

No. 865,530.

W. ROBINSON.
BOX MAKING MACHINE.
APPLICATION FILED AUG. 15, 1902.

PATENTED SEPT. 10, 1907.

7 SHEETS—SHEET 1.

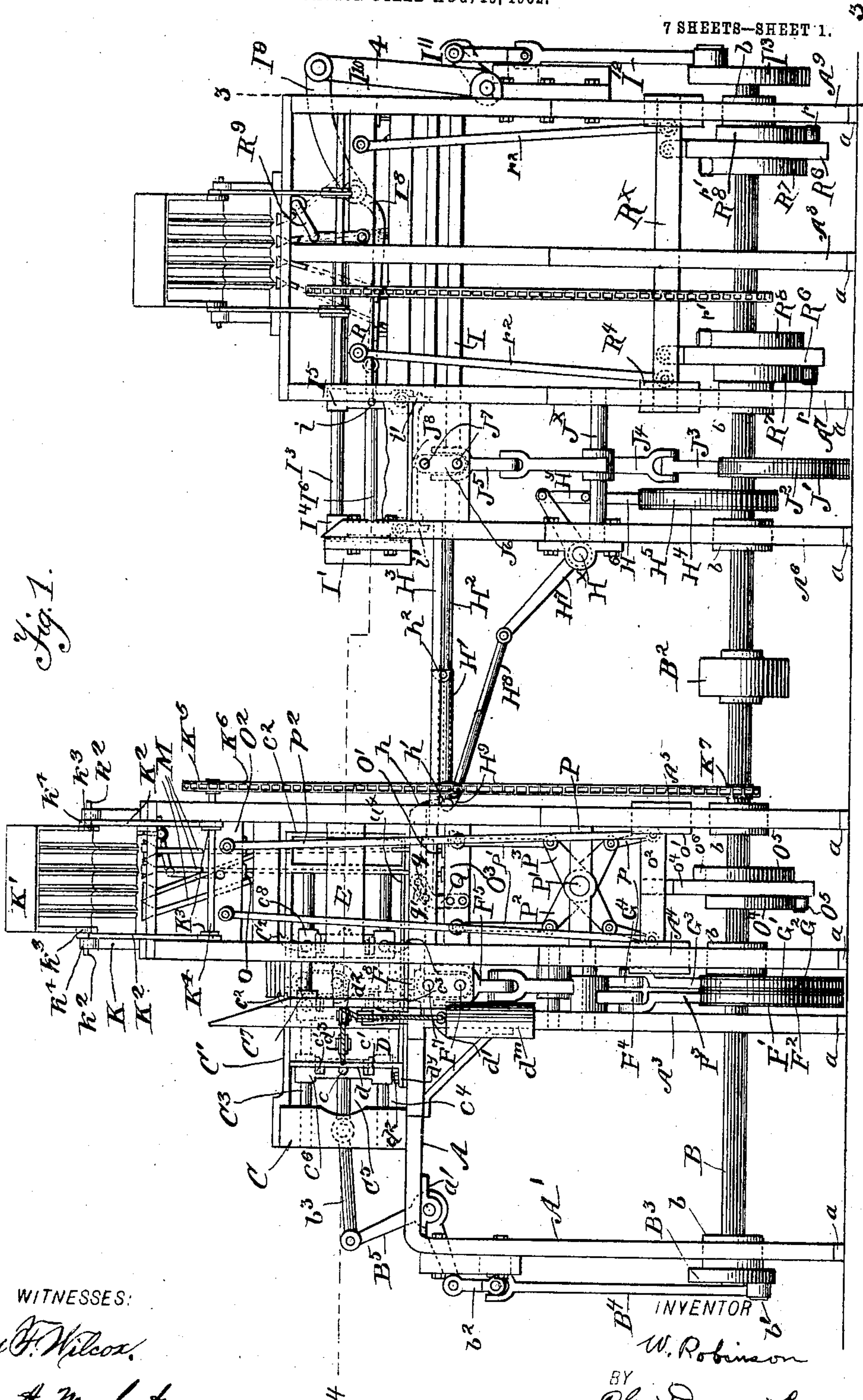


Fig. 1.

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ATTORNEYS

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7 SHEETS—SHEET 2.

Fig. 3.

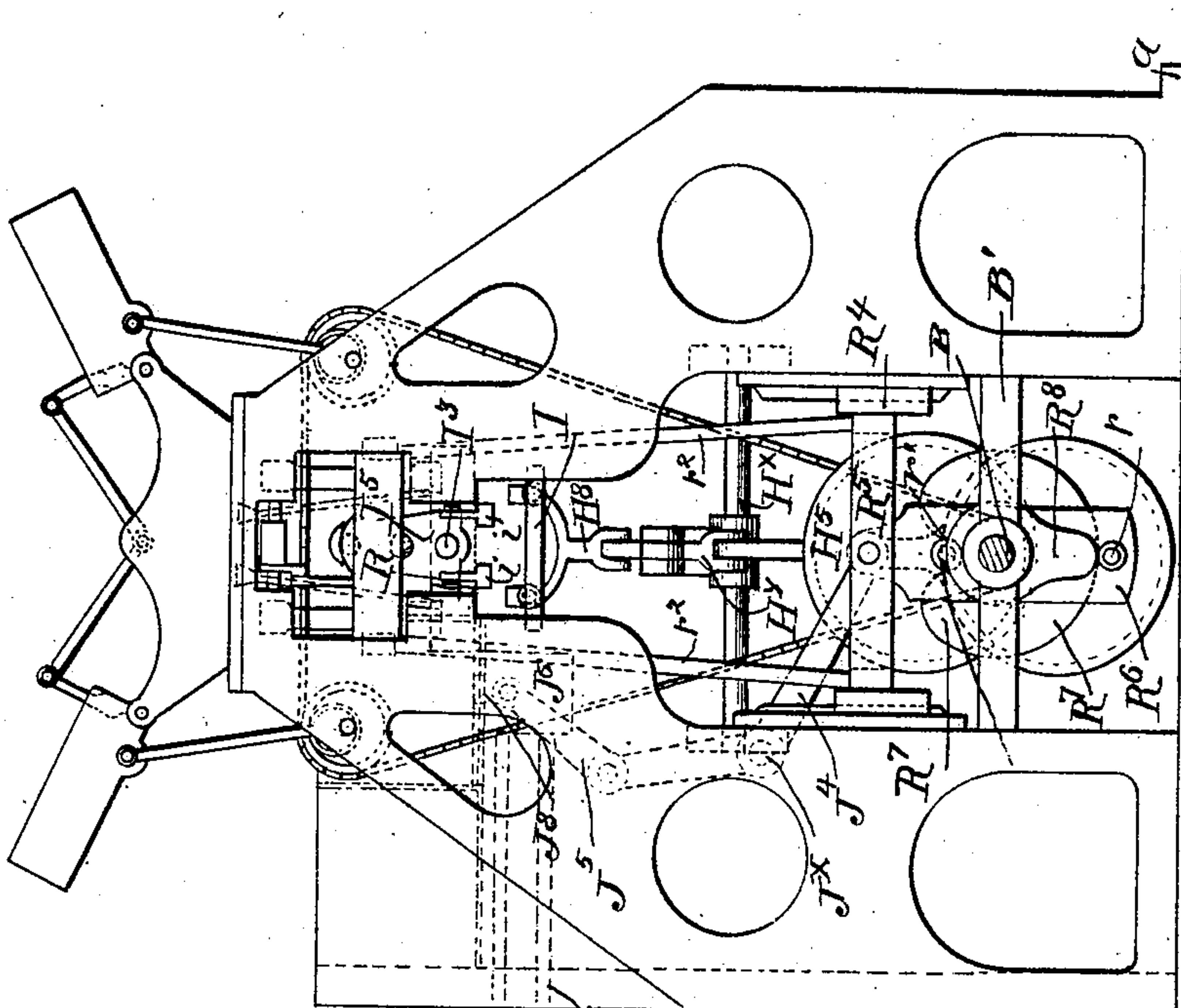
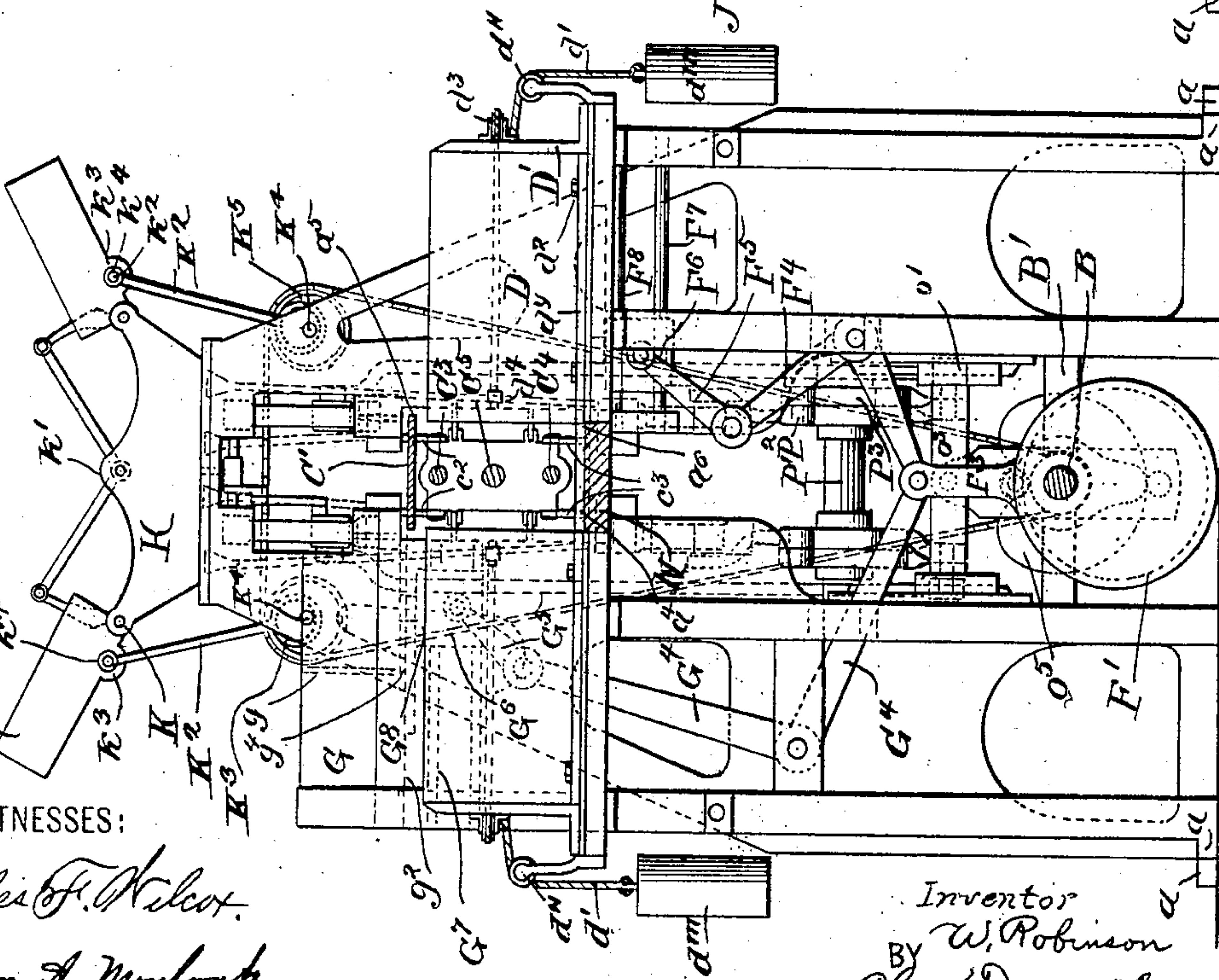


Fig. 2.

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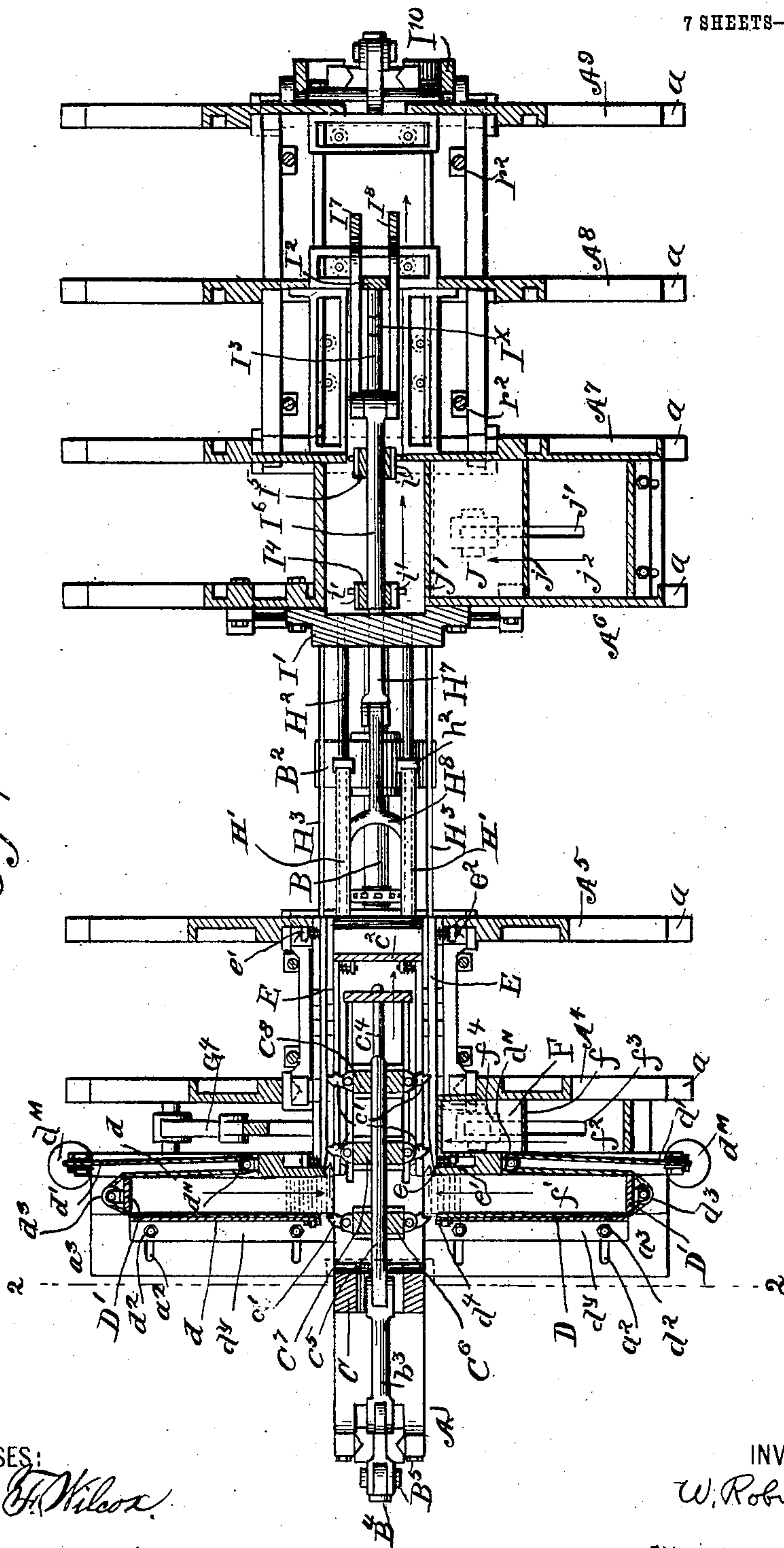
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7 SHEETS—SHEET 3.

Fig. 4.



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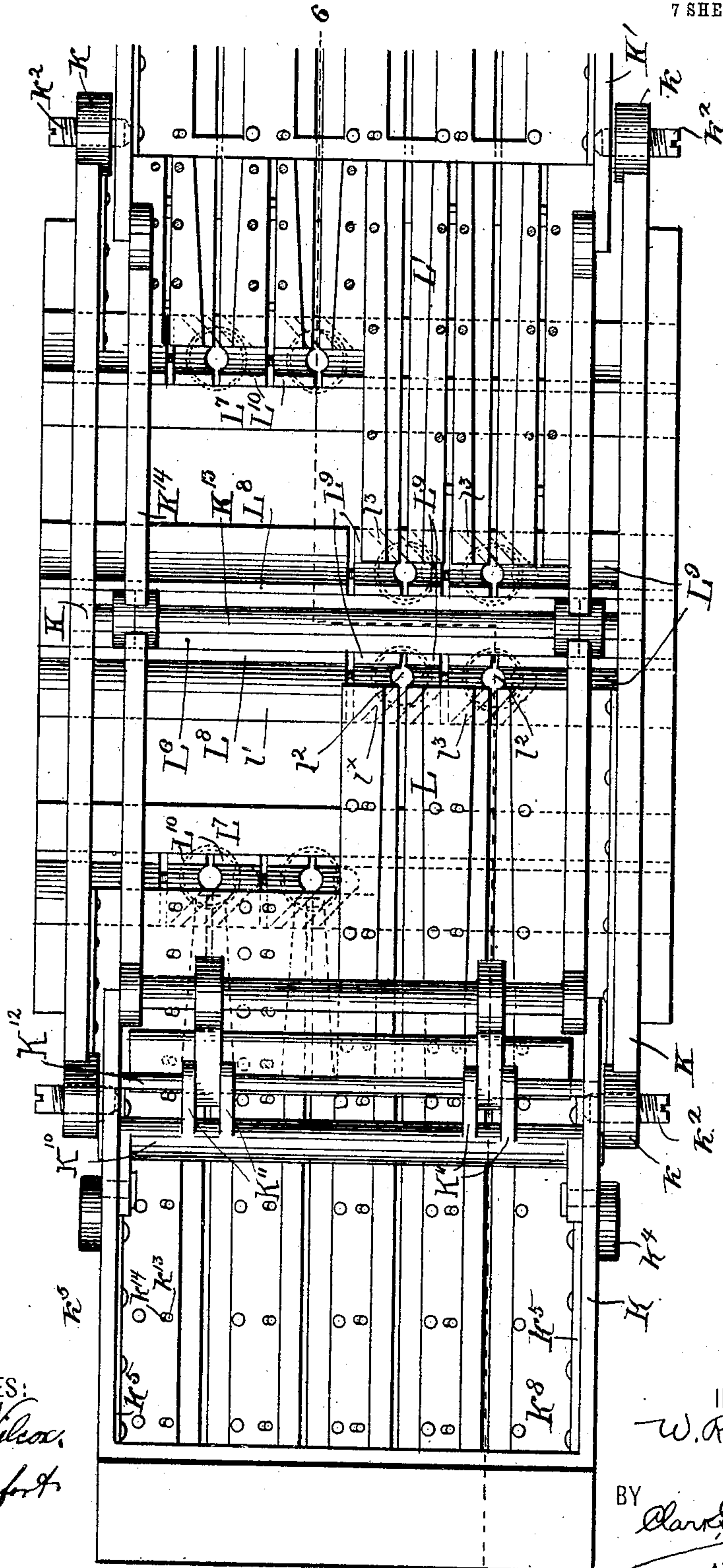
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7 SHEETS—SHEET 4.

Fig. 5.



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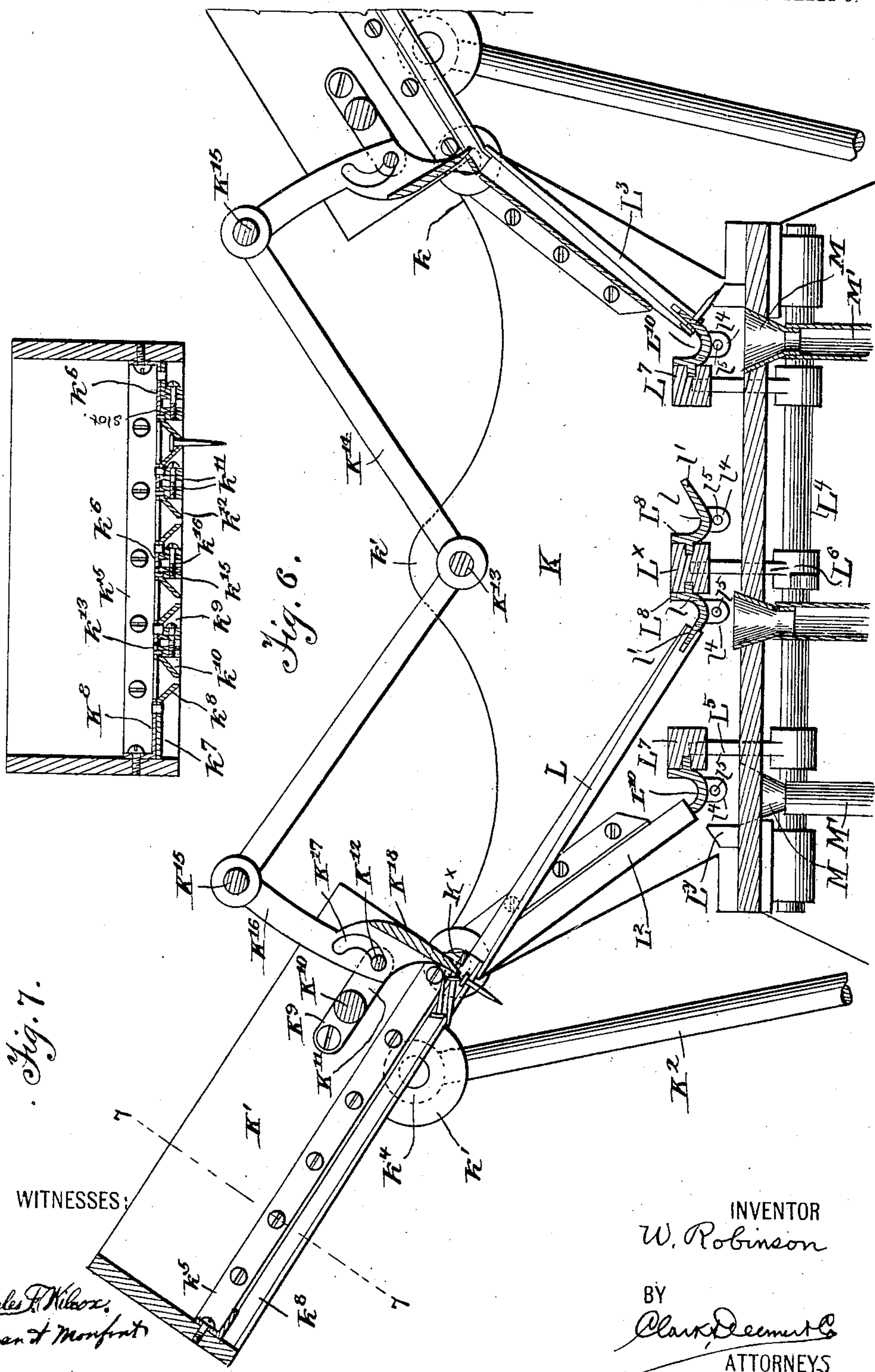
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7 SHEETS—SHEET 5.

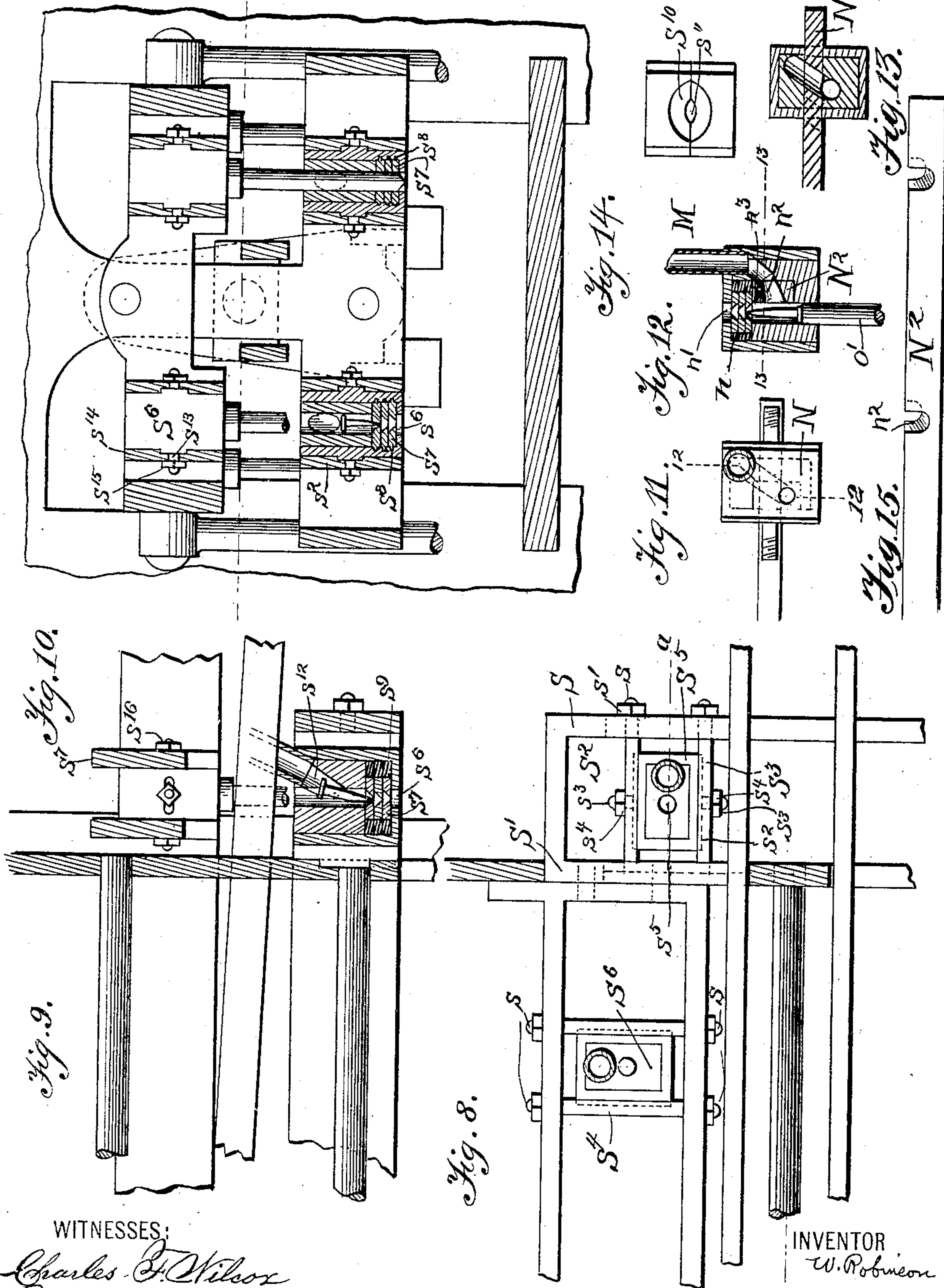


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7 SHEETS-SHEET 6.



WITNESSES:
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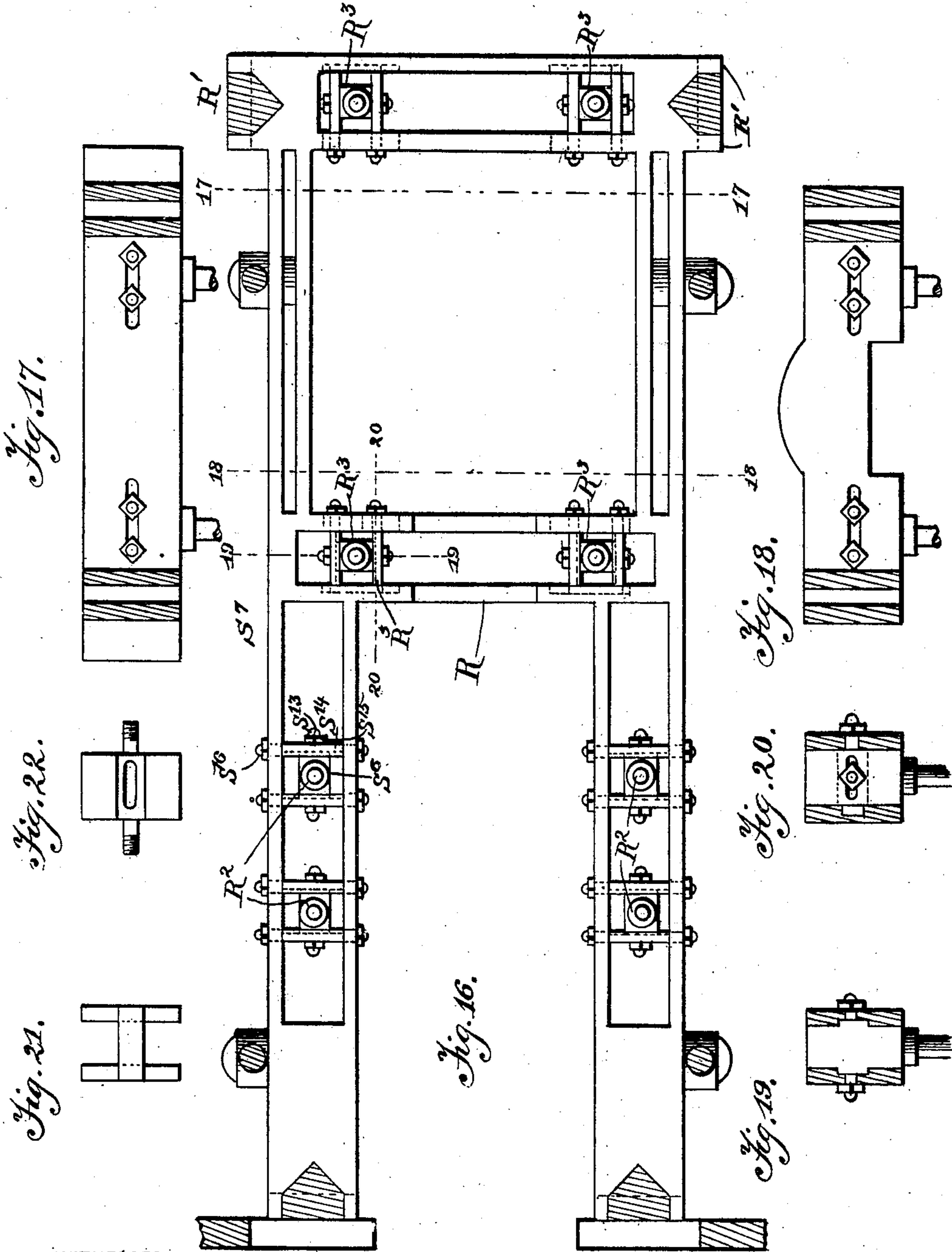
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BOX MAKING MACHINE.
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7 SHEETS—SHEET 7.



WITNESSES
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Edgar A. Monfont

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UNITED STATES PATENT OFFICE.

WILLIAM ROBINSON, OF BROOKLYN, NEW YORK.

BOX-MAKING MACHINE.

No. 865,530.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed August 16, 1902. Serial No. 119,704.

To all whom it may concern:

Be it known that I, WILLIAM ROBINSON, a citizen of the United States, and a resident of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Box-Making Machines, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof, in which similar letters of reference indicate corresponding parts.

10 This invention relates to box-making machines and consists generally in the novel construction hereinafter set forth, whereby the sides and ends of the boxes are automatically fed and assembled preparatory to their being nailed together which nailing occurs in a single operation, subsequent to which the incomplete box comprising the connected sides and ends, is automatically manipulated for the application of the bottom section and the latter secured in position by a distinct nailing operation.

20 One of the important features connected with the present machine resides in the provision whereby the assembled sides and ends are nailed both from above and below, and secured by nails fed in the loose form thus materially reducing the number of operations characteristic of this class of machines, and contributing to secure accuracy in the nailing together of said sections.

30 Improved means for feeding, distributing and driving the nails are set forth as well as numerous novel details and combinations of features all of which are described at length in the subsequent detailed description.

In the accompanying drawings forming part of this specification, Figure 1, is a vertical side elevation of a box-nailing machine embodying my invention; Fig. 2, is a vertical sectional elevation of one end portion of the machine, the section being taken in the plane indicated by the broken line 2—2, Fig. 4; Fig. 3, is a vertical sectional elevation of the other end portion of the machine, the section being taken in the plane indicated by the broken line 3—3, Fig. 1; Fig. 4, is a horizontal sectional plan view of the entire machine, the section being taken in the plane indicated by the broken line 4—4, Fig. 1; Fig. 5, is an enlarged plan view showing one of the nail pans, inner portion of its companion pan, and parts intermediate thereto; Fig. 6, is a vertical transverse section through the parts disclosed in Fig. 5, the section being taken in the plane indicated by the irregular broken line 6—6, in said latter figure; Fig. 7, is a vertical section through one of the nail pans, the section being taken in the plane indicated by the broken line 7—7, Fig. 6; Fig. 8, is a detail plan view on an enlarged scale, showing a portion of the nail-box or chuck support of the secondary nailing devices; Fig. 9, is a vertical sectional view of the parts represented in the foregoing figure, together with a part of the driver carrier and contiguous portions, the section being

taken in the plane indicated by the broken line *a—a*, of Fig. 8; Fig. 10, is a transverse vertical section showing an opposite pair of the side nailing devices of the secondary nailing mechanism; Fig. 11, is a detail sectional plan view of one of the under nail boxes or chuck of the primary nailing devices; Fig. 12, is a vertical sectional view of the parts disclosed in Fig. 11, the section being taken in the plane indicated by the broken line 12—12, of said figure, a nail and driver being also shown; Fig. 13, is a sectional plan view of said box or chuck and appurtenances, the section being taken in the plane indicated by the broken line 13—13, Fig. 12; Fig. 14, is a detail plan view of a pair of the yielding sections of the box or chuck; Fig. 15, is another detail view, the same disclosing a portion of one of the distributor bars which coacts with the lower nail boxes or chucks at one side of the machine; Fig. 16, is an inverted plan view of the driver carrier of the secondary nailing devices, and illustrating in addition, the position of the vertical guides; Fig. 17, is a transverse section through the parts shown in Fig. 16, the section being taken in the plane indicated by the broken line 17—17, of said figure, and looking toward the right; Fig. 18, is another transverse section through Fig. 16, the section being taken in the plane indicated by the broken line 18—18 of said figure and looking toward the left; Fig. 19, is a detail sectional view of Fig. 16, the section being taken in the plane indicated by the broken line 19—19, of said latter figure, and showing more particularly one of the driver stocks and clamping provision therefor; Fig. 20, is a somewhat similar view, the section being taken in the plane indicated by the broken line 20—20, Fig. 16, and illustrating the provision for transversely adjusting the position of the driver, and Figs. 21 and 22 are detail views of parts pertaining to the driver adjusting devices.

The machine comprises prominently, two divisions, the first embodying provision for automatically feeding from suitable magazines, two vertical side and upper and lower horizontal end sections, and assembling and nailing them, and a second division coactively connected with the first by a conveyer or transfer mechanism capable of imparting a quarter turn to the imperfect box thus formed, said second division including provision for feeding and applying a bottom section and nailing devices for first nailing the longitudinal edge portions of said bottom section and immediately thereafter, the transverse edge portions thereof.

Referring now more particularly to Figs. 1 to 4 inclusive, the principal members of the main or supporting frame are presented by the upper horizontal narrow bed A, merging at one end in a vertical standard A', having laterally extending feet *a*; and a series of transverse vertical frames A³, to A⁹, inclusive which are rigidly incorporated in and contribute to form said main frame. Additionally, there are ties, braces or

stays and other parts embodied in said main frame and which will be referred to at appropriate points in the specification. Lower transverse horizontal struts B' , secured centrally at relatively intermittent points along the main frame, provide bearings b , for a longitudinally extended horizontal master shaft B , from which motion is transmitted to all the other moving parts of the machine, said shaft having rigidly secured thereon between the frames A^5 , A^6 , a band pulley B^2 , by which said shaft is driven. On one end of the shaft B , is secured a disk B^3 , with the wrist pin b' , of which is pivotally engaged the lower end of a vertical pitman B^4 , pivotally connected at its upper end by a link b^2 , with the lower member of a bell-crank lever B^5 , located in an opening in the bed A , and its standard and loosely supported in hangers a' , at the under sides of the bed. The upper end of the vertical member of the bell-crank lever B^5 , is pivotally connected to one end of a short longitudinal link b^3 , which extends within an intermediately located opening in a short vertical standard C , mounted on the bed. This standard C , forms part of a longitudinally disposed assembling table, the top of which is presented by a flat longitudinal plate C' , secured both to the said standard and anvil C^2 , horizontal upper and lower longitudinal rods C^3 , C^4 , also connecting said standard and anvil. An intermediate horizontal rod C^5 , has one end pivotally connected to the extremity of the link b^3 , extending within the standard C , said rod C^5 , being of such length that it may be longitudinally reciprocated within the assembling table. Adjustably secured upon this rod C^5 , by set screws c , are relatively longitudinally disposed vertical blocks C^6 , C^7 , C^8 , three being shown although the number may be greater or less according to requirement, and these said blocks having the rods C^3 , C^4 , passing therethrough to constitute upper and lower guides therefor. The rod C^5 , and blocks constitute a reciprocative head. The block C^6 , is provided at the sides with lateral pawls c' , capable of moving inward toward the block upon a retracted movement of the same. The blocks C^7 , C^8 , in addition to said pawls c' , have also an upper and lower pair of vertically swinging pawls c^2 , c^3 , similarly capable of moving inward toward their blocks upon a retracted movement of the same. I propose to employ in connection with the pawls of the blocks, springs each so connected with its particular pawl and a relatively fixed part, that the pawl will be normally maintained in its outer position, a feature generally familiar in this class of machines.

On the main frame at opposite sides of the bed A , thereof and contiguous to the short standard C , are vertical magazines D , D , each of which is open at the top for introduction of the box-side sections and has one of its walls provided with an external base flange c^7 , for the passage of securing bolts d^2 , which engage slots a^2 , in lateral platforms a^3 , of the main frame to provide for varying the transverse area of the magazine. The wooden side sections are designed to be consecutively fed beyond the inner open end of each magazine by a gravity feed device consisting of a weight a^m , cord d' , guided around a pulley d^N , on the stationary wall of the magazine, said cord next extending around a pulley a^2 and then around a pulley d^3 , on the back of a vertical plate D' , having a lower flange resting movably on the bottom of the magazine, the cord being then led horizontally along the inner side of the wall d , and engaged

at the inner end d^4 , thereof, the plate D' , being of such width that it is capable of moving horizontally within the magazine toward the inner open end thereof, under the tension exerted on the cord by the weight. By adjusting the wall d , and substituting the plates D' , of other transverse sizes, provision can be made for feeding different widths of box-side sections. As each wooden side-section is thus fed beyond the inner end of its magazine, it passes onto one of a pair of longitudinally parallel ledges a^4 , there being one at each side of and immediately contiguous to the top surface of the platform, but in a slightly higher plane, each side section on leaving its magazine and passing onto a ledge, coming in contact with small upper and lower stops, carried by appropriate stationary parts of the machine. Consequently, when conditions permit, two side sections will be discharged from their magazines, and positioned upon opposite sides of but out of contact with the assembling table. The actuating parts are so conditioned that the shaft B , will through the disk B^3 , pitman, link and bell-crank connections, advance the head comprising block- C^6 , C^7 , C^8 , in the direction of the anvil C^2 , such movement causing the lateral pawls c' , of the block C^6 , to engage the nearest vertical edges of the side sections and conjointly carry them in their parallel relation, along the ledges a^4 , to a position corresponding with the space between the pawls c' , c' , of the blocks C^7 , C^8 , in Fig. 4, said sides as they move out of opposition to the inner open ends of their magazines, passing in contact with spring yielding longitudinal presser bars E , each having one of their end portions beveled to facilitate the movement of the side in contact therewith. Spring seated adjustable bolts e' , e^2 , located in suitable stationary parts of the machine, provide for regulating the positions of the bars E , and degree of pressure with which they are adapted to bear against the side sections.

It will be understood that the side ledges a^4 , still extend in such higher plane with respect to the platform A , that sufficient clearance is provided for laterally introducing one of the end sections of the box, the other end section being also laterally introduced but in a plane corresponding with the top of the plate C' , of the assembling table. The introduction of said end sections in the planes indicated is effected as follows:— At one side of the platform A , and adjacent to one of the magazines previously described, is a lower magazine F , closed at its vertical sides but open at the top to permit the introduction in a flat horizontal position of a number relatively superimposed box-end sections. By reference to Fig. 4, it will be seen that this magazine F , contains a partition f , which in connection with its inner wall f' , forms a chamber having a capacity for the end sections, the bottom f^2 , of the magazine extending laterally and containing an extended slot f^3 , which extends on both sides of the partition. The wall f' , has at its bottom, an opening of an area just sufficient to permit the lowermost end section to pass therethrough, said opening registering with the upper surface of the bottom f^2 , and the clearance beneath the contiguous ledge a^4 . There is an opening between the lower edge of the partition f , and bottom f^2 , to permit a horizontal movable plate f^4 , to be slid completely into and out of the chamber containing said sections.

At the opposite side of the machine, in the same transverse plane but considerably more elevated, is

another magazine G, constructed in all respects similar to the magazine F, but having its partition g , inner wall slotted bottom g^2 , and horizontally movable plate g^4 , all reversely arranged with respect to the similar parts of the magazine F. The lower opening in the inner wall, through which the box-side sections are to individually pass is in such position that they will be delivered transversely onto the plate C' , of the assembling table. Mounted on and revolving with the shaft B, between the frames A^3 , A^4 , are a pair of coincident eccentrics F' , G' , each turning in an embracing strap F^2 , G^2 , to vertically reciprocate tongues F^3 , G^3 , the upper end of the tongue F^3 , movably connected with the lower member of a bell-crank lever F^4 , pivoted in the main frame and having its upper end attached by a link F^5 , with a block F^6 , slidably mounted on a pair of transversely disposed horizontal rods F^7 . A short stem F^8 , of this block extends within the slot f^2 , of the magazine F, and is rigidly connected with the movable plate F^4 , thereof. The upper end of the tongue G^3 , is movably connected with the end of the lower member of a bell crank lever G^4 , considerably larger than the lever F^4 , the end of the upper member of said lever G^4 , extending contiguously beneath the bottom of the magazine G, and connected by a short link G^5 , with a block G^6 , slidably mounted on rods G^7 , and having a stem G^8 , extending within the slot of the bottom g^2 , and secured to the plate g^4 , movable upon the same. The position and character of the eccentrics F' , G' , and their connections with the blocks F^6 , and G^6 , are such that when the advancing movement of the box sides previously described has been made, said blocks will be outwardly moved on their guides to horizontally slide the plates f^4 , g^4 , through the openings in the partitions f , g , and out of the chambers containing the end sections, thereby permitting the lowermost section in each chamber to drop down in the plane of the opening therefor in the inner wall. By this time the fed side-sections will have been moved to a position immediately opposite the magazines F, G. The continued rotation of the disk B^3 , at this period occasions a retracted movement of the head which results in the pawls c' , of the block C^6 , being withdrawn from contact with the vertical edges of the particular side sections they previously moved, said lugs being inwardly depressed by contact with the succeeding pair of side sections which have not been projected from their magazines. When said pawls have cleared the succeeding pair of sides they engage the vertical edges of the same to longitudinally move such sides upon the next advancing movement of the heads. The pawls c' , of the block C^7 , will by this time have wiped along the second pair of sides and engaged the vertical edges of the same. Contemporaneous with the retracted movement of the head, the eccentrics F' , G' , have through their connections caused the plates f^4 , g^4 , to again enter the end-section chambers, and in doing so, they engage the lowermost section in each and expel it therefrom, the lower section being laterally moved into position onto the platform A, and beneath the ledges a^4 , while the upper section is supported transversely upon the plate C' , the end portions of both sections being in registration with the upper and lower edges of the first pair of sides. The next advancing movement of the head causes, by reason of the side pawls c' , and top and bottom pawl c^2 , of

the block C^7 , engagement of the sides and ends thus assembled, to conjointly move said assembled parts so that they incase the anvil C^2 , the ledges a^4 , tapering with a gradual incline at their upper sides so that the said sides and sections will all be brought into direct contact at this stage of the operation. This advancing movement also moves the second pair of sides to the intermediate positions to have the second pair of ends fed thereto, as described with reference to the preceding pair. The sides and ends which are assembled in mutual contact at the anvil C^2 , are then nailed together by the upper and lower nailing devices, located at each side of the anvil and which will be presently described. The incomplete box comprising the four connected sections, is then crowded further along in the machine by the assembled sides and ends of that next succeeding, so that the nailed incomplete box, will pass down the incline h , of the conveyer or transfer mechanism H. In passing over such incline, the incomplete box will partially turn so that it will be deposited upon the conveyer with one of its open sides uppermost, said incomplete box in such turned positions resting upon a pair of parallel longitudinal slides H' , movable upon rods H^2 , connected to the frames A^5 , and A^6 , the slides being provided at their respective ends with pawls h^1 , h^2 , engaging the respective end sections of the box.

By reference to Fig. 1, it will be noted that the lower part of the incline h , is formed so that the pair of pawls h' , when their slides are at the limit of their movement in one direction, will enter recesses and be flush with the incline. This arrangement and the specific distance between the pawls h' , h^2 , insures that the turned incomplete box will be accurately deposited upon the slides to be conveyed to the devices embodied in the second prominent division of the machine. Parallel side bars H^3 , in a slightly higher plane than the slides H' , constitute guards for properly guiding the incomplete boxes in their movements along the conveyer. The slides H' , are reciprocated on the rods by means of an eccentric H^4 , on the shaft B, between frames A^6 , A^7 , the strap H^5 , in which the eccentric turns, having in its upper side a vertical tongue H^6 , connected by a link H^7 , to one member of a bell-crank lever H^7 , mounted on a transverse shaft H^8 supported in suitable bearings on the frame A^6 , the other member of which is pivotally attached to the lower end of a longitudinally inclined pitman H^8 , the upper forked branches of which are pivotally secured by shackles H^9 , to the under sides of those ends of the slides which are nearest the incline h . The movement of the slides H' , in the direction of the second division of the machine, causes the pawls h' , to carry the incomplete box to a point along the same with one of its ends contiguous to the frame A^6 , where upon a retracted movement of said slides, the pawls h^2 , which are pivoted and normally spring elevated, will be depressed as they pass under the other end of said box and rise in engagement with the same. At this juncture, another nailed incomplete box will be deposited between the pawls of the slides H' , and upon the succeeding movement of the same toward the frame A^6 , the pawls h^2 , will move the first incomplete box longitudinally upon a table I, in the second division of the machine.

At one side of the table, between the frames A⁶, A⁷ is another magazine J, of larger dimensions than the other magazines before referred to, the chamber in said magazine being capable of receiving in flat horizontal positions a number of sections superimposed, one upon another, and suitable as bottoms for the incomplete boxes. As the construction and arrangement of this magazine and its appurtenances are in all respects similar to corresponding parts of the other magazines, it will be sufficient to point out that *j* is the partition plate, the inner wall *j'* having an opening located to permit a bottom section to be laterally expelled and pass onto and rest upon the upper edges of the incomplete box immediately opposite. *j*² is the bottom in which is the slot *j*³, and *j*⁴, the movable plate which slides into and out of the section chamber. J is an eccentric operating its strap J², to vertically reciprocate the tongue J³, connected to the lower member of the bell-crank lever J⁴, mounted on the short longitudinal shaft J⁵, bearing in the frames A⁶, A⁷, the upper member of the bell crank lever being pivotally connected by a link J⁶, with a block J⁶, slidably mounted on upper and lower horizontal rods J⁷, secured in the framing, the block having at its top, a stem J⁸, extending into the slot *j*³, and rigidly connected to the sliding plate. See Figs. 1 and 3. The position and character of the eccentric J⁷ and connecting parts, are such that when the incomplete box has been transferred to the table I, from the conveyer as before described, the plate *j*⁴, will be moved to expel the lowermost bottom section from the magazine, and move the same into position upon the incomplete box on the table I.

Bolted on the face of the frame A⁶, at such height that its lower edge will permit the incomplete box to pass beneath the same onto the platform I, is a transverse horizontal bar I¹, connected to which and to a hanger, located at a more intermediate point within the second division, is a pair of rods I³, I⁵ vertically parallel. Slidably mounted upon these rods, are a pair of vertical blocks I⁴, I⁵, each provided at its lower portion with a pair of depending pawls *i'* pivotally arranged to fold inward toward the block upon a retracting movement of the latter. A longitudinal rod I⁶, passes through the blocks and has the same adjustably secured thereto by bolts *i*. That end of the rod I⁶, which is beyond the block I⁵, has a transversely perforated head for the bearing of a pin to which is pivotally attached a pair of parallel upwardly curving bars I⁷, I⁸, between the upper ends of which is pivotally connected the lower inner end of an upwardly curving link I⁹, movably attached at its outer end to the vertical extended member of a bell-crank lever I¹⁰, the lower member of which is connected by a short link I¹¹, with the pitman I¹², engaging the wrist pin of a disk I¹³, on the end of the shaft B. The arrangement of the disk I¹³, and its connection with the rod I⁶, are such that when the incomplete box and bottom section are assembled upon the table I, the pawls *i'*, of the block I⁴, engage both the end wall nearest thereto as well as the edge of the positioned bottom section, with the result that upon the rod being next moved in the direction indicated by the arrow, Fig. 4, the parts so assembled, will be carried beneath longitudinally disposed nail-

ing devices located at both sides of the machine and in a higher plane than the box bottom, and the longitudinal edge portions of the latter nailed to the sides. The retracted movement of the bar I⁶, and its blocks, will occasion the pawls of the block I⁵, to recede and bear behind one of the ends, and as well as the bottom section, while the pawls of the block I⁴, will have correspondingly passed behind an end and unnailed bottom of the assembled parts behind. Another movement of the rod I⁶, in the direction of the arrow, will obviously move the assembled parts first mentioned farther along to a point in the machine, where both ends and transverse edge portions of the bottom will be immediately beneath transversely disposed nailing devices which are then operated to nail the same and complete the box. The next retracted movement of the rod I⁶, causes the pawls of the block I⁵, to engage another box with a partially nailed bottom to subsequently carry it into position for final nailing and crowd the box previously completed from the machine. These operations of assembling and nailing the sides and ends, turning and transferring the incompleting boxes to the table I, applying and nailing the four edges of the bottom sections, will of course be repeated to form and discharge any number of boxes.

Inasmuch as the nailing devices will be separately described in detail, they have only been generally referred to in the description thus far.

The advantage of having the blocks of the reciprocating head in the primary division, and the blocks I⁴, I⁵, adjustably bolted on their rods is that they may be spaced so that their pawls will coact with boxes of varying length.

Each division of the machine has its own nailing devices arranged and actuated at the proper times to meet its particular requirements. These nailing devices are operated from the shaft B. I will first describe some of the more important features of the devices for nailing together the assembled sides and ends, and afterward certain parts more particularly connected with those for nailing the bottoms, both descriptions conveying an understanding sufficient for comprehending the constructions and functions of the somewhat similar parts in both sets of devices.

Firmly supported on the upper elevated ends of the frames A⁴, A⁵, is a transverse hopper K, having its transverse parallel walls provided with screws to sustain upper side bearings *k*. In each pair of bearings *k*, is pivotally hung the inner lower end of one of the nail pans K¹, there being two for this hopper as well as for that of the secondary nailing devices, the pivotal engagement being effected by short pivot bolts *k*², in the bearings adjustably engaging recesses therefor in the contiguous sides of the scale pan. Each pan has near its lower inner pivoted end, a pair of depending ears, *k*³, containing pins pivotally engaged by the heads *k*⁴, on the upper ends of pitmen K², adapted to be reciprocated by straps loosely embracing the eccentrics K³, on short longitudinal shafts K⁴, turning in bearings in the upper part of the frames A⁴, A⁵, at each side thereof. On the projecting ends of the shafts K⁴, are sprocket wheels K⁵, driven by a pitch chain K⁶, in mesh with and driven by a sprocket wheel K⁷, on the shaft B, below. This gearing and the eccentric and

pitman connection imparts to the pans the jogging motion characteristically required for the pans in this class of machines.

The bottom of each pan comprises a plate K^8 , having at three of its sides a vertical flange k^5 , through which screws pass to secure the plate in position. The body of the plate contains a series of parallel slots, the spaces between said slots forming a series of alternately located strips. Secured on the underside of the outer strips of the series, are extended metallic sections k^7 , each having a downwardly inclined wing k^8 , extending within the vertical plane of the contiguous bottom slot above. Connected to the underside of each intermediate strip k^6 , are a pair of extended metallic sections k^9 , k^{10} , each having a depending vertical rib k^{11} , and an inclined wing k^{12} , the latter extending within the vertical plane of the contiguous bottom slot above to coöperate with the wing of another section oppositely extending within the vertical plane of the same slot. The sections k^9 , are each rigidly secured while the rivets k^{13} , of the sections k^{10} , play in slots k^{14} , in the bottom strip above. A pair of extended bars k^{15} , in connection with screws K^{16} , bearing thereon and passing also through the vertical ribs k^{11} between, provide for uniformly adjusting the movable section of each pair and for varying the width of the opening in the bottom of the channel formed by each pair of downwardly inclined wings.

Fastened on the inner faces of the vertical side walls of each pan, are brackets K^9 , connected by a transverse horizontal rod K^{10} , provided with parallel ears K^{11} , arranged in companion pairs and extending contiguous to the inner pivoted portion of the pan. Through these ears passes a rod K^{12} , the extremities of which for the purpose of strength, bear in the side walls of the pan. Upon a transverse rod K^{13} , supported in the central bearings k' , of the hopper are hung upwardly inclined diverging bars K^{14} , each transverse pair carrying at its upper outer extremities, a rod K^{15} , from which depend pivoted arms K^{16} , having lower enlargements between the ears K^{11} , containing arc-shaped slots K^{17} through which the rod K^{12} passes. Integrally carried by the enlargements of the arms, is a thin vertical transverse fender K^{18} , the lower edge of which is tapered and which lies contiguous to the bottom of the nail slot as indicated most clearly in Fig. 6.

Within the hopper are two downwardly converging series of runs or channels L , L^1 , formed of stationary and adjustable sections, similar to those within the pan bottoms. Each series extends about half way across its pan at the inner portion thereof, the positions of the openings presented by the runs, being such that they closely register at their upper ends with those in the pans. Two other series L^2 , L^3 , incline at a greater pitch from the balance of the width at the pan bottoms at their inner portions, and also comprise relatively stationary and movable sections forming runs which register at their upper ends with the remaining half of the channels in the pan bottoms.

Oscillative in suitable bearings in the supporting frame, immediately below the hopper, is a shaft L^4 , having short upwardly projecting arms L^5 , L^6 , rigidly secured thereon, the arrangement of the frame being such that said arms which extend above the same can

be rocked by the shaft when oscillated. These arms loosely play in lower recesses in horizontal bars L^x , and L^7 , transversely disposed in intermediate positions with the lower part of the hopper. The bar L^x , carries at opposite sides, metal distributors L^8 , L^8 , each comprising an extended depressed portion l and outer slide l' , slightly upwardly inclined and sliding loosely within a recess therefor in the lower end of the contiguous series of runs L or L' , as the case may be. Each depressed portion l , contains a pair of circular openings l^2 , while its slide l' , has a pair of oblique slots l^3 , dotted lines Fig. 5, of a width corresponding with the width of the runs across which they play, the lower ends of said slots intersecting the openings l^2 . With a view of varying the area of said openings and slots, each distributor L^8 , is composed of a plurality of sections L^9 , L^9 , which are divided centrally along the plane of the openings and slots, each section having lower ears l^4 , with threaded perforations for engagement by an adjusting screw l^5 , so that they may be adjusted to the required size. Each of the bars L^7 , carries at one side only, a distributor L^{10} arranged and operating with respect to the runs L^2 , L^3 , in all respects similar to the distributors L^8 , and their runs.

Supported in the top of the frame, beneath the distributors L^8 , L^{10} , are the flaring receiving mouths M , delivering to tubes M' , of extended length and of such shape as to communicate at their lower ends with the upper and lower nail boxes or chucks of the primary nailing mechanism. By referring to Fig. 1, it will be seen that certain of the tubes M' , extend straight to the lower nail boxes N , while the other tubes are angularly disposed to bring their vertical parts immediately in line with and deliver to the upper nail boxes N' .

The nail boxes or chucks of the first division of the machine are disposed in upper and lower pairs in stationary parts of the machine and at each side of the anvil C^2 . As the general construction of the upper nail boxes generally corresponds with the boxes of the secondary nailing mechanism in which there are no lower boxes, a description of the boxes in such secondary mechanism will suffice for an understanding of the upper boxes in the first division.

$S S'$, designates parallel stationary parts of the second division, which parts are appropriately located and recessed on their opposite inner faces for the reception of the vertical end portions of a pair of plates S^2 , S^3 , having intermedially located horizontal threaded stems s at one end projecting through horizontal slots in the parts $S S'$, for engagement by nuts s' , for rigidly and adjustably clamping them in position. It will be seen that where the conditions require, as in the matter of side located nailing boxes S^4 , in Fig. 8, stems s extend from both ends of the clamping plates to be engaged by nuts.

The inner opposite sides of the plates S^2 , S^3 , are horizontally recessed for adjustably receiving the lateral horizontal guide offsets s^2 , of a rectangular box S^5 , threaded lugs s^3 integrally extending from said offsets passing through horizontal slots in the plates and engaging nuts s^4 , permitting the horizontal adjustment of the boxes between the plates. The box contains a shell S^6 having a vertically extending passage s^5 ,

circular in cross section, adapted for the entrance of a descending nail punch or driver, said passage vertically registering with an opening s^6 , of corresponding diameter in the bottom of the box. Between the lower end of the shell and the box-bottom, are a series of thin plates s^7 , superimposed upon each other and each comprising two segments having guide ribs s^8 , at their longest outer edges guided in grooves in the interior of the box while between their ends and the box, yielding cushions s^9 are interposed. Each pair of segments has a central downwardly contracting depression s^{10} , with a central perforation s^{11} , the arrangement permitting the segments of each pair to relatively spread and enlarge the perforation when a nail is forced through the latter.

The arrangement of plate segments s^7 , in all the nail boxes of my machine, constitutes an important feature. In forcing a nail through the driver passage of any one of the boxes, the companion pairs of segments successively spread in the order of their relation to permit the nail head to pass and as it clears each pair, the depressed portions of the same close behind the head on the punch and in connection while the others support the nail the corresponding spreading of the other pairs of segments and their successive closing on the punch behind the nail head, insuring the maintenance of the nail in proper position throughout its forced movement in the driver channel and until its shank has entered well within the material of the box section.

The lower end of the feed tube of each upper box communicates with a chuck at the top thereof through an inclined passage s^{12} . The lower boxes N, are correspondingly adjustable but have the yielding segments n in the upper part thereof, the opening in which the ascending lower punch or driver enters, of course being in the bottom of the box, while the aperture n' , through which the nail is driven, being in the top.

Through each companion pair of lower boxes, at each side, passes a horizontal shutter or cut off bar N^2 , having for each box a horizontally disposed oblique opening n^2 . By reference to Fig. 12, it will be observed that the bar N^2 , extends between the driver passage and the inclined duct n^3 , through which pass the nails delivered at the lower communicating end of the feed tube M. By reciprocating the bar N^2 , communication between the nail passages of each companion pair of lower boxes and the inclined feed ducts n^3 , will be cut off, the oblique character of the openings n^2 , resulting in angular edges of the bar N^2 , which shear across the inner end of each duct n^3 , forcing a nail into the driver passage, isolate the same therein, and completely confine it to insure its maintaining its proper vertical position, with its head lowermost to be driven. The upper and lower nail punches or drivers O, O', are properly disposed to coact with their respective nail boxes and are secured to carriers O^2 , O^3 , vertically movable in guides provided by the frames A^4 , A^5 .

At the lower portions of the frames A^4 , A^5 , at each side, are slideways o' , in which vertically play the ends of a horizontal bar o^2 , intermediately connected by a transverse bar o^3 with its companion at the opposite side of the machine.

Centrally depending from the bar o^3 , is a tongue o^4 , slotted to straddle the shaft B and having on one face a lower contact roller o^5 , and on the opposite face, a similar roller o^6 , but in a much higher plane. Revolving with the shaft B, at opposite sides of the tongue o^4 , and closely adjacent thereto, are cams O^4 , O^5 , the former being of a familiar nose type, while the latter is of a heart configuration. This arrangement of the cams is such that in their rotation, the rollers act as followers, the rollers o^5 , to be depressed by the nose of cam O^4 , to effect the downward movement of the tongue and connected parts which will be permitted at this time by the reëntrant portion of the cam O^5 being opposite to the roller o^6 and allowing the latter to move therein, the subsequent withdrawal of said roller o^6 , and its follower-contact with the rest of the heart shaped cam, resulting in a movement of the tongue and its accompanying parts in an opposite direction with an entire absence of lost motion.

Secured in longitudinal braces P, connected to the frames A^4 , A^5 , at each side, is the ends of a fixed transverse shaft P', upon which near each brace, are pivotally mounted a pair of crossed levers P^2 , P^3 , their lower ends being pivotally connected by short links p , with the bar o^2 , below, while their upper ends are pivotally connected by somewhat more extended links p' , with the lower punch carrier o^3 . Extended vertical rods p^2 , pivotally connect the upper punch carrier O^2 , with the bars o^2 , at each side. When the bars o^2 , are drawn downward by the cam devices described, the crossed levers will be moved to force the lower punch carrier upward with a powerful lever-effect to cause its punches to pass through their coacting nail boxes to expel and drive the nails therefrom. Simultaneously, the upper punch carrier is drawn downward and its punches perform a similar office with respect to the nail boxes. The subsequent upward movement of the bars o^2 , effects the relative raising and lowering of the carriers O^2 , O^3 , in a manner readily apparent.

Returning now to Figs. 5 to 7, inclusive, it will be understood that with the nails introduced loosely into the pans, the jogging motion of the latter will occasion many of said nails to descend point downward within the channels, the walls of which will engage their heads so that the points and a considerable portion of the nail-shanks will be suspended below the bottom openings of said channels. The nails thus positioned in consecutive relation, will gravitate downward along said channels and enter and continue to descend along the slots of the series of runs L to L³ inclusive. The angular relation and rigid connection of the bars K^{14} , and pivotal attachment of arms K^{16} are such that as each pan is vibrated on its inner pivotal connections, the rod K^{12} moving downward in the arc shaped slots K^{17} of the arm enlargements, will result in the fender K^{18} moving inward relative to its pan, so that its lower edge moves in such plane immediately above the properly positioned nails descending below, that any contiguous nails not properly positioned will be swept to a more remote point within the pan and afforded an opportunity to assume a proper position within the channels of the same. As a nail arrives at the lower end of each of the runs of the series L, L¹, the shaft L⁴,

which is oscillated by an arm and link connection p^3 , with the carrier O^2 , will reciprocate the bar L^x , and with it, the distributors L^8 , thereby causing the edge of each oblique slot therein, to separate the foremost nail from those succeeding, the communication between each slot L^x , and the run slot, with which it contacts, being cut off by the movement of the distributor. The nail, point downward, next passes along said oblique slot to the opening I^2 communicating therewith, which at this time will be immediately over the mouth of one of the feed tubes so that the nail descends through said opening and mouth and is conveyed to its proper upper nail box.

Inasmuch as the series of runs L^2 , L^3 , constitute part of the nail feeding mechanism of the lower boxes, it becomes necessary to deliver the nails head-downward, to the feed tubes delivering to such boxes. This is accomplished by causing the depending portion of each nail just as it is leaving a channel within its distributor slide, to trip against one of a plurality of blocks L^7 , secured on the top of the supporting frame at each side, below the hopper, such tripping operation resulting in each nail being turned into an inverted position and so delivered to and descend through the appropriate distributor opening and feed tube.

Angle plates Q , secured to the lower punch carrier O^3 , at each side, have their upper portions extending contiguous to the lower punch boxes and provided with oblique slots q , receiving projections q' , on the shutter-bar N^2 , to reciprocate the same through the movements of said punch carrier.

The punch-carrier R , of the secondary nailing mechanism, there being in this instance only one carrier and that an upper one, reciprocates in suitable guides R' , provided by the frames A^7 and A^9 , said punch-carrier having the companion pairs of side punches R^2 , for driving the nails in the longitudinal edge portions of the top section, as well as the transverse pairs, R^3 , of punches, for subsequently driving the nails through the transverse edge portion of said top section. The upper nail boxes previously described and designated by reference characters S^4 , S^5 , etc., cooperate with these longitudinal and transverse pairs of punches R^2 , R^3 . The stocks S^6 , of these punches have stems, S^{13} , extending through slotted plates S^{14} and clamped by a nut S^{15} , the plates in turn being adjustable by stems and nuts S^{16} , in parallel parts S^7 , of the carrier R , to accord with the adjusted positions of the boxes beneath. Bars R^x , at each side of the machine, have their ends moving in guide-ways R^4 , carried by the frames A^7 , A^9 , said bars being connected by transverse bars R^5 , located near each end and from which depend tongues R^6 , having oppositely extending contact-rollers r and r' , cooperating with nose and heart cams R^7 , R^8 , in a manner the same as that previously described with reference to the cams O^4 and O^5 . This will occasion the reciprocation of the bars R^x , which will be transmitted to the carrier R , by means of the rods r^2 . An arm and link connection R^9 , provides for oscillating the distributor actuating-shaft of the secondary nailing-devices from the movements of the carriers R .

From the foregoing description, it will be understood that both side and end sections of a box are automatic-

ally assembled, then conveyed to an anvil, where they are nailed together by both upper and lower nailing-devices operating with freely separated nails, that thereafter the incomplete box thus formed is partially turned and delivered to a conveyer with one of its open sides uppermost, next delivered to a platform, where the bottom section is automatically positioned, the parts thus assembled being shifted so that the longitudinal edge portions of the bottom section are nailed to the rest of the box, after which, the transverse portions of the bottom section, are correspondingly secured and the completed box finally discharged from the machine. It will further be obvious that the improved machine provides for the numerous operations required, so that they will be conducted at the proper periods of time with certainty and in a comparatively simple manner. Moreover, the general construction and character of the nail-feed and driving mechanism of both the first and second divisions of the machine are such that the nails will be fed and driven without liability of their becoming choked or lodged in the various passages and ducts through which they move.

The adjustable character of the different magazines, together with the adjustable capacity of the blocks on the reciprocating-head and the rod I^6 , provide for operating the box sections of various sizes.

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

1. In a box making machine, the combination with a supporting frame, upper and lower longitudinally disposed mailing devices mounted thereon, having reciprocating blocks and nail driving punches carried by said blocks, a revoluble shaft supported by said frame, cams mounted thereon and actuating said blocks, mechanism connecting said blocks, and means connecting said blocks with said cams, of a plurality of longitudinally and transversely disposed upper nailing devices also mounted in said frame and having reciprocating blocks, nail driving punches carried by said last named blocks, revoluble cams mounted on said shaft actuating said last named blocks, mechanism connecting said last named cams with said last named blocks, mounted on said frame and occupying a position in longitudinal relation with respect to the upper and lower devices first mentioned and coacting therewith, and means for feeding parts of boxes, also mounted on said frame, and coactive with all of said devices.

2. In a box-making machine, the combination with a supporting frame having upper and lower supports, of a plurality of nail boxes or chucks carried by said supports, means for independently adjusting each box or chuck thereon, both longitudinally and transversely, nail feed tubes mounted in said frame, communicating with the boxes, an automatic shutter for the lower boxes mounted in said frame, controlling the movement of passing nails, and provided with obliquely disposed channels for controlling the tube communicating therewith, and means for operating the said shutter.

3. In a box-making machine, the combination with a supporting frame having upper and lower supports, of a plurality of upper and lower nail boxes or chucks carried by said supports, each box or chuck having a vertical passage, and bolts binding in slots and apertures in said boxes and in their supports and arranged to afford facility for adjusting said boxes, both longitudinally and transversely, segments backed by yielding material in the passages of the lower boxes, nail feeding tubes mounted in said frame, communicating with the upper and lower boxes, an automatic shutter mounted in said frame and arranged to control the passage of nails in the tubes communicating with lower boxes, means for operating the said shutter, and means for driving nails.

4. In a box-making machine, the combination with a supporting frame having upper and lower supports, of a plurality of individually adjustable nail boxes carried by said supports, means for feeding nails, having tubes connecting with both the upper and lower boxes and mounted
5 in said frame, a vibrating nail pan also mounted in said frame, an independently pivoted nail fender working at the inner end of the pan, means for actuating the said nail pan, another and separate means for imparting a

separate and independent movement to the said fender, 10 and means for driving nails.

In testimony that, I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this 2nd day of August 1902.

WILLIAM ROBINSON.

Witnesses:

EDGAR A. MONFORT,
BELLE PATTERSON.