

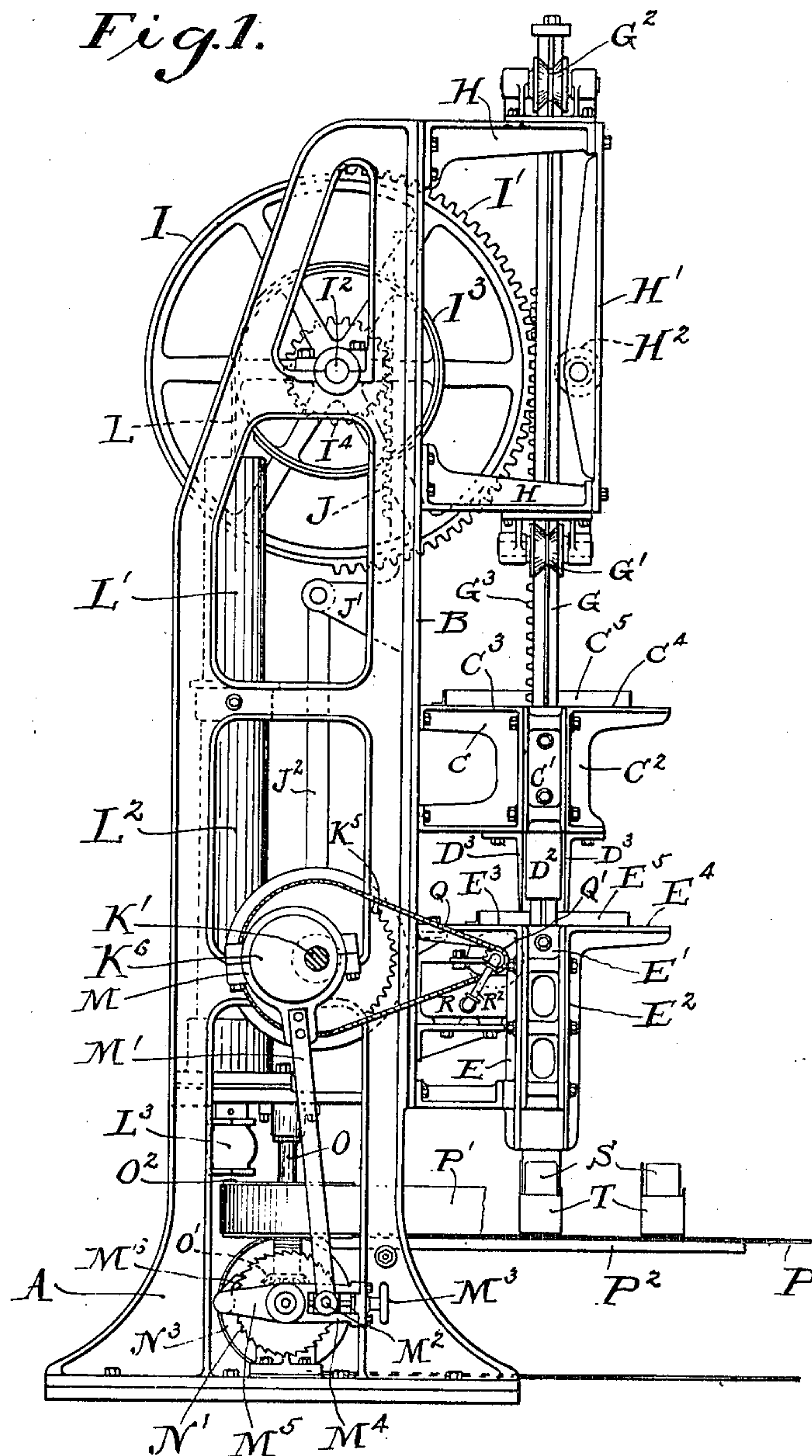
No. 837,325.

PATENTED DEC. 4, 1906.

J. H. MITCHELL.
BOX FORMING MACHINE.
APPLICATION FILED MAR. 8, 1905.

6 SHEETS—SHEET 1.

Fig. 1.



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6 SHEETS—SHEET 2.

Fig. 3.

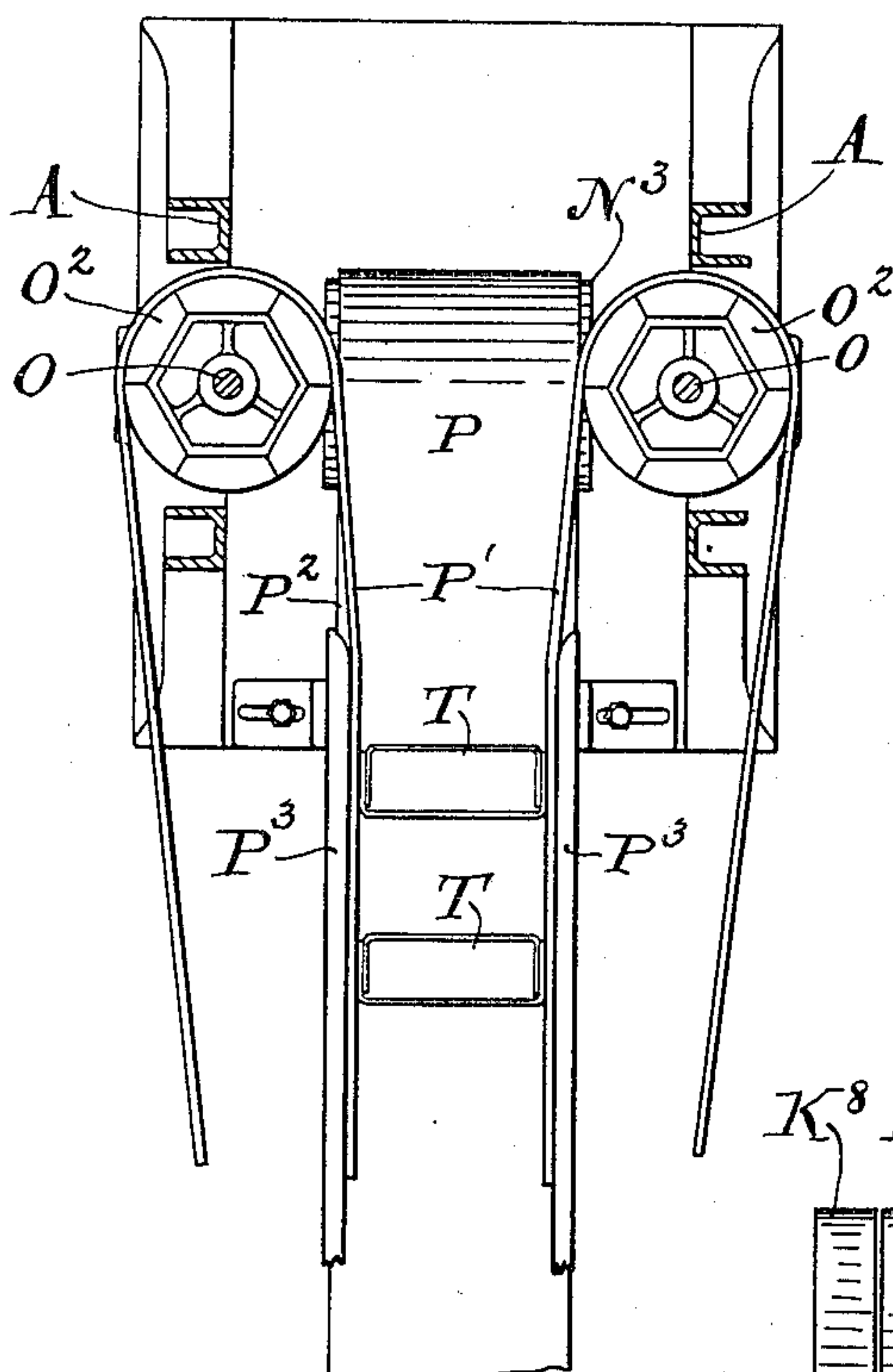
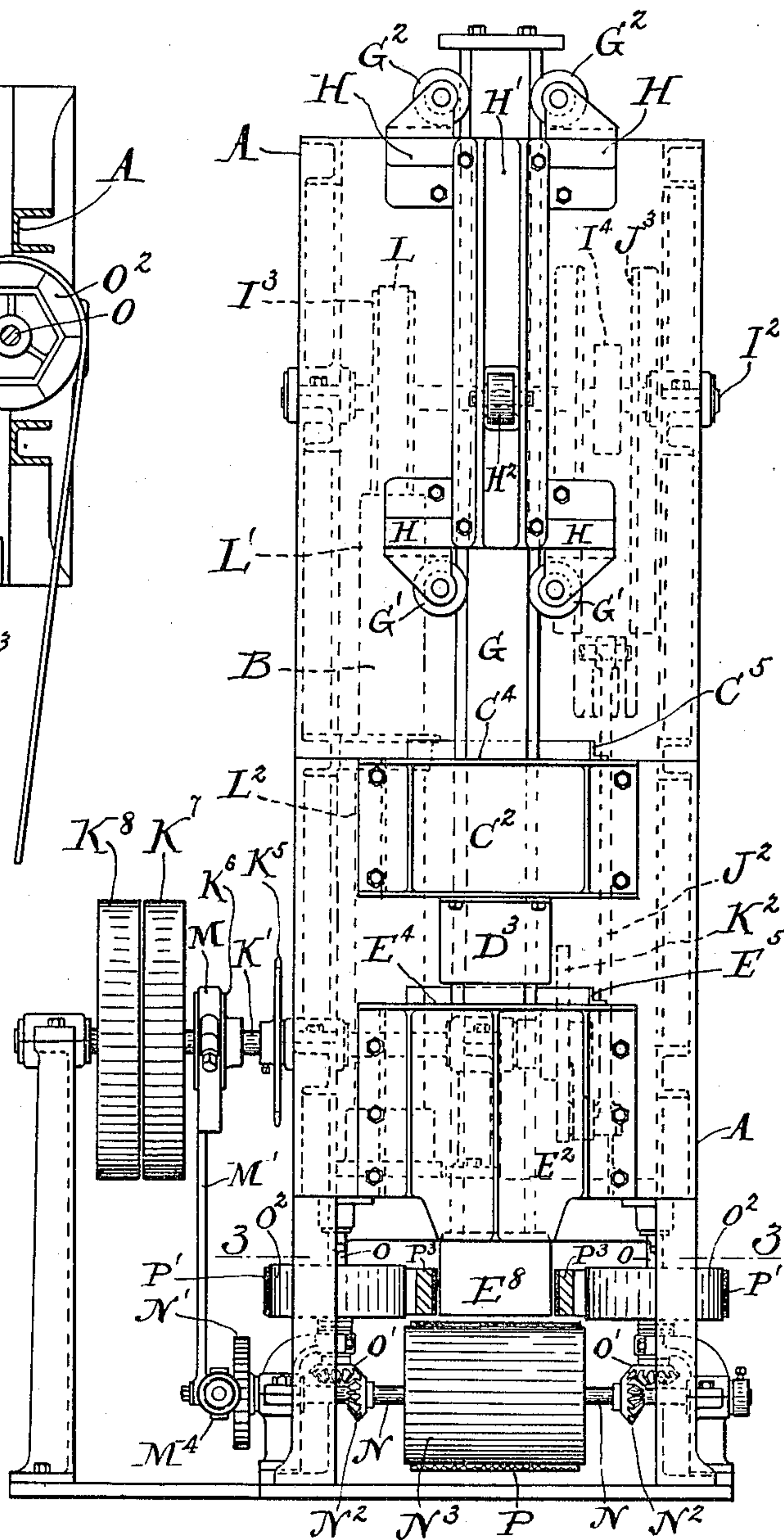


Fig. 2.



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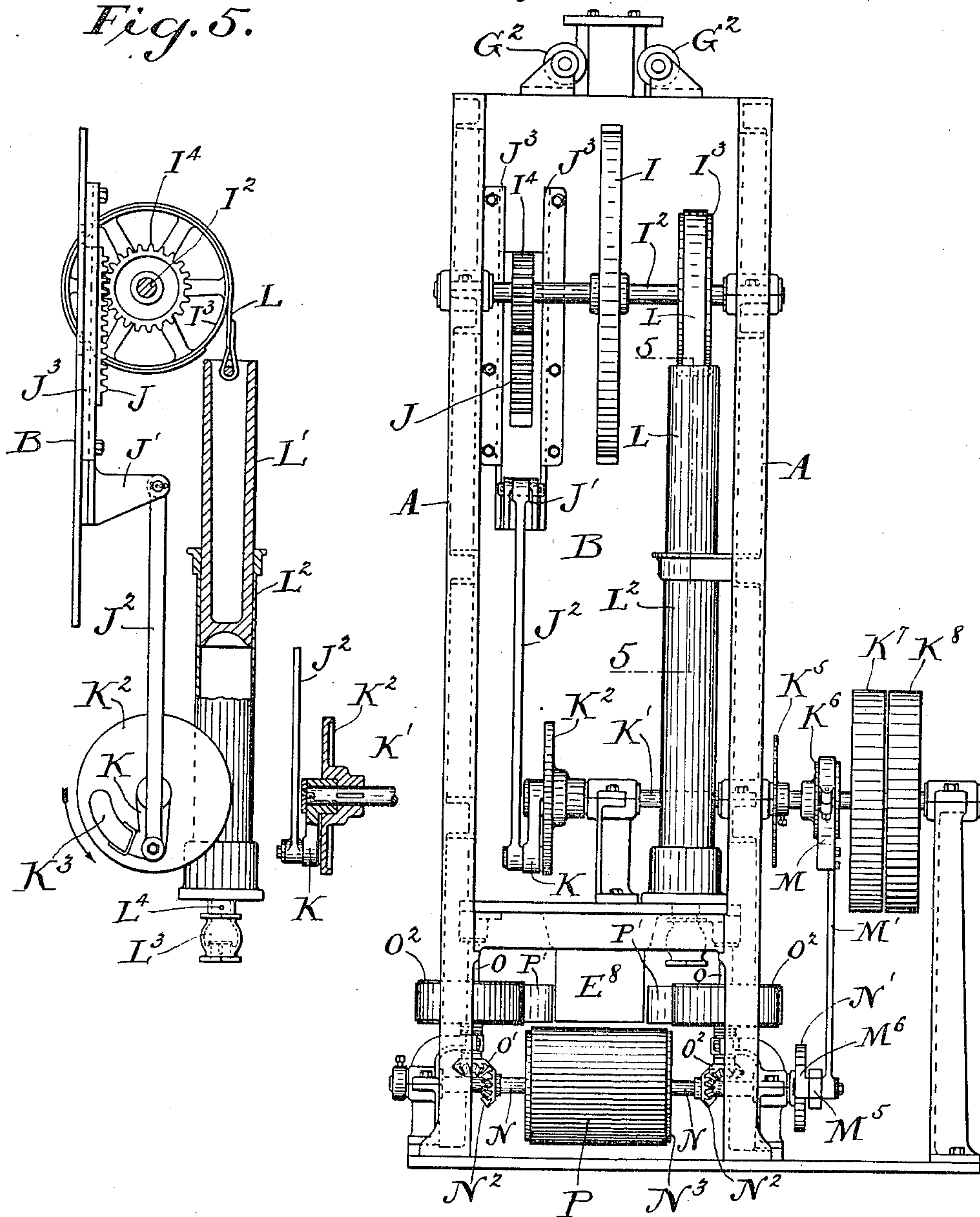
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6 SHEETS—SHEET 3.

Fig. 4.

Fig. 5.



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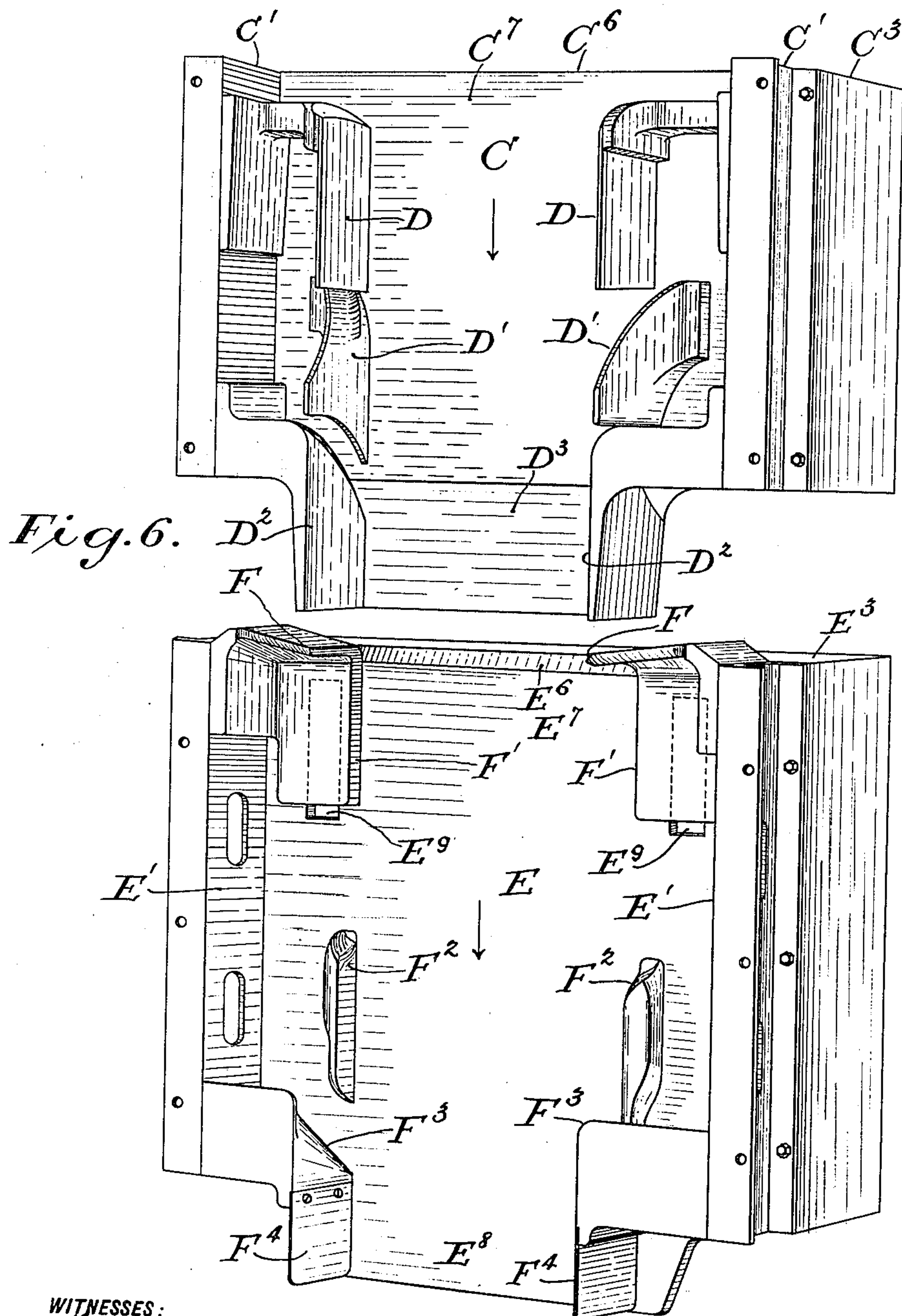
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6 SHEETS—SHEET 4.



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8 SHEETS—SHEET 5.

Fig. 9.

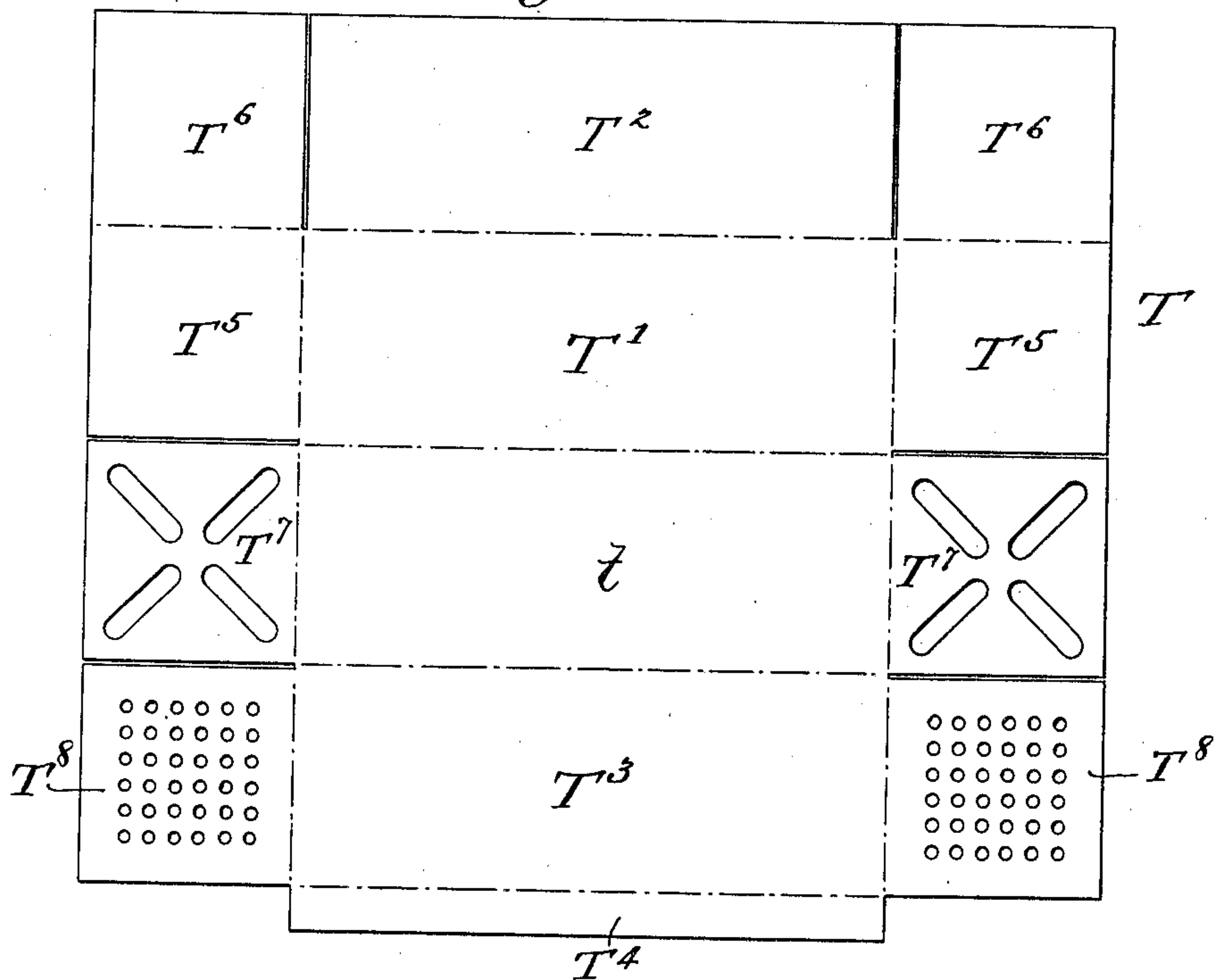


Fig. 7.

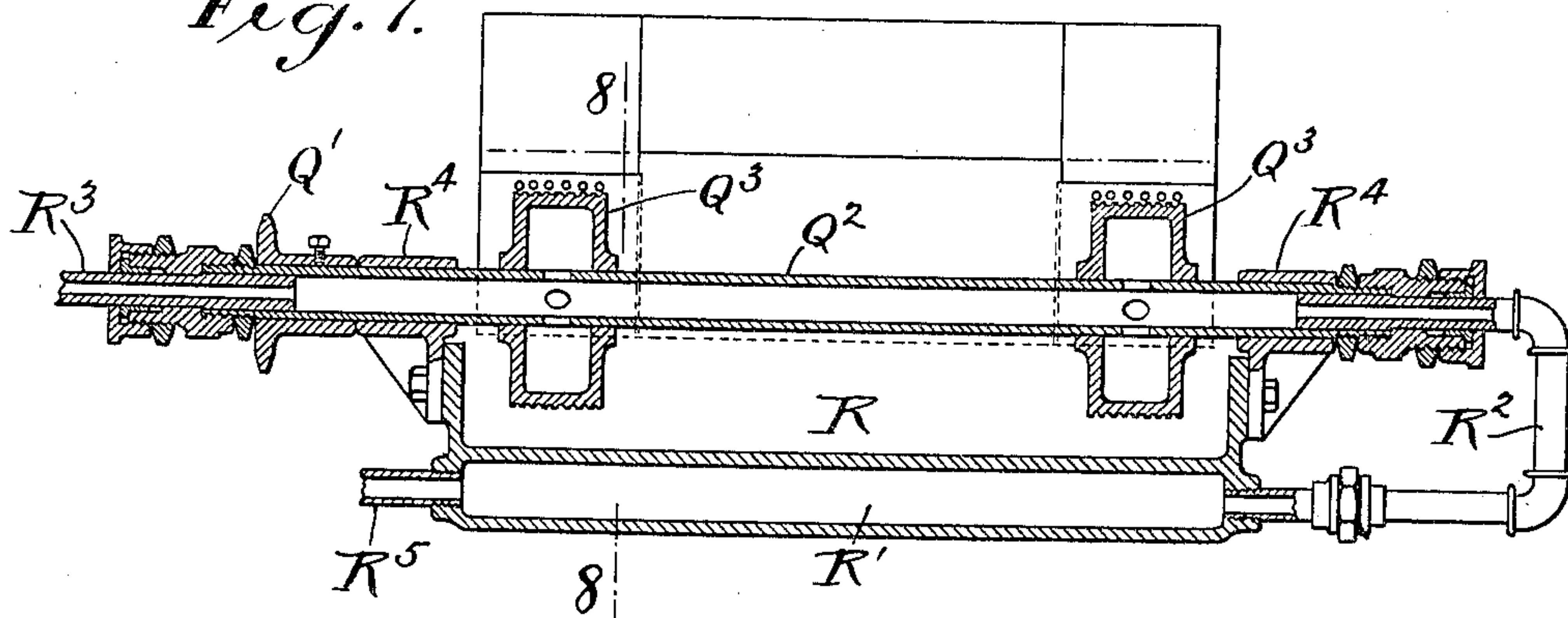
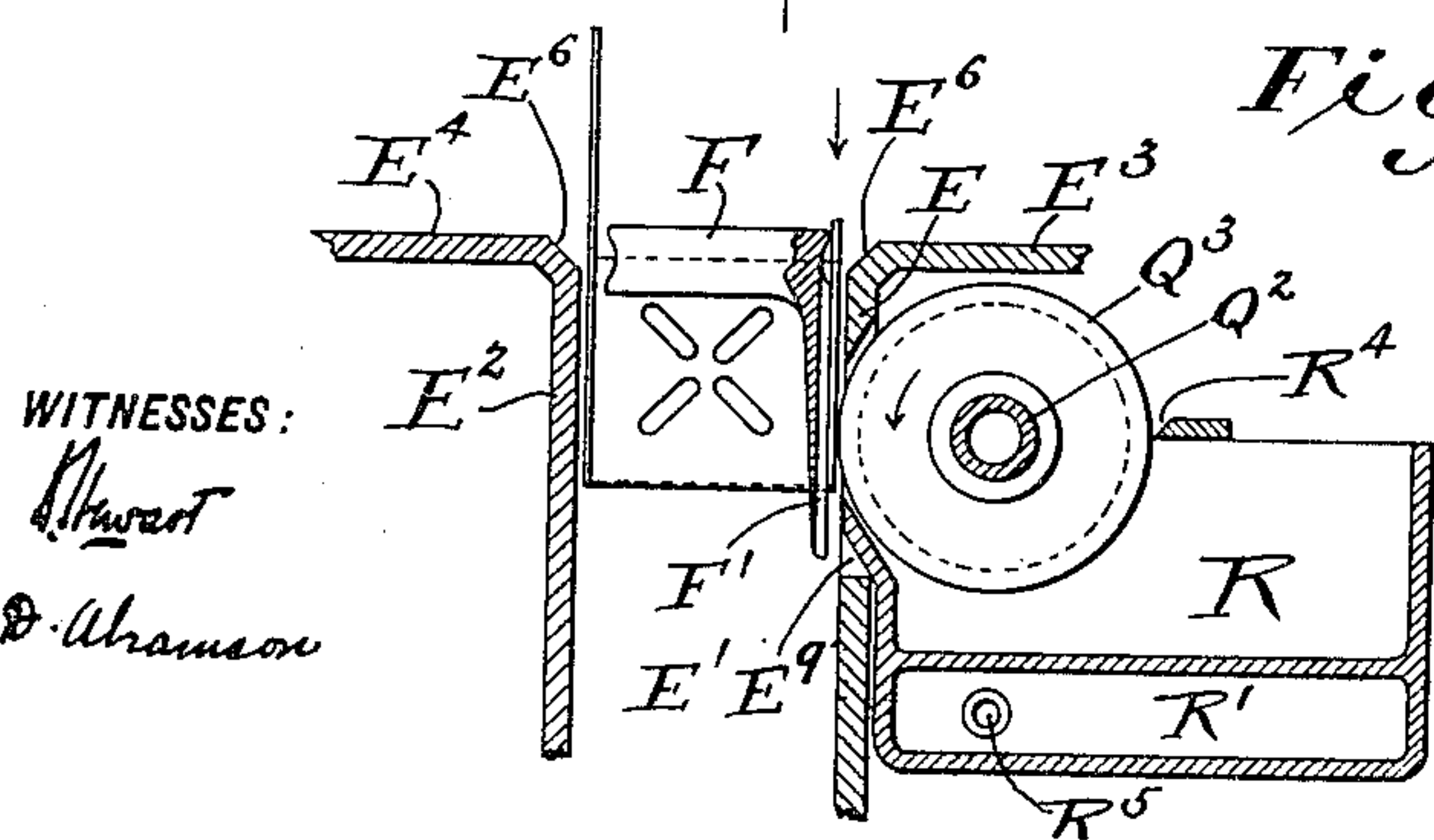


Fig. 8.



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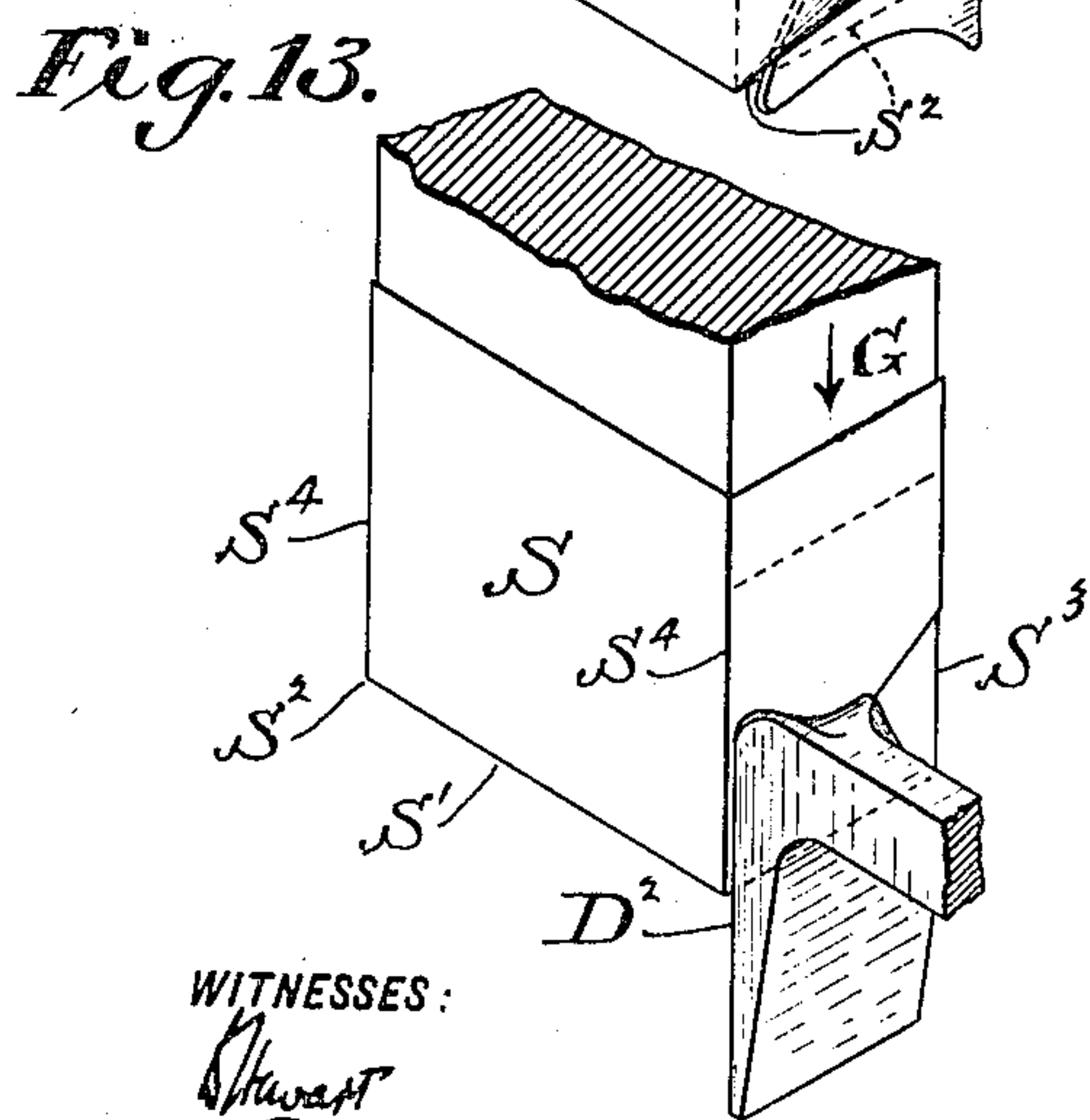
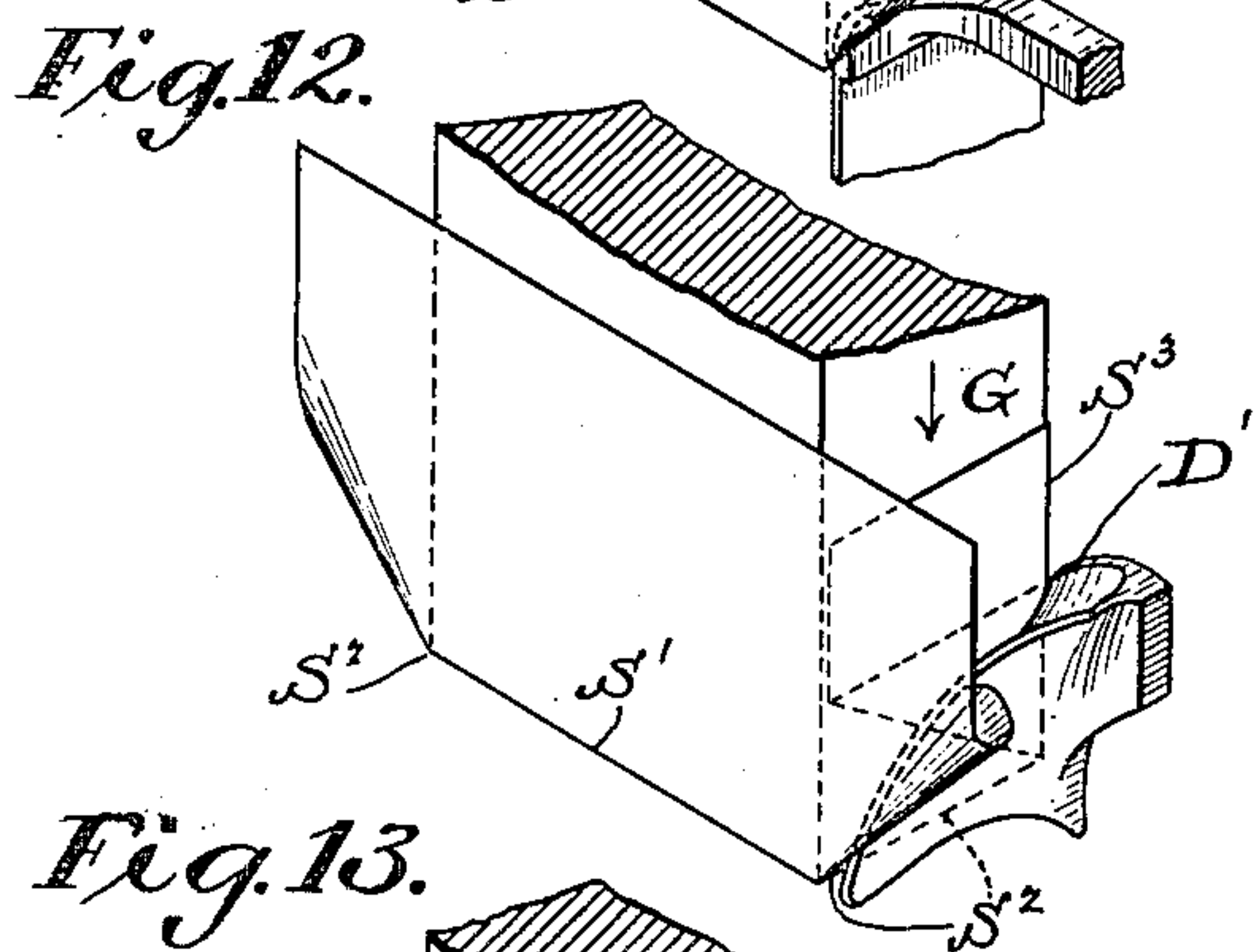
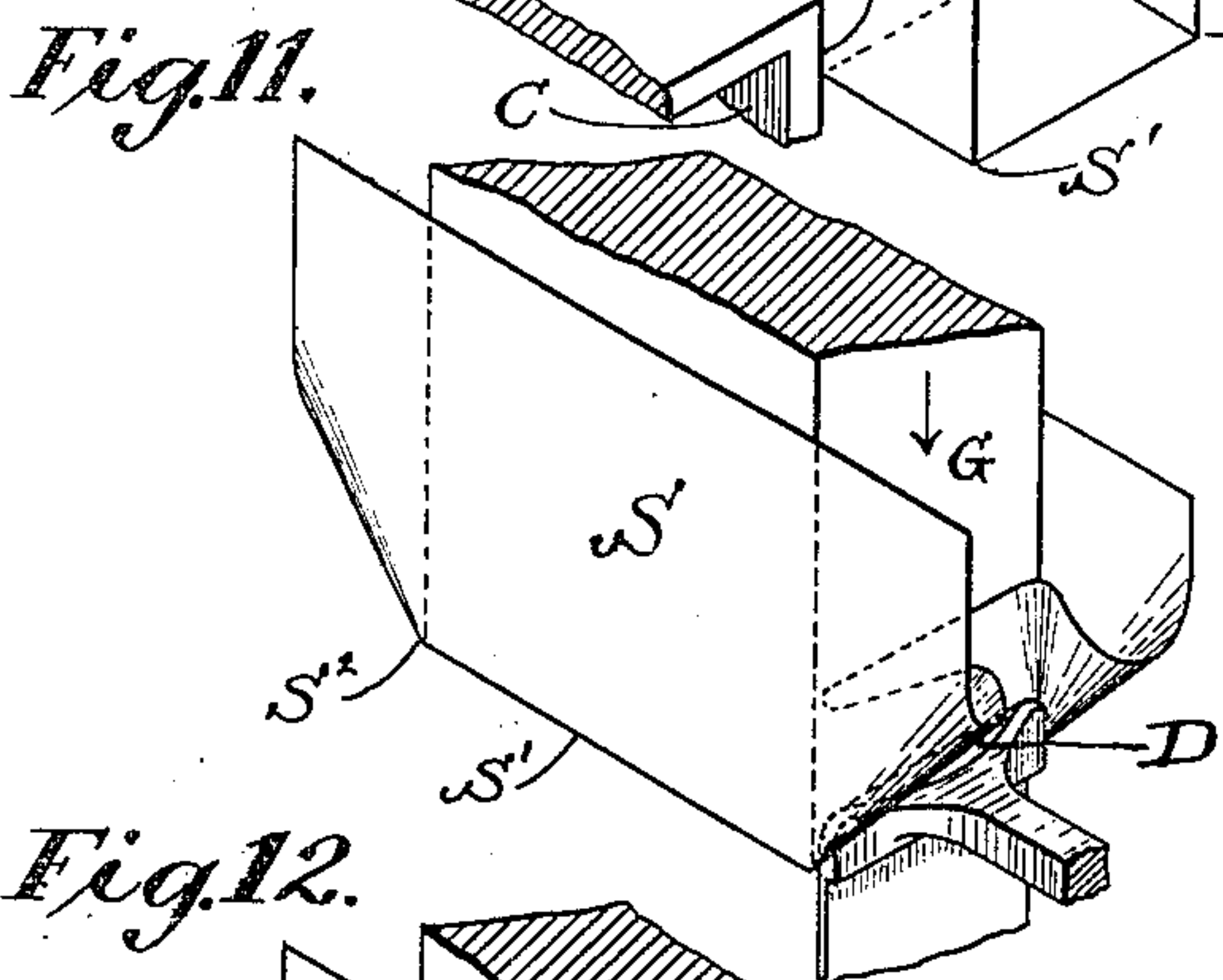
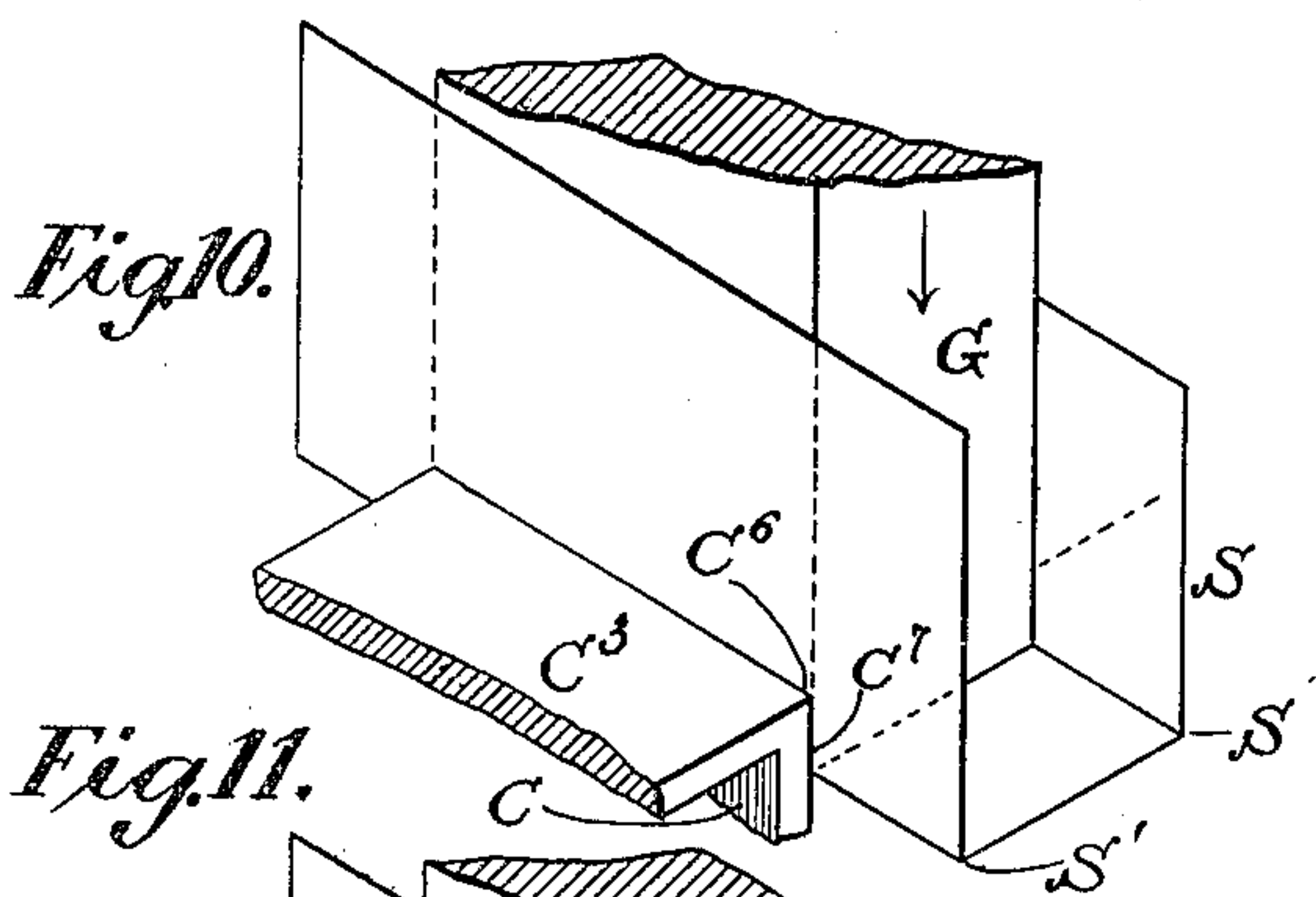
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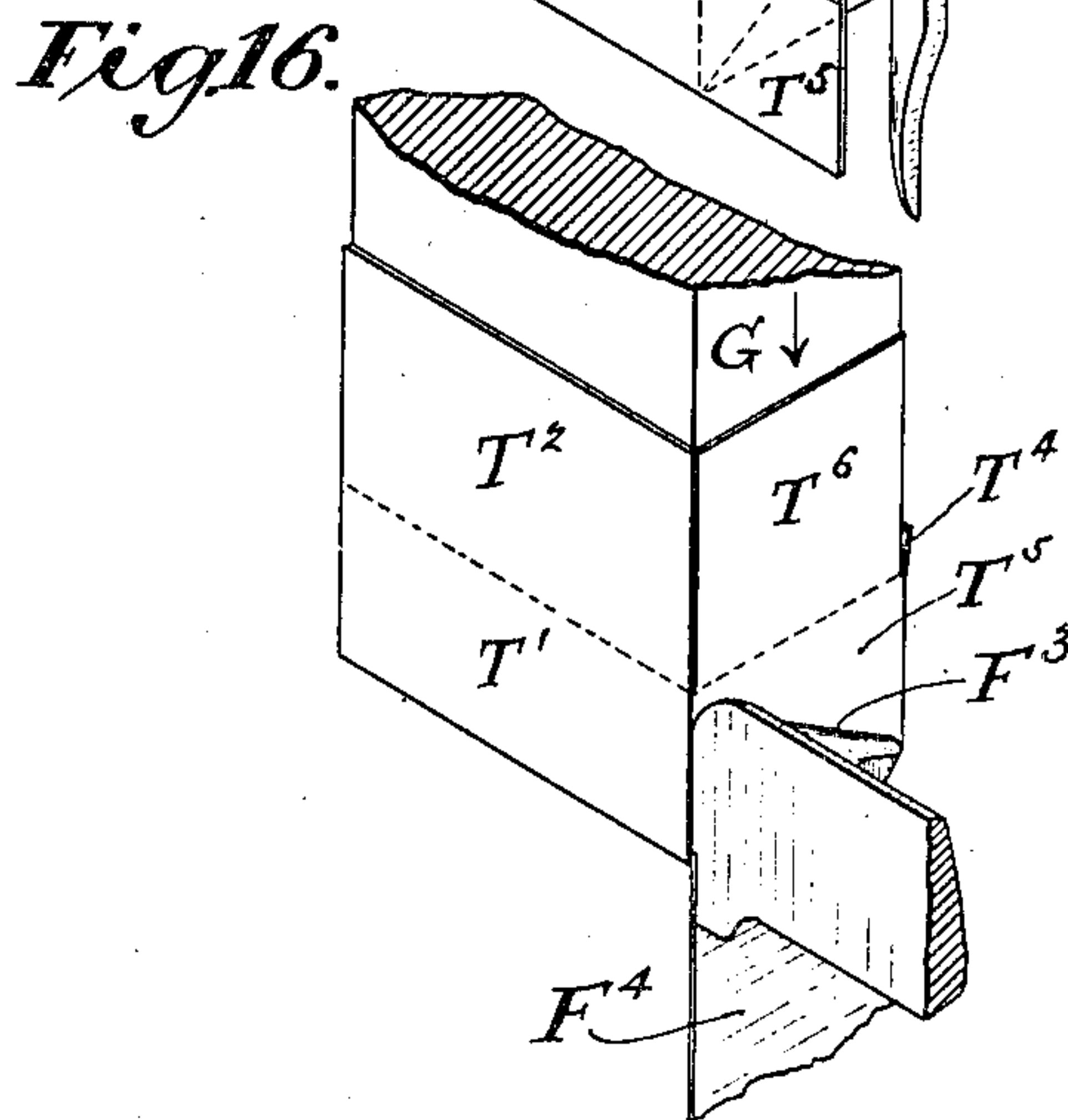
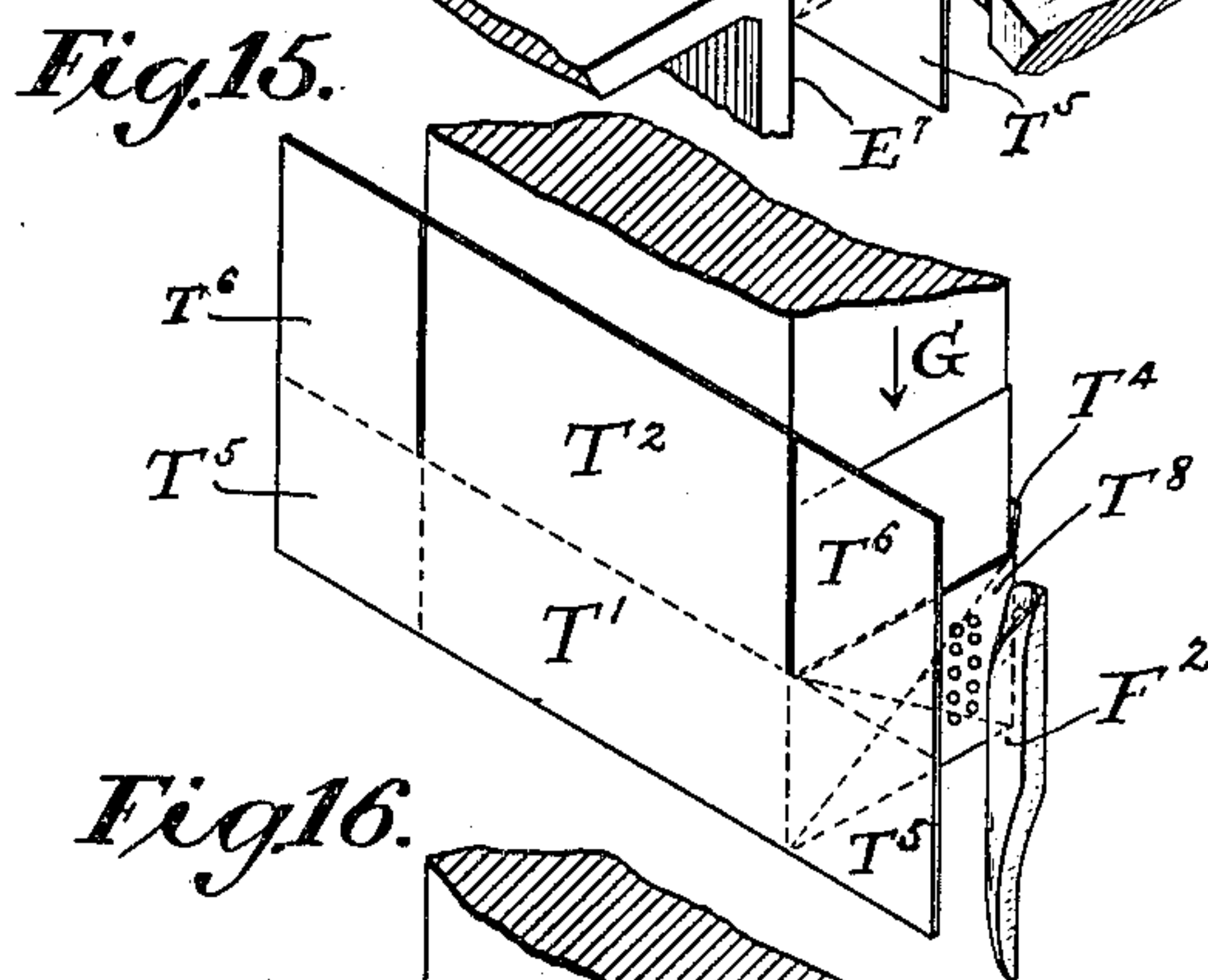
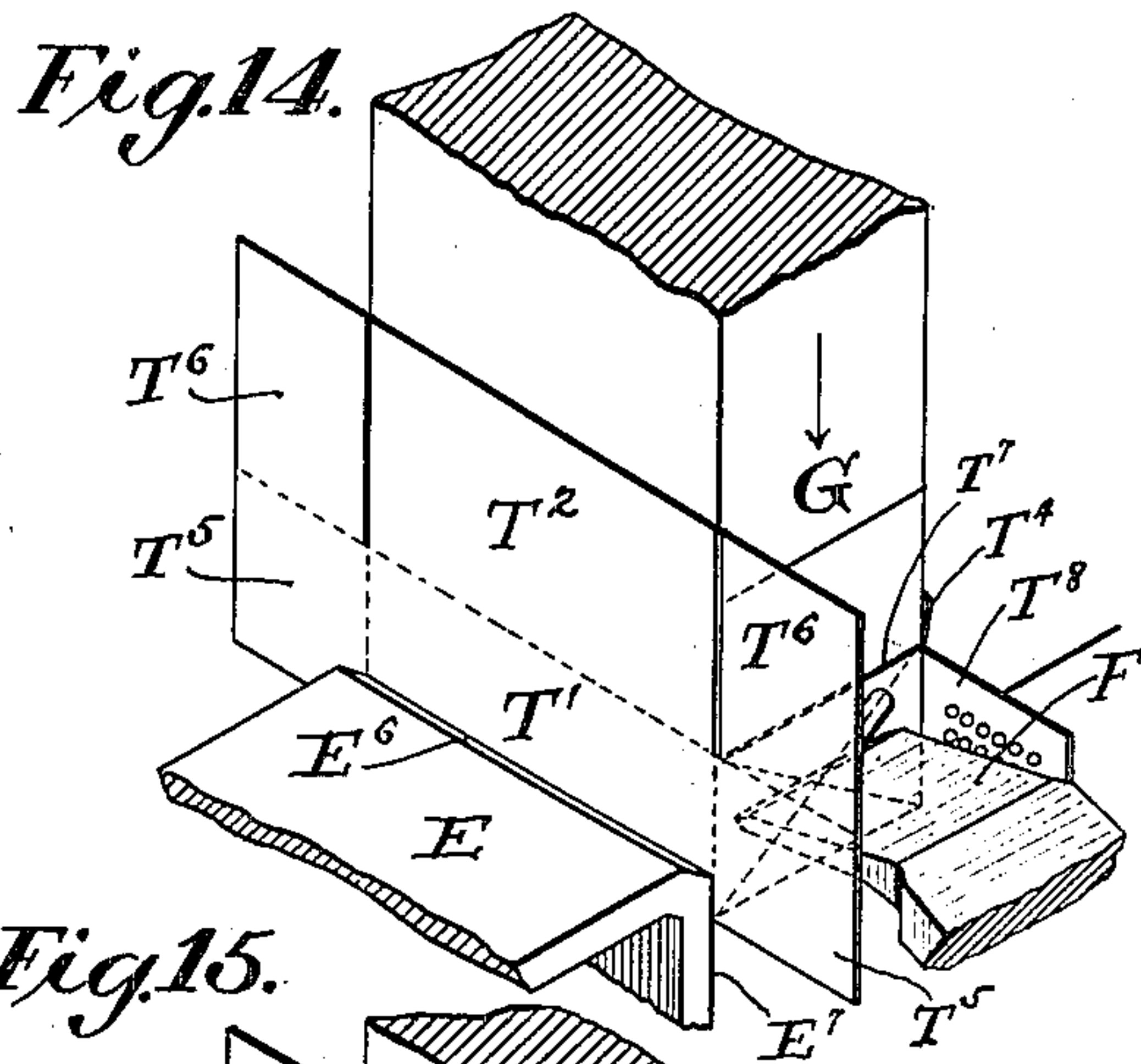
PATENTED DEC. 4, 1906.

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BOX FORMING MACHINE.
APPLICATION FILED MAR. 8, 1905.

6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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BOX-FORMING MACHINE.

No. 837,325.

Specification of Letters Patent.

Patented Dec. 4, 1906.

Application filed March 8, 1905. Serial No. 249,062.

To all whom it may concern:

Be it known that I, JAMES H. MITCHELL, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Box-Forming Mechanism, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to mechanism for forming paper boxes, and is especially adapted for the manufacture of lined paper boxes or boxes consisting of an inner box or case of light material and an outer case of heavier material, though in some of its features my invention is applicable to machinery for making unlined boxes.

The object of my invention is to provide simple and efficient mechanism for the manufacture of boxes for blanks, and the features which are new with me will be best understood as described in connection with drawings, which illustrate a machine constructed in accordance with and embodying my improvements, and in which—

Figure 1 is a side elevation of the said machine; Fig. 2, a front elevation; Fig. 3, a plan view of the carrier devices, taken as on the line 3 3 of Fig. 2. Fig. 4 is a rear elevation of the machine; Fig. 5, a side elevation of the mechanism for actuating the forming head or plunger, said mechanism being partly shown in section on the line 5 5 of Fig. 4. Fig. 6 is a perspective view of the two sets of folding devices, which are an important feature of my invention, the view representing the chambers in which the folding devices are situated with the front walls removed. Fig. 7 is a sectional elevation through the cement-trough and cement-applying rollers, the section being a vertical one taken through the middle of the shaft carrying the rolls. Fig. 8 is a cross-sectional view taken as on the line 8 8 of Fig. 7. Fig. 9 is a plan view of the blank of the outer covering or case of the box. Figs. 10 to 13, inclusive, represent the action of the head in connection with the folding devices of the upper set of such devices in folding a paper blank into the inner or lining box; and Figs. 14 to 16, inclusive, represent the action of the folding-head in connection with the folding devices of the second set in folding the outer blank into the form of a box around the inner blank.

A indicates the frame of the machine, and B a vertical plate supported on and virtually forming part of the frame.

C is a bracket extending out in front of the plate B and forming the back face of the chamber or channel in which the upper set of folding devices are situated, C' C' indicating the lateral walls of this chamber and C² the detachable front wall of the chamber, all fastened to the bracket C and having their upper faces flush, as indicated at C³ and C⁴, and provided with an alining-plate C⁵, blanks for the inner box being fed to the tubular surface C³ C⁴, which thus constitute a blank-holder, and alined against the plate C⁵. I have indicated in Fig. 6 by the symbol C⁷ the chamber or channel made up as above described and in which are situated the folding devices of the upper set of folding devices, these consisting, as shown, first of all, of the edges C⁶, which serve to turn the ends of the inner blank up around the head, as shown in Fig. 10; second, in the folding-blades D D, which press the edges of the blank up against the edges of the head, as shown in Fig. 11; third, in the folding-blades D' D', which turn one of the end flaps in, as indicated in Fig. 12, and, fourth, in the folding-blades D² D², which turn the other flap in, as shown in Fig. 13.

D³, as shown in Fig. 6, indicates a plate forming a virtual prolongation of the bracket C, having simply the function of guiding the inner box as it passes on its way to the second set of folding devices, which are situated directly in line with and, as shown, directly beneath the first set of folding devices and are supported on a bracket E, which forms the inner wall of the chamber in which the second set of folding devices is situated and which, like the upper bracket C, supports side walls E' E' and a front wall E², the upper end of the bracket and attached parts forming a table or blank-holder, (indicated at E³ E⁴;) provided with alining-plates E⁵ for the introduction and alinement of the blank which is made into the outer cover or box. The folding devices of the second set are made up, first of all, of the inner and outer edges E⁶ of the plates making up the chamber or channel E⁷; second, of the folder-plates F F, which, as shown, are provided with extensions F' F', which serve to support certain flaps of the partially-folded blank while cement is being applied to them;

third, in the folder-plates $F^2 F^2$, and, fourth, in the folder-plates $F^3 F^3$, from which extend guide-plates $F^4 F^4$, acting in connection with a prolongation E^8 of the plate E to guide the

5 completed box into the grip of the transporting-belts, situated below the folding devices. G is the forming and feeding head, preferably made in the form of a plunger, as indicated, and moving, as shown, between
10 grooved guide-rolls G^1 and G^2 , the rear side of the plunger being provided with a rack G^3 . The guide-walls G^1 and G^2 are supported on brackets $H H$, which also support a vertical plate $H^1 H^1$, on which is pivoted a guide-wheel H^2 , which rests against the back of the
15 plunger, so as to hold the rack in contact with the actuating gear-segment I^1 of a wheel I , which is secured on a shaft I^2 , to which shaft is also secured a wheel I^3 and a
20 gear-wheel I^4 . The said gear-wheel I^4 is in engagement with the rack J , moving in guideways $J^3 J^3$, secured on the plate B and connected, through a bracket J^1 , with a connecting-rod J^2 , the end of which is pivotally
25 connected with a crank-arm K , which is journaled on the end of a shaft K^1 and positioned to be engaged by a projecting finger K^3 on the disk K^2 , which is firmly secured to the shaft K^1 , so as to rotate with it. Also se-
30 cured to the shaft K^1 is the chain-wheel K^5 and the eccentric, (indicated at K^6 .)

K^7 and K^8 are fast and loose pulleys on the shaft K^1 .

Returning now to the shaft I^2 , L is a belt
35 or strap secured at one end to the wheel or drum I^3 and at the other end secured to the plunger L^1 , which moves in the cylinder L^2 , which said cylinder has at its lower end the valve L^3 for permitting the free entrance of
40 air and a restricted passage L^4 for the exit of air.

M indicates the eccentric-strap on the eccentric K^6 of the shaft K^1 , the said strap connecting, through the end M^2 of a rod M^1 , with
45 a lever $M^4 M^5$, having an adjusting device (indicated at M^3) for adjusting the point of connection of the rod end M^2 and having at its free end a pawl M^6 , adapted to engage a ratchet-wheel N^1 on the shaft N , said shaft
50 having attached to it bevel-gears $N^2 N^2$ and a belt-drum, (indicated at N^3 .) The bevel-gears actuate through bevels $O^1 O^1$, the vertical shafts $O O$, to which are secured the lateral belt-wheels, (indicated at $O^2 O^2$.)

55 P is the lower belt, and $P^1 P^1$ the lateral upper belts, the upper surface of the lower belt being supported, as shown, (see Fig. 1,) on a guide-plate P^2 , and the lateral belts being preferably partly guided and supported on
60 lateral plates $P^3 P^3$, as shown in Figs. 2 and 3.

The sprocket or chain wheel K^5 is connected, through a chain Q , with the sprocket or chain wheel Q^1 , which is secured to the hollow shaft Q^2 , which supports the hollow ce-
65 menting-wheels, (indicated at $Q^3 Q^3$.) The

shaft is supported on bearings $R^4 R^4$, extending up from the cement-trough R , between which is formed the steam-chamber R^1 , which is in communication with the hollow shaft Q^2 through the pipe connection $R^2 R^3$, indicating
70 the steam connection leading from the other end of the shaft, and R^5 the steam connection leading from the other end of the chamber R^1 .

The inner blank, (indicated at S , see Figs. 10 to 13,) is first folded on the lines $S^1 S^1$,
75 then on the lines $S^2 S^2$, then on the lines $S^3 S^3$, and finally on the lines $S^4 S^4$. The outer blank, the preferable construction of which is shown at T in Fig. 9 and of which the panel marked T^2 forms the top and the panel
80 marked t forms the bottom of the box, is first folded so that the panels T^1 and T^3 extend at right angles to the panel t . Then the flaps $T^7 T^7$ are folded up, as shown in Fig. 14, the flaps $T^8 T^8$ passing in front of the guide-
85 plates F^1 , which support them in front of openings E^9 , while the rollers Q^3 apply cement to them. Then the side flaps T^8 are folded, passing in front of the guide-plates F^1 , which support them while the rollers Q^3 ap-
90 ply cement to them. Then the side flaps T^8 are folded in, as shown in Fig. 15, and, finally, the flaps T^5 are folded inward, as indicated in Fig. 16, enfolding of the flaps T^4 , T^6 , and T^2 be-
95 ing left to be performed by hand after the receptacle is filled and ready for closure. It will be noticed that the flaps T^8 and T^7 are perforated, so that the cementing material applied to the flaps T^8 will pass through it
100 into contact with the flaps T^7 and through the perforations of the last-mentioned flaps into contact with the folded end of the inner lining or box, thus cementing all of these parts together and also to the end flaps T^5 ,
105 which are folded down on the cemented flaps T^8 . The box thus constructed is a new one and forms the subject-matter of my application for Letters Patent filed December 27, 1904, Serial No. 238,414.

In operation a plain blank is placed on the
110 table $C^3 C^4$ and a properly cut and grooved blank T on the table $E^3 E^4$, the forming-head being of course in its upper or retracted position. The driving-shaft K^1 may be taken
115 as in constant rotation, so that when the front end of the projecting finger K^3 of disk K^2 engages the crank-arm K , which may be said to stand normally in an upright position, the said arm is rotated downward, carrying
120 with it the rack J , which by its engagement with the gear-wheel I^4 on the shaft I^2 rotates said shaft, so that the segmental rack I^1 is also rotated and through its engagement with the rack G^3 forces the plunger, with its form-
125 ing and feeding head on its end, through the two sets of forming devices, with the result of first forming the inner box or lining, as shown in Figs. 10 to 13, and then forming around said inner lining the outer box, as shown in Figs. 14 to 16. The rotation of the
130

shaft I' through its wheel I³ draws up the bolt L and the plunger L' to the position shown in Fig. 5, so that when the crank-arm K has passed the center line, or the position it occupies in Fig. 5, the weight of the plunger L' will cause the shaft I² to oscillate backward, with the result of rapidly retracting the plunger and bringing all parts to their normal starting position, this action being much quicker than that which would be caused by a direct connection with the driving-shaft, and the parts remaining in retracted position until the rotation of the driving-shaft again brings the plunger into contact with the arm K³. As shown, I have provided the cylinder L² with an air-admission valve L³ and a restricted air-exit passage L⁴, so that the said cylinder, besides connecting the piston or plunger L', acts as a dash-pot to prevent destructive jar at the end of the retracting stroke.

It will be understood that the cement-applying wheels Q³ are in constant rotation in the heated cement-receptacle R and that the rolls are also heated by the steam which heats the receptacle. I have already described the manner in which these wheels apply cement to the flaps T⁸ of the blank T, and their action is fully illustrated in Fig. 8. The movement of the belt-drums N³ O² O² is effected intermittently by the action of the eccentric K⁶, which communicates an oscillating motion to the shaft N, to which is directly attached the belt-wheel N³, the intermittent motion being communicated, through the bevel-gears M² and O', to the shafts O O and the attached lateral belt-wheels.

It will be understood that the working stroke of the forming-head carries the completed boxes down between the lateral belts P' P', which grip the boxes sufficiently tightly to hold them against the retracting movement of the head and the head being retracted carry them—as indicated, for instance, in Figs. 1 and 3.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a box-forming machine, mechanism for forming a lined box from two blanks consisting of two sets of folding devices arranged in sequence and each having a blank-holder at its entrance end in combination with a forming and feeding head moving in a direct line and without rotation first, through one set of folding devices and then through the other set.

2. In a box-forming machine, mechanism for forming a lined box from two blanks consisting of two sets of folding devices arranged in sequence and each having a blank-holder at its entrance end in combination with a forming and feeding head adapted to move first through one set of folding devices and then through the other set and means for ap-

plying cementing material to flaps of the second blank as it passes through the second set of folding devices and before the cemented flaps are folded to place.

3. In a box-forming machine, mechanism for forming a lined box from two blanks consisting of two sets of folding devices arranged in sequence and each having a blank-holder at its entrance end in combination with a forming and feeding head adapted to move first through one set of folding devices and then through the other set, supporting-plates arranged in the second set of folding devices to support unfolded flaps of the second blank in unfolded position and means for applying cementing material arranged to apply cement to the flaps while so supported.

4. In a box-forming machine, mechanism for forming a lined box from two blanks consisting of two sets of folding devices arranged in sequence and each having a blank-holder at its entrance end in combination with a forming and feeding head adapted to move first through one set of folding devices and then through the other set, means for applying cementing material to flaps of the second blank as it passes through the second set of folding devices and before the cemented flaps are folded to place and carrier-belts arranged to receive the boxes as they are delivered from the folding devices and carry them away.

5. In a box-forming machine, mechanism for forming a lined box from two blanks consisting of two sets of folding devices arranged in sequence and each having a blank-holder at its entrance end in combination with a forming and feeding head adapted to move first through one set of folding devices and then through the other set, means for applying cementing material to flaps of the second blank as it passes through the second set of folding devices and before the cemented flaps are folded to place and intermittently-moving carrier-belts arranged to receive the boxes as they are delivered from the folding devices and carry them away.

6. In a box-forming machine, mechanism for forming a lined box from two blanks consisting of two sets of folding devices arranged in sequence and each having a blank-holder at its entrance end in combination with a forming and feeding head adapted to move first through one set of folding devices and then through the other set, means for applying cementing material to flaps of the second blank as it passes through the second set of folding devices and before the cemented flaps are folded to place and carrier-belts P', P', arranged to receive the boxes as they are delivered from the folding devices and carry them away and at the same time hold the folded flaps in position.

7. In a box-forming machine, mechanism for forming a lined box from two blanks con-

sisting of two sets of folding devices arranged in sequence and each having a blank-holder at its entrance end in combination with a reciprocating forming and feeding head adapted to move first through one set of folding devices and then through the other set and means for actuating said head whereby it moves relatively slowly through the folding devices while acting on the blanks, is retracted swiftly and dwells in retracted position.

8. In a box-forming machine, the combination with folding devices and a reciprocating feeding and forming head adapted to move through said folding devices, of means

for actuating the head consisting of a shaft I^2 , connected to actuate the head, a cylinder and piston $L^2 L'$, said piston being connected to shaft I^2 , so as to be raised when the shaft is rotated in a direction to move the former-head through its working stroke whereby the shaft is rotated in the opposite direction by the vacuum in the cylinder when free to act, and means acting intermittently on the shaft I^2 , to rotate it in a direction to move the former-head through its working stroke.

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Witnesses:

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