
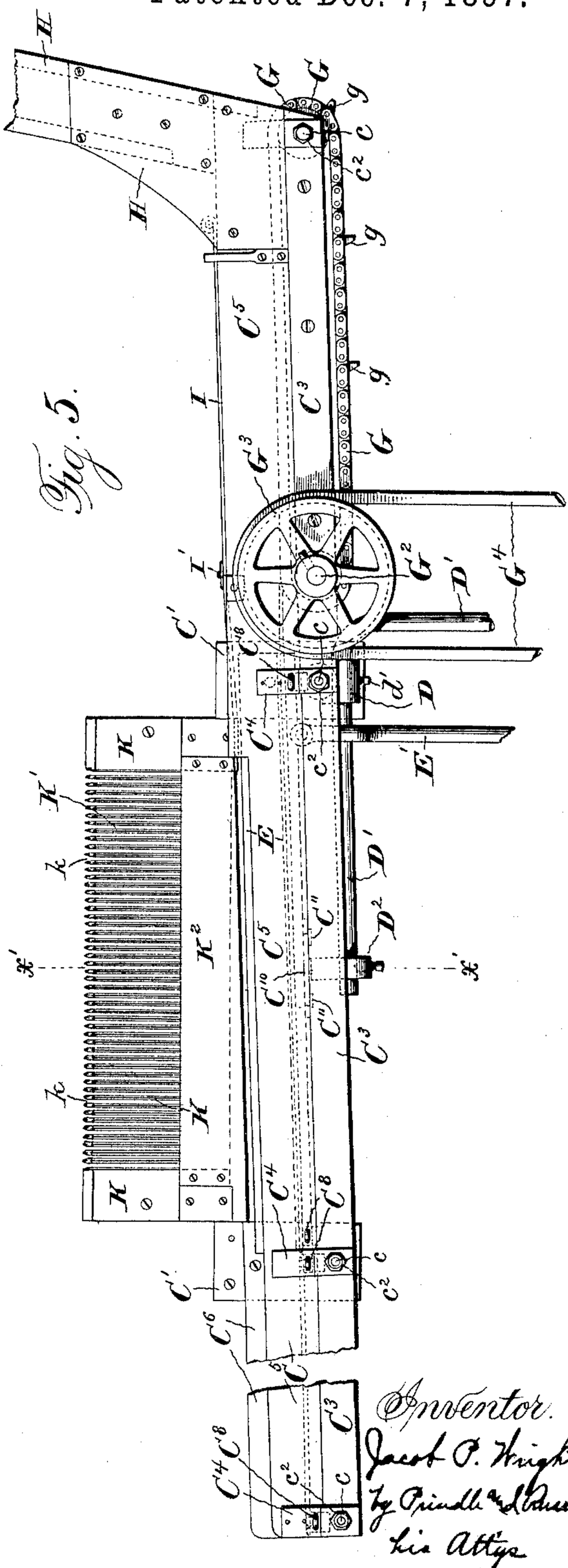


Fig. 5.



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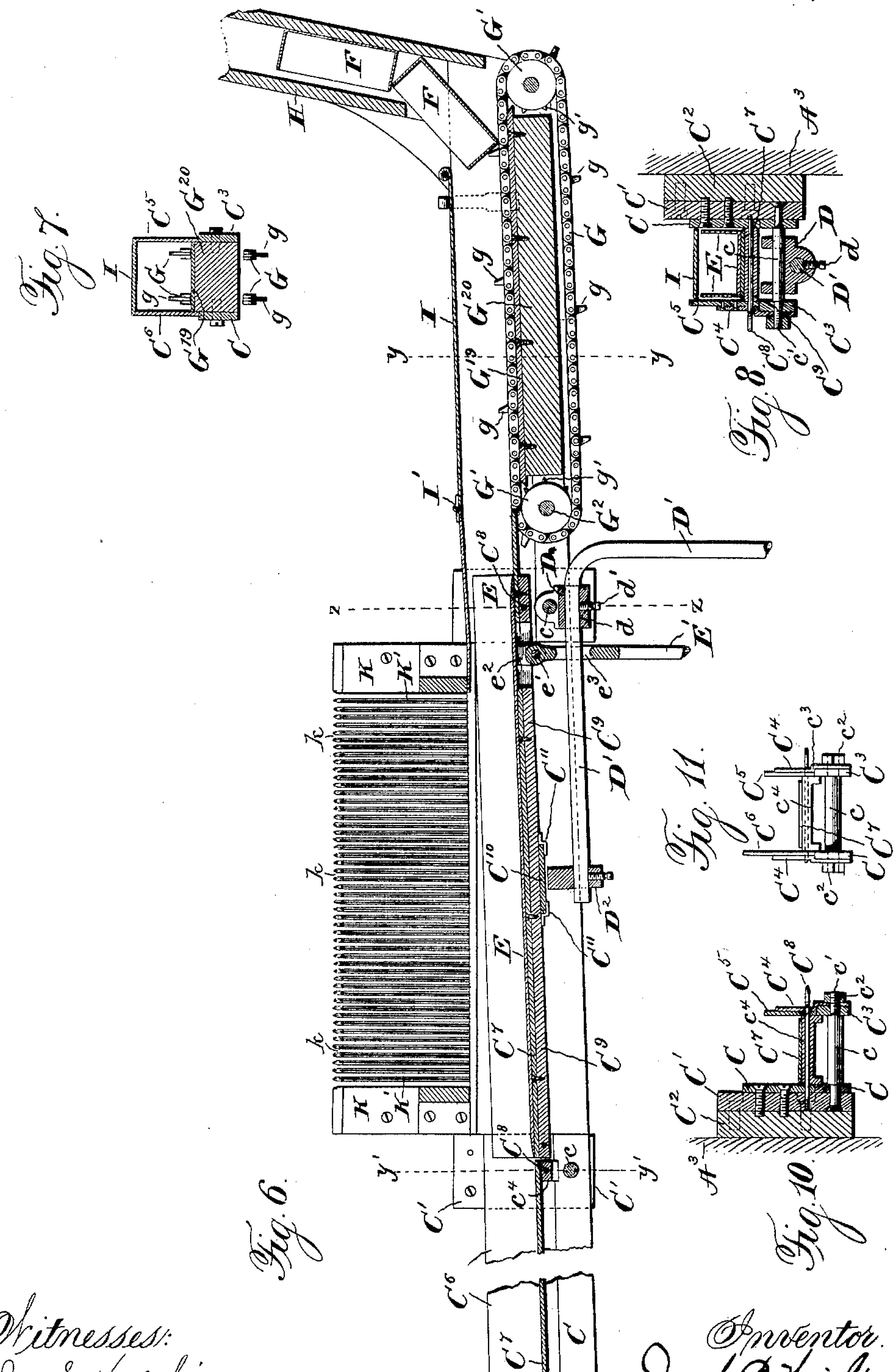

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Fig. 9.

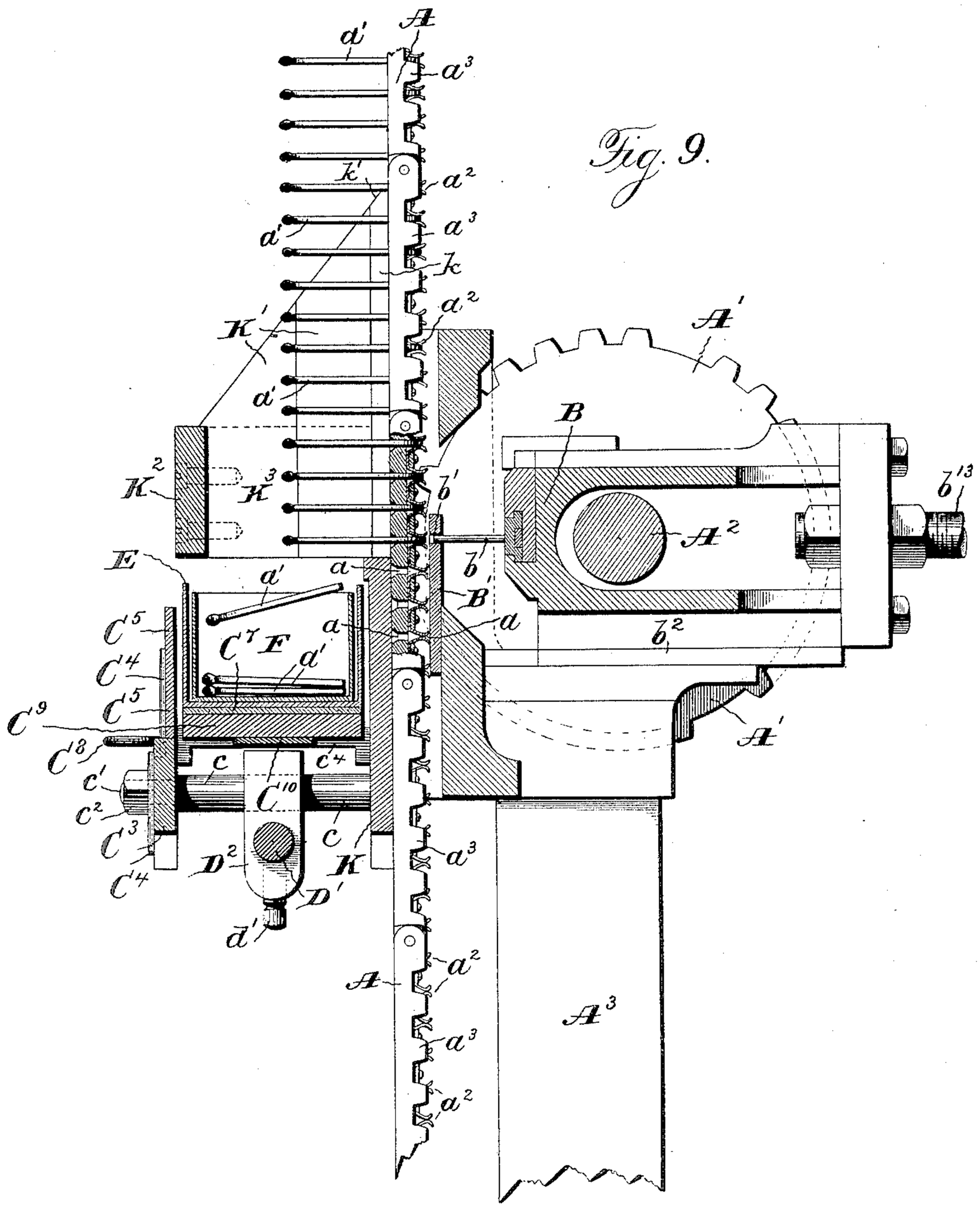

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Fig. 12.

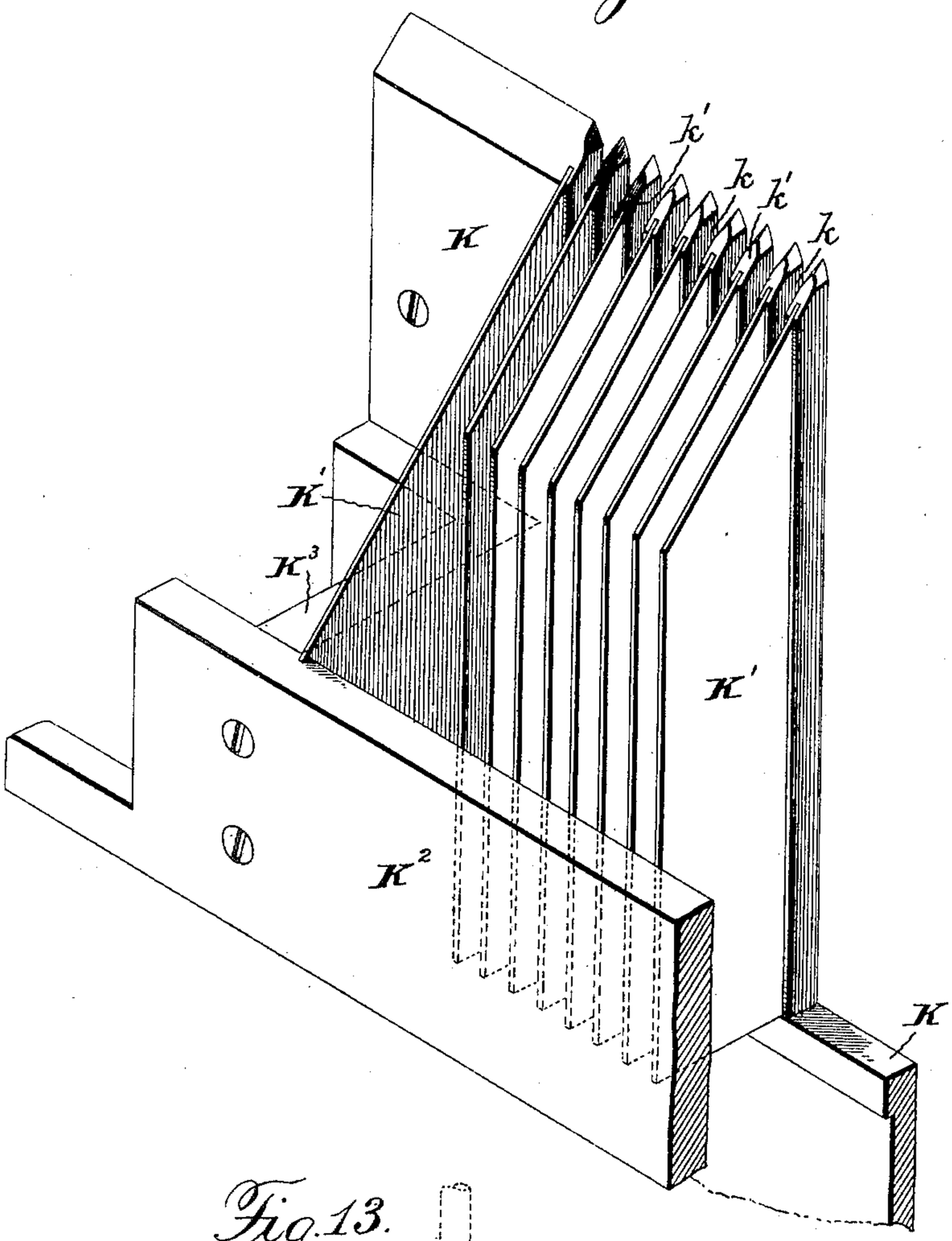
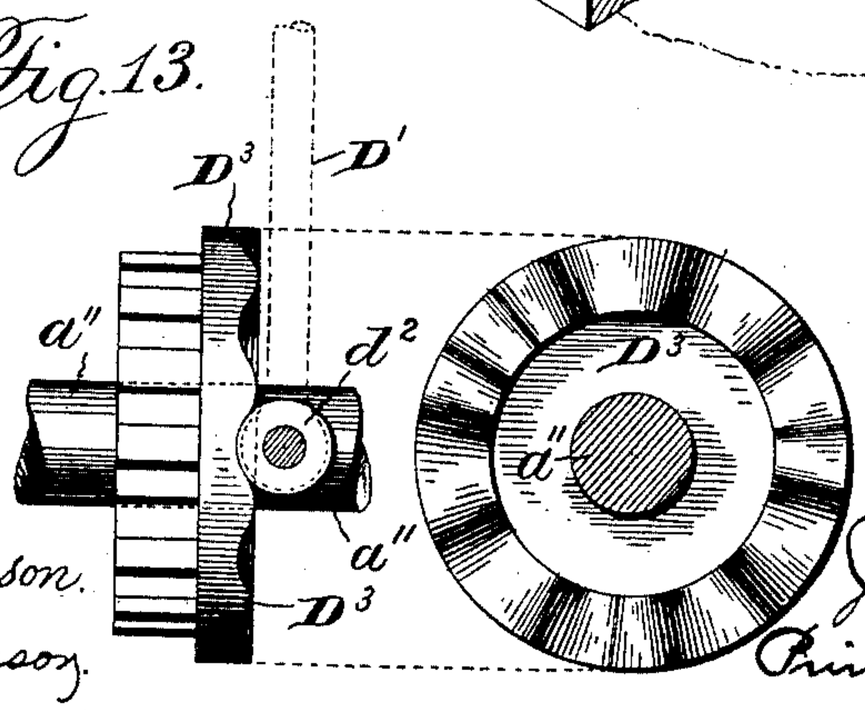


Fig. 13.



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UNITED STATES PATENT OFFICE.

JACOB P. WRIGHT, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO THE DIAMOND MATCH COMPANY, OF CHICAGO, ILLINOIS.

BOX-FILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 595,233, dated December 7, 1897.

Application filed August 14, 1896. Serial No. 602,807. (No model.)

To all whom it may concern:

Be it known that I, JACOB P. WRIGHT, of New Haven, in the county of New Haven, and in the State of Connecticut, have invented certain new and useful Improvements in Box-Filling Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows in side elevation my box-filler as applied to a match-making machine; Fig. 2, a similar view of the machine from the opposite side; Fig. 3, a view of my filler in front elevation; Fig. 4, a plan view of the same with the means for actuating the box jarring and shaking devices left off; Fig. 5, a view in front elevation of the mechanism shown in Fig. 4; Fig. 6, a view of a section on line $x\ x$ of Fig. 4; Fig. 7, a view of a section on line $y\ y$ of Fig. 6; Fig. 8, a view of a section on line $z\ z$ of Fig. 6; Fig. 9, a detail view, on an enlarged scale, showing the box-filler in section on line $x'\ x'$ of Fig. 5 and a portion of the match-making machine, partly in section and partly in side elevation; Fig. 10, a view of a section on line $y'\ y'$ of Fig. 6; Fig. 11, a detail view of the discharge end of the trough in elevation; Fig. 12, a detail view, on an enlarged scale, showing a portion of the filler in perspective; and Fig. 13, a detail view showing, on an enlarged scale, in front and side elevation, the cam-disk for actuating the box jarring and shaking devices.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention has been to provide an improved mechanism for boxing matches for use in connection with match-making machines in which the matches, being carried in rows held in a moving carrier, are ejected or delivered from the carrier in rows as such rows successively reach a certain point; and to this end my invention consists in the box-filling mechanism, in the parts thereof constructed, arranged, and combined as hereinafter specified, and in the combination of the box feeding, supporting, jarring, and shaking devices with the match-delivering mechanism, as hereinafter set forth.

While it has been my especial object to provide means for securing the even and regular filling of boxes with matches as delivered from the carrier of a match-making machine, I desire it to be understood that I do not limit myself to such use of my invention, but contemplate employing it also for the boxing of tooth-picks, sticks of any kind, pins, &c.

In the drawings I have shown my invention as applied to a match-making machine having a traveling match-holding carrier made up of a series of plates A A, provided with rows of perforations $a\ a$ to receive portions of the sticks or splints of the matches $a'\ a'$ and clamping devices $a^2\ a^2$ to grip and hold the ends of the sticks or splints projecting beyond the backs of the plates. Such special form of carrier is, however, not necessary for the securing of the proper and advantageous action of my filler. Any other kind of carrier adapted to hold the matches in rows could be used, whether it consisted merely of perforated plates, into the perforations of which the match-sticks or splints are forced so as to be gripped and held firmly thereby, or of pairs or sets of splint-clamping devices without perforated plates.

Whatever the form of carrier may be, it is desirable, for the best action of my box-filling mechanism, that it should be arranged to hold the matches in transversely-extending rows and bring such rows successively up to the ejecting or discharging device for forcing them out of the carrier.

While it is desirable that the matches should be so carried and delivered in rows, it is not absolutely essential that they should be. They might, instead, without departure from my invention be carried in other than transverse rows, or even in no rows at all, on the carrier, as long as when they are brought by the motion of the carrier to the discharging or ejecting point they will be discharged so as to form a broad falling stream of matches to be received by the boxes moved along across such stream in the manner to be described hereinafter.

The carrier shown in the drawings is given a step-by-step movement, each movement being of such an extent as to bring a new row of matches down to the point where they are to be ejected. Such travel of the carrier is caused by intermittently-moved toothed

wheels A′ A′, meshing with the teeth a^3 a^3 on the back of the carrier-plates. In the drawings I have shown only two of such wheels meshing with the plate-teeth at different points of the travel of the carrier. It will be understood, however, that at each of such points there are two of these wheels secured upon the same shaft, so as to turn together and arranged to engage two rows of teeth on the plates A A at or near the plate ends. The shafts A^2 A^2, carrying these wheels, are journaled in suitable bearings in the frame A^3 A^3 of the match-making machine, and each one carries fixed upon it a ratchet-wheel A^4. Journaled upon each shaft close to the respective ratchet-wheel is a disk A^5, carrying a pawl A^6 to engage the ratchet-wheel teeth. One of these disks A^5 is connected by a pin a^4 with the eccentric-rod a^5, which is connected with the eccentric-strap a^6, engaging the eccentric a^7, fixed on the rotating shaft a^8 of the match-making machine, journaled in suitable bearings on frame A^3 A^3. The pawl-disk A^5, which is thus connected with the eccentric-strap, is connected with the other pawl-disk A^5 by means of the connecting-rod A^7, engaging pins a^8 a^8 on the respective disks. With this construction as the shaft a^8 revolves the eccentric will cause both of the pawl-carrying disks to rock simultaneously back and forth, causing the pawls carried by them to engage and give a step-by-step movement to the ratchet-wheels A^4 A^4, and so to the shafts A^2 A^2 and toothed wheels A′ A′, fixed on such shaft, the result being the desired step-by-step advance of the carrier-plates A A.

The ejecting mechanism shown in the drawings is arranged to operate to eject a row of the matches from the plates each time that the carrier comes to rest after one of its described step-by-step movements. As shown, it consists of a head B, carrying a series of ejecting pins or punches b, one for each of the match-holding devices in one of the rows of the latter on the plates A A. Each of these pins or punches, being situated so as to be directly opposite the respective match-holding devices as the carrier comes to a rest, is preferably, though not necessarily, guided by a guide-opening b' in a guide-plate B′, attached to frame A^3 A^3.

The head B is guided so as to reciprocate in a straight line toward and from the carrier upon guides b^2 b^2, also supported on frame A^3 A^3. In order to give it the desired reciprocations to punch the rows of matches from the carrier at the proper times with relation to the travel of the carrier—that is, during the periods of rest of the latter—I actuate the head from the same shaft a^8 from which the carrier-moving devices are actuated. For this purpose such shaft is provided with a cam B^2, having the cam groove or way b^3 in its side engaging a roller or other bearing b^4 on a reciprocating piece b^5, which has a longitudinal guiding-slot b^6, through which the shaft a^8 passes. This piece b^5 is connected by rod b^7 with a pin b^8 on an arm b^9, fixed upon a rock-shaft b^{10}, journaled in suitable bearings on frame A^3 A^3. Fixed upon such shaft is a second arm b^{11}, carrying a pin b^{12}, engaging an opening in the rod b^{13}, which has its other end connected with the ejector-head B.

The cam groove or way b^3 is arranged with its greater part concentric with the shaft a^8 and the rest of it sharply eccentric, the object being to have the piece b^5 held stationary during most of each revolution of the shaft, and then to give it a quick outward-and-inward movement which is to be communicated to the head through the connections formed of the rods, rock-shaft, and arms above described.

The result of the described construction, the cam-groove being arranged so that its eccentric portion reaches and engages the roller or bearing b^4 on the piece b^5 just as the carrier comes to rest after each of its step-by-step advance movements, is that the ejector-head will be quickly advanced to eject a row of matches from the carrier and then retracted again before the carrier begins another advance movement. The machine will then, as long as the carrier is supplied with matches, go on discharging row after row of the latter, and with the advance movements of the carrier following each other closely the matches will be delivered in a substantially continuously-falling stream formed of successive rows of matches.

Attached to and extending out from opposite sides of the frame A^3 A^3 are the two plates C C, below the level of the point where the splints are ejected from the carrier. These plates, being parallel with each other, have their outer or front faces in a plane extending across in front of the carrier, as indicated in Figs. 1 and 4. They are supported from the frame A^3 A^3 through the medium of the two plates C′ C′, which are screwed to the side pieces or brackets C^2 C^2 on the sides of the frame-uprights. A long plate C^3, parallel to and corresponding in shape and height with plates C C, extends across in front of the match-carrier and as far as the outer ends of said plates C C and is connected rigidly with the latter by the distance-posts c c, having the reduced end portions c' c', passing out through openings in plates C C and C^3. As shown, there are two of these distance-posts, connecting the plates C^3 with each of the plates C C. Of these two posts the outer one has its two reduced end portions threaded and provided with the nuts c^2 c^2, between which and the outer faces of the adjoining plates are the clips C^4 C^4, through which the threaded portions of the posts pass. Each of the other distance-posts has its inner reduced end portion passing through an opening in one of the plates C′ and secured therein by heading down or otherwise, as desired, and its outer reduced end portion

threaded and passing out through plate C^3 and a clip C^4. Beyond this clip is a nut c^2, tapped onto the threaded part of the post.

With the above-described construction if the nuts c^2 c^2 be screwed down against the clips the plates C C and C^3, being firmly clamped against the abrupt ends of the main parts or bodies of the distance-posts, will form with the latter a strong rigid frame, secured to and supported from the machine-frame A^3 A^3 and carrying a series of clips C^4 C^4, for a purpose to be explained. While the transversely-extending frame thus formed and supported has the inner and outer faces of its plates parallel to the plane of the face of the match-carrier, it does not extend across the carrier-way at a right angle to the line of travel of the carrier, but is inclined from such position at a slight angle, as shown in Figs. 3, 5, and 6, so that at one side of the carrier-way it is lower than at the other.

The clips C^4 C^4 are provided with shoulders c^3, engaging a portion of the upper edges of the plates against which the clips are clamped. To those clips which are secured to the plate C^3 and project above the same is fastened the long thin plate C^5 to form the outer side of a trough or way for holding and guiding the match-receiving boxes as they are moved along across the carrier-way in the process of filling, as hereinafter specified. Similar shorter plates C^6 C^6 are secured to the end clips on the plates C C and to the plates C′ C′, so as to form the inner side or wall of the box-way or trough at points beyond the sides of the carrier-way.

Between the plates C^6 C^6 and plate C^5 are the transverse plates C^7, supported on pins C^8 C^8, passing through the clips C^4 C^4, the plates C^5 C^6 C^6, and through openings in blocks c^4 c^4 on the under sides of plates C^7. One of these plates C^7 C^7 extends across in front of the carrier-way and has its ends supported just beyond the sides of such way. To the under side of this plate I secure a flat piece of wood C^9, the object being to render the vibrations of the plate C^7 under the influence of the power of blows transmitted to it, from mechanism to be hereinafter described, sharper and quicker than the vibrations of the metal plate alone would be.

On the under side of the wooden strip or plate C^9 is secured a piece of leather C^{10}, which is held in place by the two cleats C^{11} C^{11}, screwed or otherwise fastened to the wooden strip or plate.

Upon one of the distance-posts c c I journal a rocking yoke D, having an opening d at right angles to the distance-post, through which extends a rod D′, carrying upon its end a head or striker D^2, adapted to strike the piece of leather C^{10}, above described. This rod is secured in place in the yoke D in any desired way, as by set-screw d', and beyond such yoke is bent downward, as shown in Figs. 3 and 6, and then rearward, so as to pass to the rear of the front of frame A^3 A^3 at the side of the latter. Its lower end carries a bearing preferably in the form of a roller d^2, which engages the cam side of the wheel D^3, such cam side being formed with a series of rounded projections, so as to constitute a wave cam, adapted as the wheel D^3 revolves to give the roller d^2, and consequently the bent rod D′, a series of short quick vibrations. A spring d^3, attached to the rod and to a bearing on the frame A^3 A^3, serves to hold the roller against the cam and to return it quickly after any one of the raised portions of the cam has moved it and passed by it. The result of this construction is that as the cam-wheel D^3 revolves the bent rod D′ will be repeatedly retracted by the cam to carry the head or striker D^2 away from the leather strip C^{10}, and then swung back quickly by the spring d^3 to cause the striker to deliver a quick blow on the leather, which will give the combined wooden and metal plates above a quick upward vibration, adapted to jar sharply anything resting upon the metal plate C^7. The cam-wheel D^3 is preferably, as shown, fixed upon the main driving-shaft a^{11} of the match making and delivering machine.

A thin-metal trough E, resting upon the plate C^7 and of a width but slightly greater than the external width of the boxes F F to be filled, is arranged to reciprocate longitudinally over plate C^7. The means for reciprocating this trough consists of a swinging lever E′, pivotally supported on a piece e, secured to one of the uprights of frame A^3 A^3, and having its upper end pivotally connected by pin e' with the ears e^2 e^2 on the under side of the trough E, such ears extending down through slots in the plate C^7 and in the wooden plate or strip C^8, attached to the latter. The other or lower end of this lever E′ is connected, by means of the link E^2, with the portion of the bent rod D′ which carries the cam-engaging bearing or roller d^2. The result of this construction is that, as the bent rod D′ is swung back and forth quickly by the action of the cam-wheel D^3 and spring d^3, the lever E′, connected with the rod as described, will be given corresponding movements, so that the thin-metal trough E will be rapidly moved longitudinally back and forth upon plate C^7, upon which it rests.

To allow the passage of the horizontal upper part of bent rod D′, the lever E′ is provided with the slotted part having the slot e^3, through which the rod extends.

To convey the boxes to be filled to the trough E, there are, beyond the upper end of plate C^7, upon which the trough E rests, the parallel endless chains G G, each having a series of box-engaging teeth g g, adapted to engage the ends of the boxes and move the latter along. Such chains run over the rollers G′ G′, provided with suitable teeth g' g' to engage the links of the chains, one of these rollers being preferably journaled upon the outer distance-post c. The other or inner roller is secured to the shaft G^2, journaled in

suitable bearings in the plates C and C^3, and carrying on its outer end, beyond plate C^3, the band-pulley G^3, driven by the band or belt G^4, which in turn is driven by the band-wheel G^5, secured to shaft G^6, journaled in bearings on an extension supplemental frame A^{14}, attached to frame A^3 A^3.

In order that the rate of travel of the box-moving chains G G may be adjusted to cause the boxes to pass along across the falling stream of matches at a greater or less speed, as desired, I provide an adjustable speed connection between the shaft G^6 and its driver. While this can, without involving any departure from my invention, be of any desired form and construction, I prefer that shown in the drawings, consisting of a cone G^7, secured to shaft G^6, a second cone G^8, arranged so that the opposing portions of the peripheries of the two cones will be parallel to each other, and a friction-ring G^9, affording a frictional connection between the two cone-peripheries and made capable of adjustment along the cones.

The cone G^8 is fixed on the shaft G^{10}, journaled in frame A^{14} and bearing a sprocket-wheel G^{11}, driven by a sprocket-chain G^{12}, which in turn is driven by the sprocket-wheel G^{13}, rotating with the shaft G^{14}, forming part of the operative mechanism of the match making and delivering machine to which my invention is applied. The double-cone form of speed adjuster or regulator shown and described is one well known to mechanics and machinists and need not be described at length herein. It has the usual screw-threaded rotary rod G^{15}, with hand piece or wheel G^{16}, and the two plates G^{17} G^{17}, having threaded openings to engage the threaded part of rod G^{15}, and guide-openings through which passes the fixed guide-rod G^{18}. These plates have portions projecting on opposite sides of part of the friction-ring, so that as they are moved by the rotation of rod G^{15} they will shift the ring longitudinally along between the cones to change the speed with which the cone G^7 will be driven from cone G^8 in the well-known way.

The box-feeding chains G G are supported when engaging and moving the boxes by a plate G^{19}, secured to the top of the piece G^{20}, which is supported at its sides from the plates C and C^3.

The boxes F F are supplied to the chains through an inclined chute H, having its angle of inclination downward and forward with reference to the travel of the box-engaging portions of the chains G G. The angle of inclination is preferably such that the boxes will be fed down upon the chains by gravity; but, if desired, a pressure device or other means for causing the boxes to move to and upon the chains may be used.

As the chute H is arranged in the drawings, the lower box in the chute being pressed down by its own weight and that of the boxes above, it will strike the chains G G with its lower end, which will then by the movement of the chains be carried forward, the forward or inner side of the chute being cut away to allow for the change of position of the box as its lower end is carried forward and its upper or rear end descends in the chute. (See Fig. 6.)

The teeth or projections *g g* on each of the chains are arranged at a distance apart substantially equal to or a little greater than the length of the boxes to be filled. If then the boxes be placed end to end in the chute H, with the lowest box resting upon the chains, as does the lowest box shown in Fig. 6, such box will, as the chains move on to carry its lowest end forward, be forced by its gravity, and that of the boxes above it, down in position flat upon the chains, its rear end coming just forward of the next succeeding pair of teeth *g g* on the chains. The next box then rests upon the upper edge of the rear end of the box so seated on the chains and has its lower end carried forward by such box until it can drop upon the chains to the rear of the seated box and just behind the teeth *g g*, engaging the rear end of the latter. The movement of the chains will then carry forward the lower end of this second box until the latter becomes seated on the chains in front of the next pair of chain-teeth *g g* in the same manner as the preceding box was seated in front of the teeth for moving it along. From the box-feeding chains G G the boxes pass onto the first plate C^7 and then into the reciprocating trough E. As this trough is made of thin metal, the passage of the boxes into it is easy, but, if desired, the end of the trough-bottom can be beveled to facilitate the entrance of the boxes.

To afford access to the guideway for the boxes where they are engaged by the feeding-chains, I prefer to provide such way with a cover I, hinged at I′ and held down upon the tops of the plates C^5 and C^6, forming the sides of the way, by spring-catches *i i*. Beyond this hinged cover there is a fixed top for the way extending to or nearly to the side of the carrier-way in order to guide and keep the boxes down in position where they enter the reciprocating and jarred trough E.

Extending across the space between the inner ends of plates C C^6 at one side of frame A^3 A^3 and plates C C^6 at the other side is the plate K, attached at its opposite ends to the frame A^3 A^3 beyond the opposite sides of the way for the match-carrier plates A A. This plate, being situated between the trough E and the carrier, extends upward close to the outer face of the carrier to a point well above the trough and way for the boxes F F, and is provided with a series of slots *k k* with open upper ends extending down to a point just below that where the matches are discharged from the carrier by the ejecting mechanism hereinbefore described. There is one of these slots for each match in a row carried by the carrier, the slots being of such width as to

just admit the downward passage of the respective match as the carrier is moved forward. With this construction the sides of the slots in the plate serve to insure that each match shall be properly separated from its neighbor and that all the matches, as they pass down toward the point of discharge, shall be exactly parallel and in planes at right angles to the carrier-plates. The upper ends of the sides of the slots are beveled or inclined outward, as shown at *k' k'*, so as to insure the entrance of the matches into the slots, even if the matches should be inclined to one side or the other.

Any matches so inclined as to bring their heads toward those of the adjoining matches will be straightened up into their proper positions by the inclined sides of the flaring mouths of the slots.

The upper edge of the plate K is beveled off with a downward and outward inclination.

The result of the above-described construction of plate K is that a series of fingers are formed to come between adjoining matches in the transverse rows of the latter, carried by the carrier-plates A^3 A^3, to separate and straighten up any matches that may have become bent or inclined toward their neighbors and to insure that when the matches are discharged from the carrier-plates by the ejector mechanism they shall be in positions parallel to each other and to the ends of the boxes, as they are to lie in the latter.

To prevent any chance of the matches getting out of parallel as they leave the carrier-plates and begin to fall toward the boxes below, I secure to plate K the division-plates K' K', there being one of these plates for each of the match separating and guiding fingers on plate K and one just beyond each end of the series of slots in such plate.

While plates K' K' can be secured to plate K in any desired way without departure from my invention, I prefer to attach them in the manner shown in the drawings (see Fig. 12)—that is, by grooving the plate K and securing portions of the division-plates in the grooves. These division-plates have their upper edges inclined downward and outward at the same angle as the bevel of the upper edge of plate K, hereinbefore described, for a purpose to be explained hereinafter.

The outer or end plates K' K' of the series extend out from the face of plate K farther than the others and have their outer edges secured in grooves in the plate K^2, parallel to plate K and supported from the latter by distance-pieces K^3 K^3.

As shown best in Figs. 4, 9, and 12 of the drawings, those of the plates K' K' which come between rows of matches on the carrier do not project far enough from plate K to be capable of engaging the head of any crooked match. The depth of such plates from plate K to their outer edges is less than the length of a match from the outer face of plate K to the match-head. With this construction there can be no danger of the head on any match coming in contact with and being fired by friction on the edge of any of the plates K' K'. These plates K' K' are also made thin, so that the straightening up of any crooked or inclined matches is performed by the fingers formed by the slotting of plate K rather than by the plates K' K'.

The operation of my box-filling mechanism described hereinbefore and shown in the drawings is briefly as follows: With the boxes supplied to the chute H they will be successively taken from the chute by the feed-chains G G in the manner fully described hereinbefore and carried forward by the teeth *g g*, so as to be delivered upon the first plate C^7 and pushed into the trough E. As they enter this trough they will be crowded close together, so that no match can pass in between their adjoining ends. As they pass on through the trough they will, because of the rapid short reciprocations of the trough caused by the swinging of lever E', which, through link E^2, is moved by the action of the cam D^3 upon the roller d^2 and of the returning-spring d^3, be given a series of short sharp longitudinal vibrations in a direction at right angles to the positions which the matches are to have in the filled boxes. At the same time they are given a series of quick jars in a vertical direction by the rapidly-repeated blows of the striker D^2 against the piece of leather C^{10} on the under side of the wooden plate or strip C^8, which is secured to the under side of plate C^7, upon which trough E is supported and slides. As explained hereinbefore, the strip or plate of wood fastened to the metal plate C^7 makes the up-and-down vibrations caused by the blows of the striker D^2 and transmitted to the trough E by plate C^7 sharper and quicker than they would be were the metal plate C^7 alone used, with the leather C^{10} for receiving the blows of the striker secured directly to its under side. As will be understood from the description hereinbefore given, the quick rapidly-repeated blows of the striker are caused by the vibrations of the rod D', which is actuated in one direction by the cam projections on wheel D^3 engaging the bearing or roller d^2, and in the other by the spring d^3. When the boxes are being pushed along through the trough E and are being given a series of short sharp longitudinal shakes, caused by the reciprocation of the trough, and a series of quick upward jars, because of the retracting of the trough under the quickly-repeated blows of the hammer transmitted through the trough-support, the matches from the carrier-plates A A of the traveling match-carrier are being discharged in rows which, closely following each other, fall into the boxes below them, so that as the boxes proceed through the trough across the stream of falling matches they will become gradually filled, a sufficient quantity to properly fill each box being delivered therein before it passes beyond the farther side of the

stream. As matches from each row discharged from the carrier-plates fall into a box they are quickly settled down into place by the described longitudinal shaking and up-and-down jarring of the boxes, so that all the matches in the box will be parallel to each other, and the mass of matches in the box at any time will have its upper side substantially level, and the filling of different parts of the box will consequently be substantially uniform. The rate of travel of the boxes across the stream of matches delivered from the carrier, and consequently the quantity of matches which each box will receive, can be readily adjusted by turning the hand-wheel G^{16}, so as to vary the speed of the rotation of the cone G^{7}, and consequently of the box-feeding chains G G, which are driven by the connecting-gearing hereinbefore described from the shaft of such cone. With this arrangement the machine is adapted for use in filling boxes of different depths, all that is necessary to adapt it for filling shallower or deeper boxes being to operate the speed-adjuster so as to cause the box-feeding chains to move faster or more slowly. In this way the time during which the boxes will be exposed to the stream of matches can be regulated to secure any desired amount of filling before the boxes are passed out along the box-way over the outer or farther bottom plate C^{7}, whence they can be removed for application of the usual inclosing shucks or of any desired form of cover. The inclination of the main trough or boxway within which the trough E moves is for the purpose of gradually lowering the boxes as they move along and the tops of their contents rise higher and higher within them, so that the conditions under which the matches are received by the boxes at different points in the filling process will not be too greatly varied by the shortening of the distance through which the matches must fall, due to the rising of the top of the masses of matches within the boxes, as the filling progresses. It also insures a proper clearance, should some of the matches on the top of the contents of a filled box be uneven or out of position, and thus prevents any danger of clogging or jamming which might injure the matches or set fire to them.

As the matches carried by the plates of the carrier are moved step by step down toward the point where the rows of matches are to be discharged by the described intermittently-acting ejector or discharging mechanism, the step-by-step motion of the carrier being caused by the intermittently-acting carrier-moving mechanism hereinbefore described at length and shown in the drawings, the slots *k k* in the straightening-plate K will serve to guide and steady the matches, and should any of the latter be inclined out of parallel with the adjoining matches or crooked the inclines at the upper ends of the slots will insure their passage down into the proper slots and will straighten them up as they pass into proper parallel position. As the matches travel on downward the sides of the slots on opposite sides of the match-sticks will preserve the parallelism of the matches until they are ejected by the discharging device. As they are so ejected the matches will be prevented by the division-plates between which they fall from swinging to one side or the other, so as to fall into the boxes below at any considerable angle to the other matches. As the matches are moved by the travel of the carrier down between the division-plates on their way to the place of ejection the downwardly and outwardly inclined upper edges of the plates between the matches will engage and force outward any splinters, broken splints, or pieces of match-sticks which may be among the matches, so that when the matches reach the place where they are to be ejected from the carrier there will be no crossed splints, splinters, or pieces of sticks among them to interfere with the proper falling of the matches into the boxes in position to be best straightened out and settled in place in the latter. The inclined upper edges of the division-plates will also assist the separating-fingers, formed by the slotting of plate K, to straighten up any bent or inclined matches carried by the carrier-plates.

I have found by practice that my box-filling apparatus constructed as and operating in the manner shown in the drawings and above described is well adapted for the successful, rapid, and uniform filling of boxes, such filling being continuously carried on as long as the boxes are supplied to the chute H and the matches continue to be supplied from the carrier or source of supply.

The simultaneous shaking and jarring of each box in the manner described while it is receiving the matches from the source of supply has been found to insure the most even and uniform filling, for while the longitudinal shaking or reciprocation of the box acts to cause the matches to take the desired parallel positions at right angles to the length of the box the upward jarring settles them down at the same time into a level-topped mass.

Having thus described my invention, what I claim is—

1. In a box-filling machine, in combination with means for feeding the boxes to be filled, means for giving the boxes a series of short to-and-fro movements, and means for jarring them up and down in a direction substantially at right angles to their to-and-fro movements, substantially as and for the purpose specified.

2. In a box-filling machine, in combination with means for feeding the boxes to be filled, a support over which the boxes are fed, means for reciprocating such support, and means for jarring it in a direction substantially at right angles to its reciprocation, substantially as and for the purpose shown.

3. In a box-filling machine, in combination with means for feeding the boxes, a reciprocating trough through which the boxes are

fed, means for giving such trough a series of short reciprocations while the boxes are passing through it, and means for giving it a series of short upward jars, substantially as and for the purpose set forth.

4. In a box-filling machine, in combination with means for feeding the boxes, a reciprocating trough, through which the boxes are fed, a support for the trough, means for reciprocating the trough thereon, and means for giving the support a series of short upward vibrations, substantially as and for the purpose described.

5. In a box-filling machine, in combination with a source of supply of the boxes, a support over which the boxes are fed, means for reciprocating such support, a second support over which the box-support reciprocates, and means for giving such second support a series of short sharp upward vibrations, substantially as and for the purpose specified.

6. In a box-filling machine, in combination with a source of supply of the boxes, a support over which the boxes are fed, a lever connected with such support so as to reciprocate it, a second support over which the box-support reciprocates, a swinging piece provided with a striker, means for receiving the blows of the striker and transmitting their force to the second support, and means for actuating the striker-carrying piece and the lever, substantially as and for the purpose shown.

7. In a box-filling machine, in combination with a source of supply of the boxes, a support over which the boxes are fed, adapted to afford an extended bearing-surface, to engage the bottoms of the boxes and support them while being fed along, a swinging rod carrying a striker, a cam engaging a bearing connected with such rod, a spring also connected with the rod, and means for receiving the blows of the striker and transmitting their force to the box-support, substantially as and for the purpose described.

8. In a box-filling machine, in combination with a source of supply of the boxes, a support over which the boxes are fed, a second support below the other, a swinging rod carrying a striker, to strike and jar the second support, and means for swinging such rod, substantially as and for the purpose specified.

9. In a box-filling machine, in combination with a source of supply of the boxes, a support over which the boxes are fed, a metal plate upon which such support rests, a wooden plate or strip attached to such plate, and a striking device, to give a series of jars to the connected wooden and metal plates, substantially as and for the purpose shown.

10. In a box-filling machine, in combination with a source of supply of the boxes, and a support over which they are fed, a metal plate upon which such support rests, a wooden plate or strip attached to the plate, a cushion on the wooden plate, and a striker to deliver jarring blows upon the cushion, substantially as and for the purpose set forth.

11. In a box-filling machine, in combination with a source of supply of the boxes, and a support over which they are fed, a lever connected with such support, to reciprocate it, a swinging rod carrying a striker, a cam, a bearing on the rod engaging the cam, a spring connected with the rod, connections between such bearing and the lever, and means for receiving the blows of the striker, and transmitting them to the box-support, substantially as and for the purpose described.

12. In a box-filling machine, in combination with means for supplying, in a stream, the material with which the boxes are to be filled, the toothed chains to feed the boxes along and cause them to move across the stream of material, means for moving such chains, a rotary device from which the power to move the chains is derived, and connections between such device and the chains, including a speed-regulating mechanism, whereby the speed with which the chains are moved may be varied as desired, substantially as and for the purpose set forth.

13. In a machine for filling boxes with matches and the like, in combination with a carrier for the matches, and means for causing the matches to be discharged therefrom, in a stream, so that a box passed through the latter will receive its supply of matches gradually, as it moves along, means for passing boxes across the stream of falling matches, and means for giving the boxes a series of upward jars, as they are passing across the stream and being filled therefrom, substantially as and for the purpose set forth.

14. In a machine for filling boxes with matches and the like, in combination with a means for supplying the material to be boxed, means for passing boxes across the stream of material from such supply, a yielding support upon which a series of boxes can rest, and over which such boxes are fed, and means for giving the yielding support a series of short upward movements, to jar the boxes, during their passage across the stream of matches, substantially as and for the purpose described.

15. In a machine for filling boxes with matches and the like, in combination with the carrier for the matches, and means for causing the latter to be discharged from the carrier, means for passing the boxes across the stream of falling matches, and means for giving the boxes a series of reciprocations while they are passing across the stream and being filled therefrom, and means for giving them, at the same time, a series of upward jars, substantially as and for the purpose described.

16. In combination with a moving match-carrier, provided with means for holding the matches, from which the matches are ejected at a certain point in the travel of the carrier, a series of fingers in line with the spaces between the adjoining matches on the carrier, adapted to engage only the sticks and not the

heads of any crooked or inclined matches, so as to straighten the latter up toward parallelism with the adjoining match-sticks, before the matches are ejected from the carrier, substantially as and for the purpose specified.

17. In combination with a moving match-carrier, provided with means for holding the matches, a series of stationary fingers to pass between adjoining matches on the carrier, having their ends projecting rearward with reference to the travel of the carrier beveled on opposite sides, substantially as and for the purpose shown.

18. In combination with a moving match-carrier, provided with means for holding the matches, a series of stationary fingers to pass between adjoining matches on the carrier, having their ends projecting rearward with reference to the travel of the matches with the carrier beveled on their opposite sides, and also downwardly and outwardly with reference to the face of the carrier, substantially as and for the purpose set forth.

19. In combination with a moving match-carrier, provided with means for holding the matches, the series of match separating and straightening fingers, adapted to engage the sticks of any crooked or inclined matches, so as to straighten such matches up toward parallelism with the adjoining matches, as the carrier moves along and the series of dividing-plates situated between the paths of adjoining matches carried by the moving carrier, substantially as and for the purpose described.

20. In combination with a moving match-carrier, provided with means for carrying the matches, the stationary slotted plate having slots, to guide the matches, as they are moved along by the travel of the carrier, such slots having open ends provided with flaring mouths for the entrance of the matches as the latter are moved along by the carrier, substantially as and for the purpose specified.

21. In combination with a moving match-carrier, provided with means for carrying the matches, the stationary slotted plate having slots with flaring mouths, and the dividing-plates, parallel with these slots, substantially as and for the purpose shown.

22. In combination with a moving carrier, provided with means for holding the matches, a series of stationary fingers past which the matches are carried, adapted to engage the sticks of any crooked or inclined matches, so as to straighten such matches up toward parallelism with the adjoining matches, such fingers standing close to the carrier, and having their ends projecting rearward with reference to the travel of the carrier, provided with inclined faces, extending outward and forward with reference to the travel of the carrier, such fingers being about equal in width to the spaces between the inner portions of the match-sticks, which are held in the match-holding means of the carrier, so that they will straighten up toward the parallelism with the adjoining matches and crooked or inclined matches moved along by the carrier substantially as and for the purpose set forth.

23. In combination with a moving carrier provided with means for holding the matches in rows, means for causing the discharge of the matches from the carrier, when, by the motion of the latter, they have been brought to a certain point, and a series of dividing-plates on opposite sides of which the matches pass, adapted to separate each match from the adjoining matches, on opposite sides of it, as the matches are brought to the point of their discharge from the carrier.

24. In combination with a moving carrier provided with means for holding matches in rows, means for causing the discharge of the matches from the carrier, when, by the motion of the latter, the matches have been brought to a certain point, and a series of dividing-plates for separating each match from the adjoining matches on opposite sides of it, as the matches are brought to the point of their discharge from the carrier, such plates being arranged parallel with the lines of the travel of the matches and extending out from the carrier, so as to stand between the sticks of the matches and not between their heads; substantially as and for the purpose described.

25. In combination with a moving carrier, provided with means for holding the matches, a series of dividing-plates, between which the matches are carried by the carrier, having their edges, which are rearward with reference to the travel of the carrier, inclined outward and forward with reference to such travel, substantially as and for the purpose described.

26. In combination with a moving carrier, provided with means for holding the matches, means for causing discharge of the matches from the carrier, when they reach a given point, and the series of dividing-plates, between which the matches are moved by the carrier, situated so as to divide adjoining matches from each other after they have been discharged from the carrier, substantially as and for the purpose specified.

27. In combination with a moving carrier, provided with means for holding the matches, means for causing the discharge of the matches from the carrier, at a given point, means for feeding boxes along below such point, and across the stream of matches discharged from the carrier, and a series of dividing-plates, between which the matches are moved by the carrier, extending down below the point of discharge of the matches from the carrier, substantially as and for the purpose shown.

In testimony that I claim the foregoing I have hereunto set my hand this 11th day of August, A. D. 1896.

JACOB P. WRIGHT.

Witnesses:
L. A. BEECHER,
WILLIS B. ISBELL.