

No. 689,443.

Patented Dec. 24, 1901.

J. H. & E. L. WHITE.  
MATCH MAKING MACHINERY.

(Application filed June 10, 1899. Renewed Apr. 21, 1900.)

(No Model.)

9 Sheets—Sheet 1.

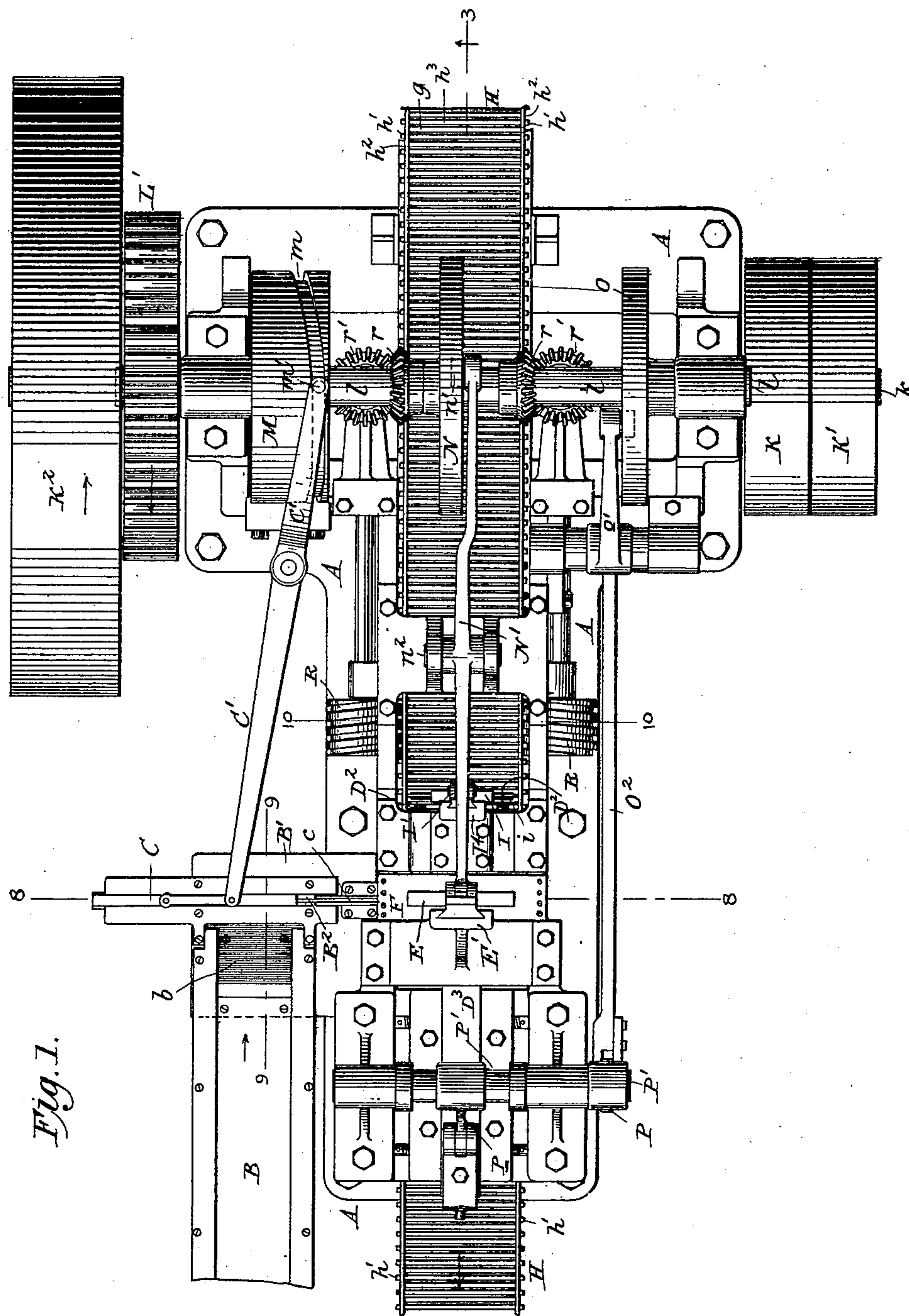


Fig. 1.

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No. 689,443.

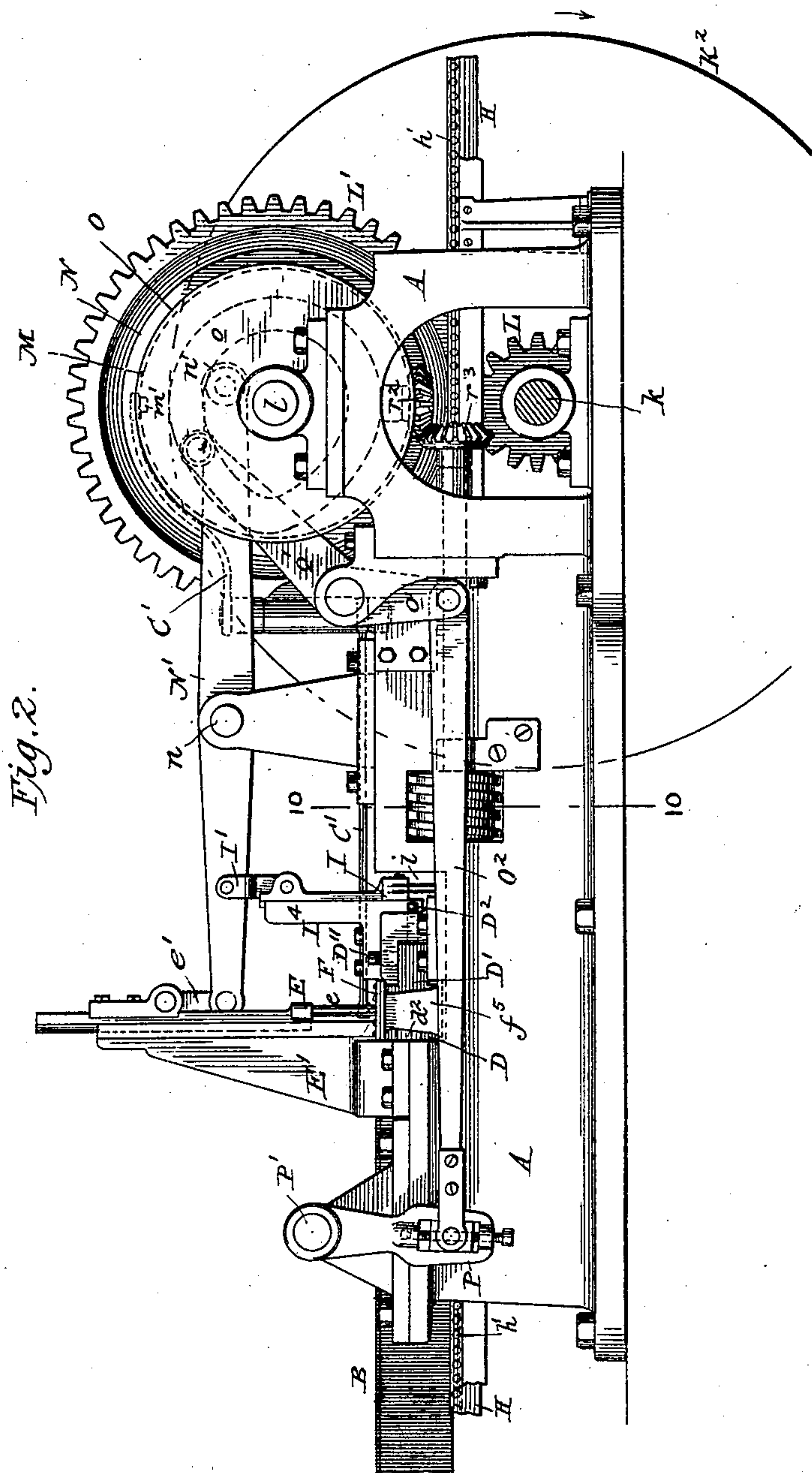
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9 Sheets—Sheet 2.



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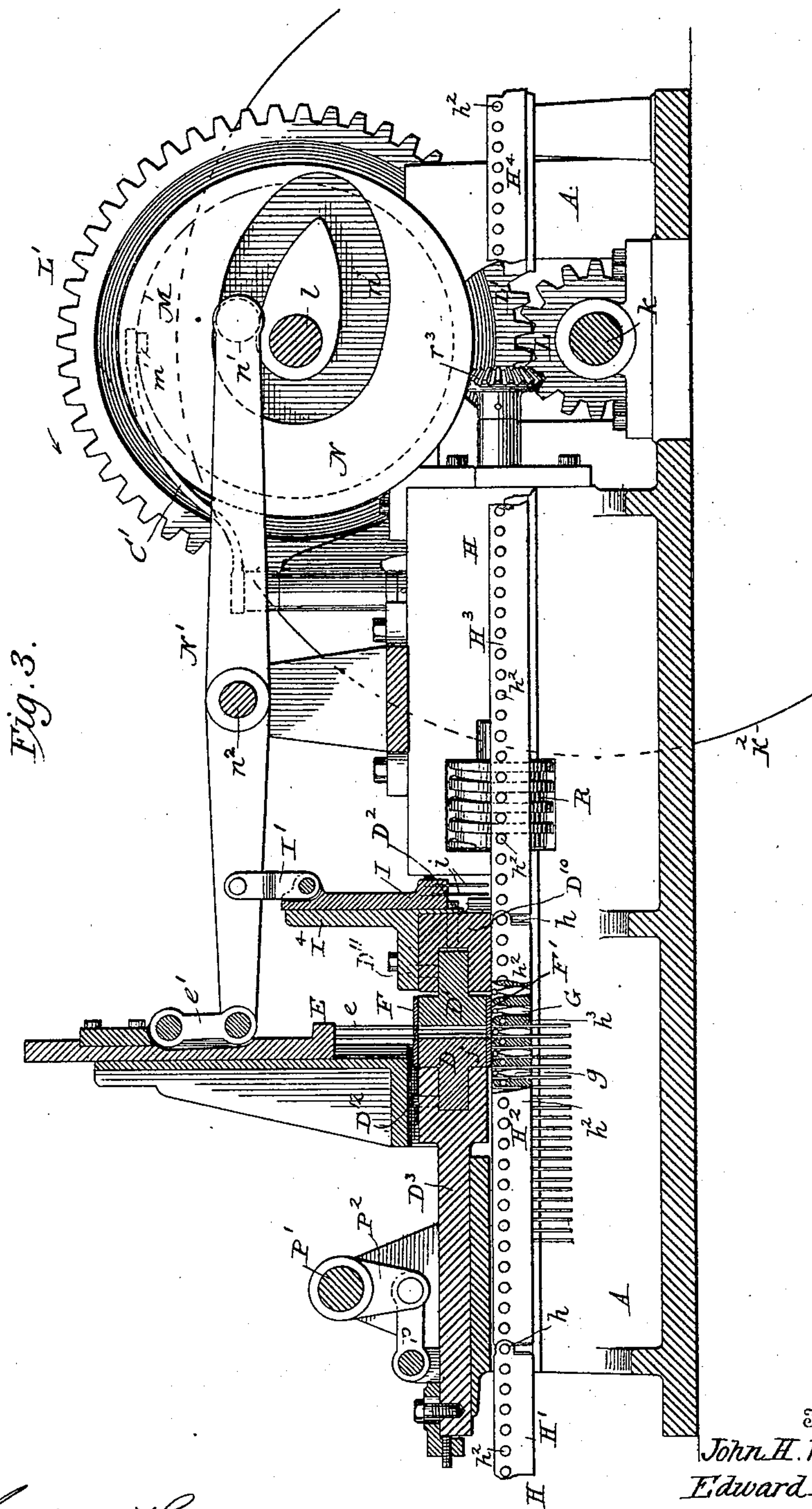
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**9 Sheets—Sheet 3.**



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Fig. 4.

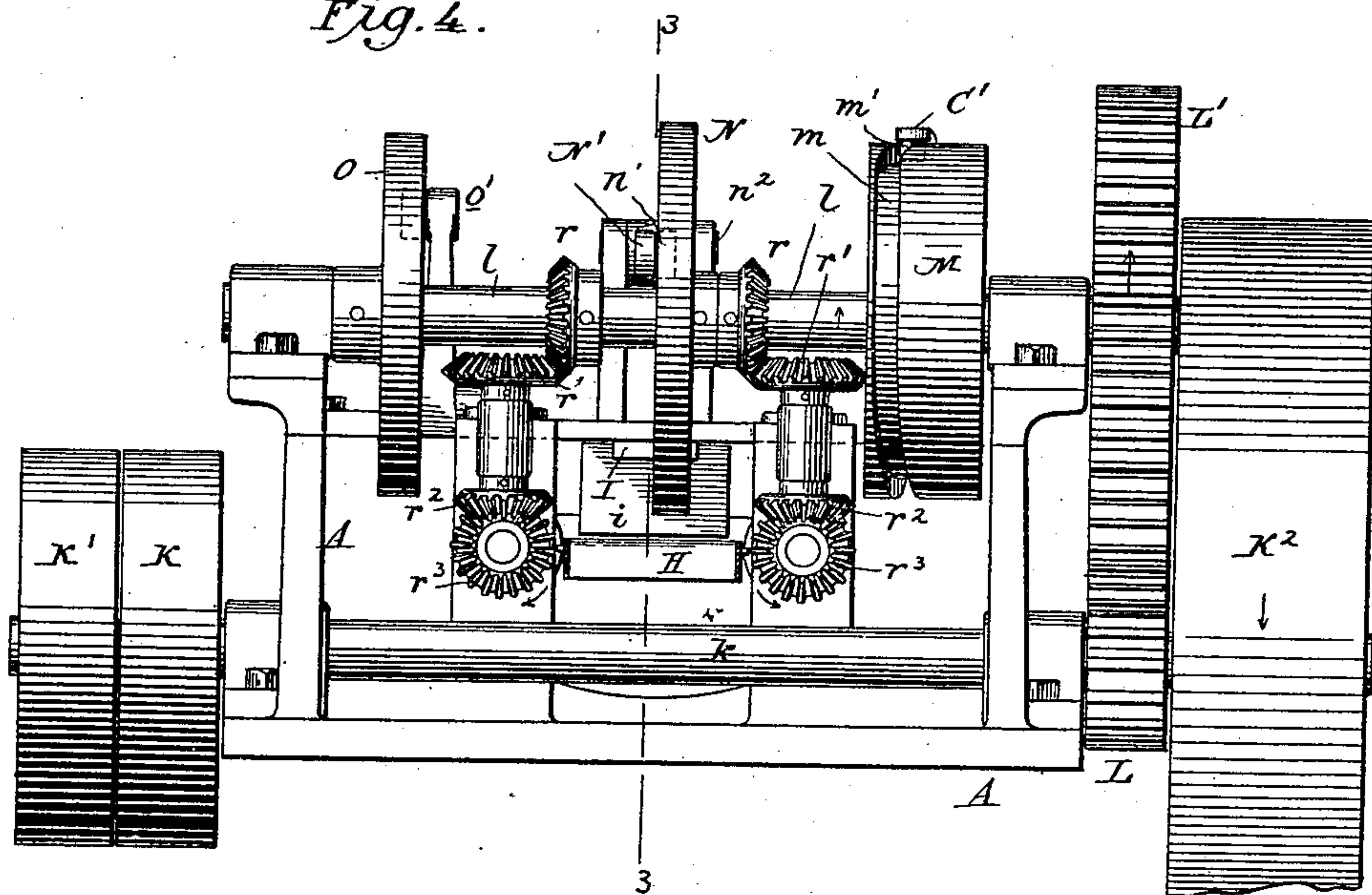


Fig. 10.

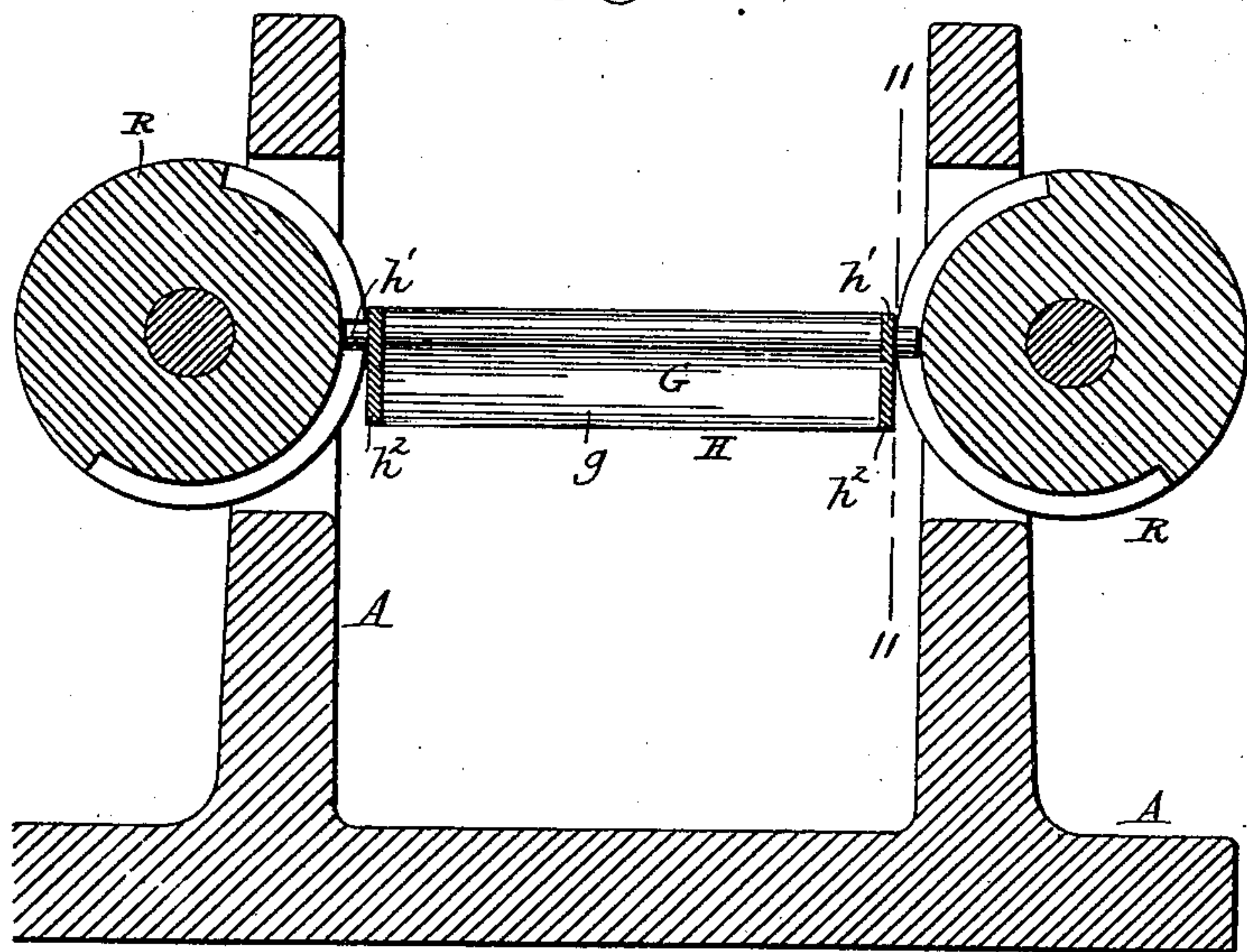
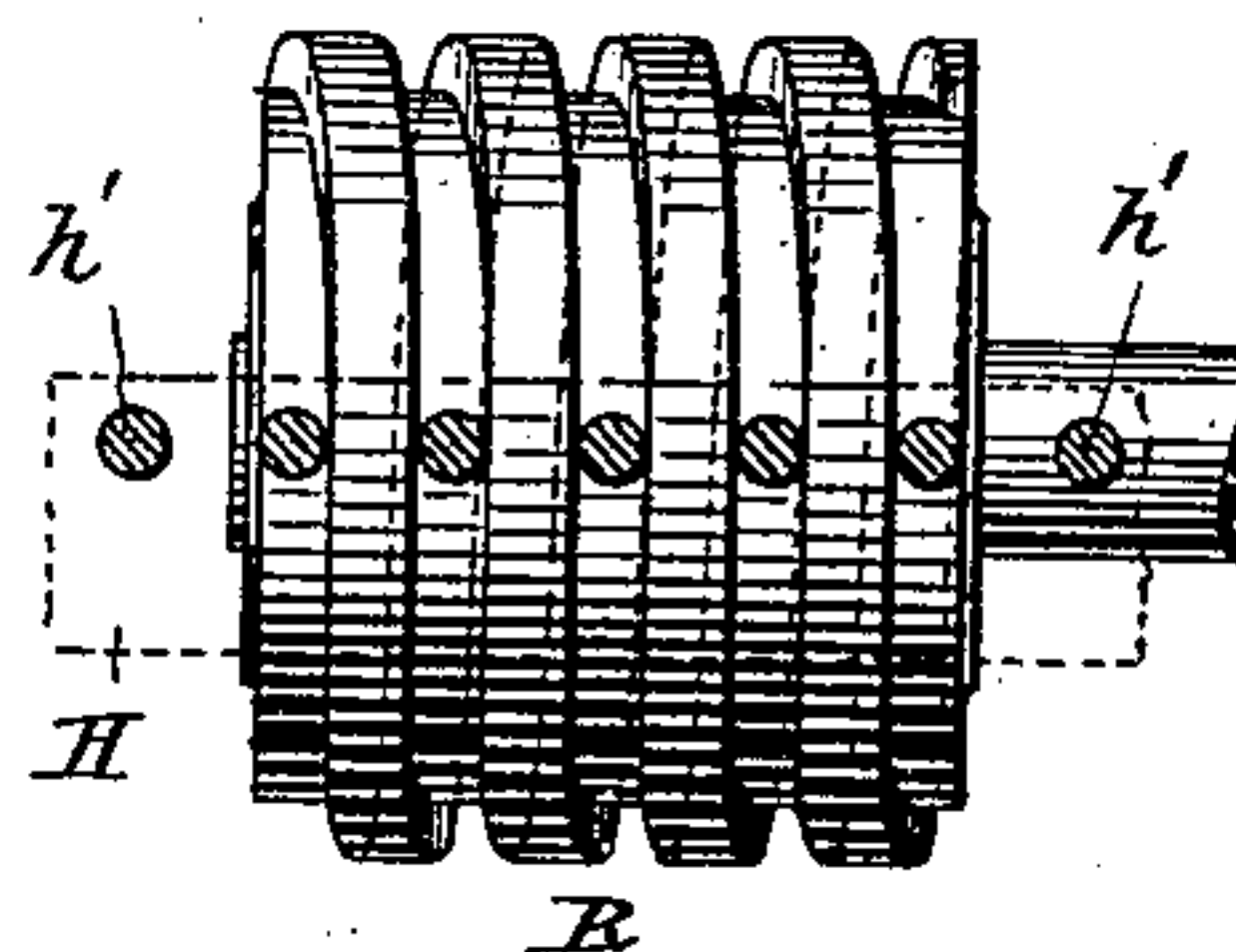


Fig. 11.



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No. 689,443.

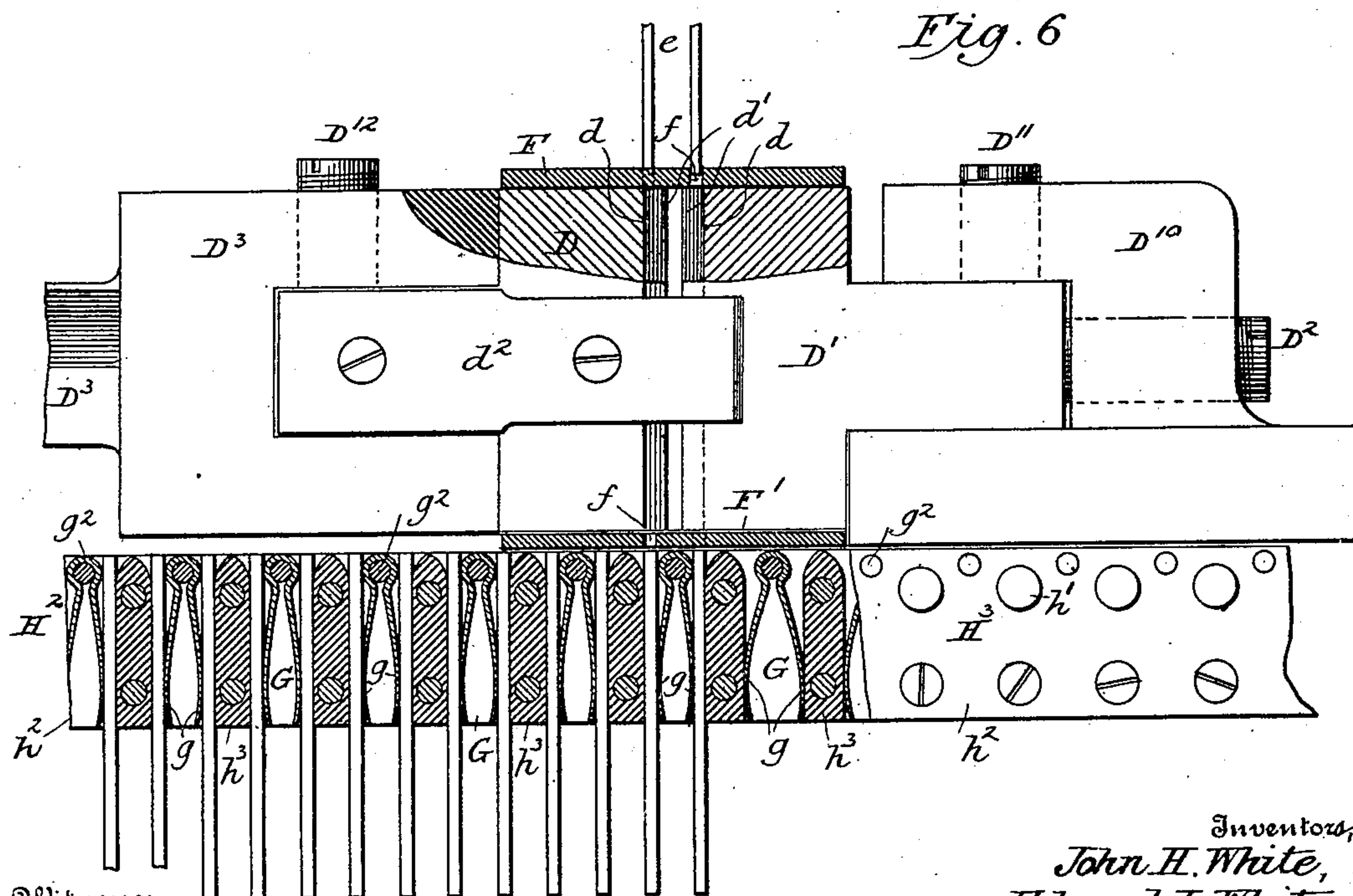
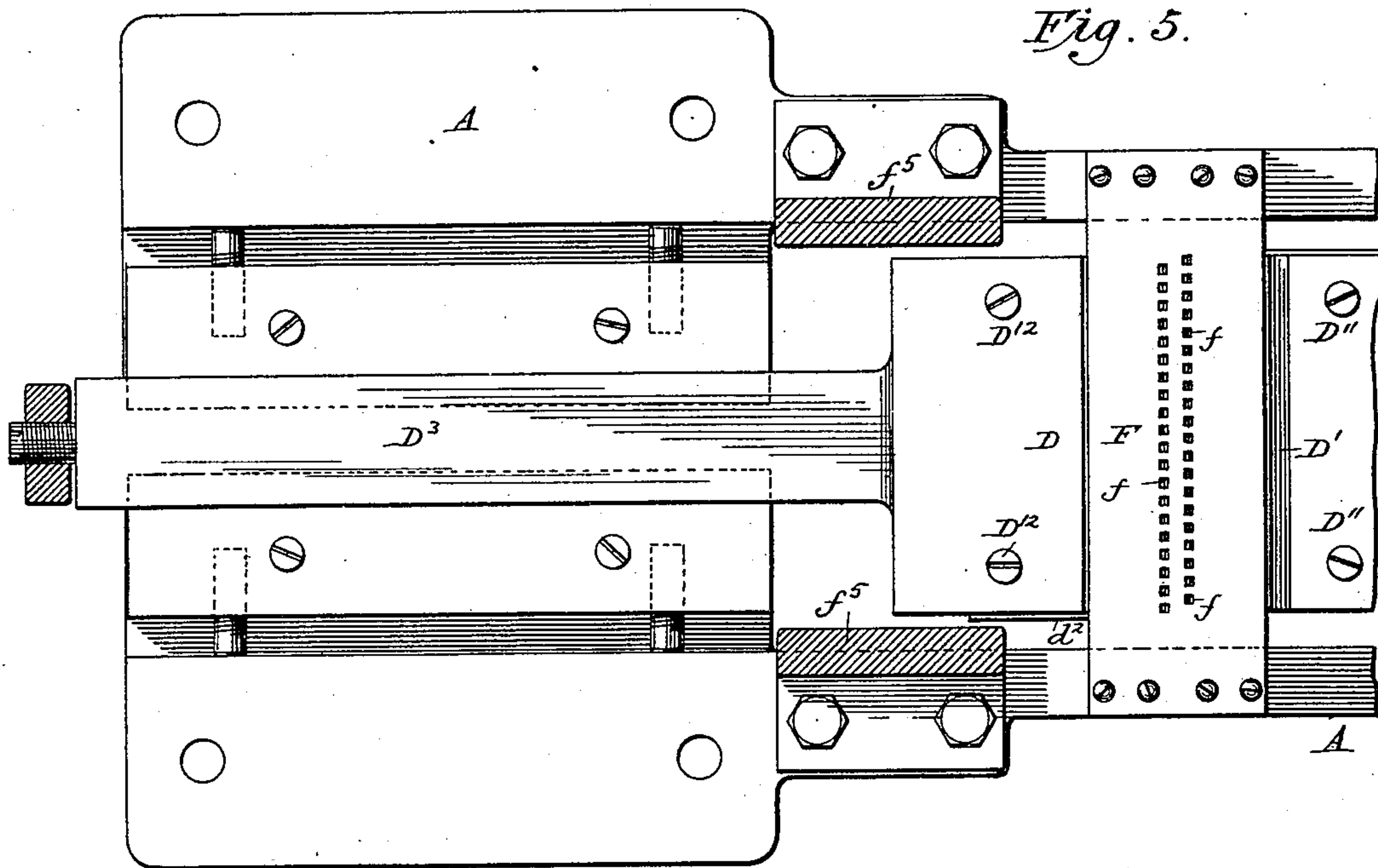
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9 Sheets—Sheet 5.



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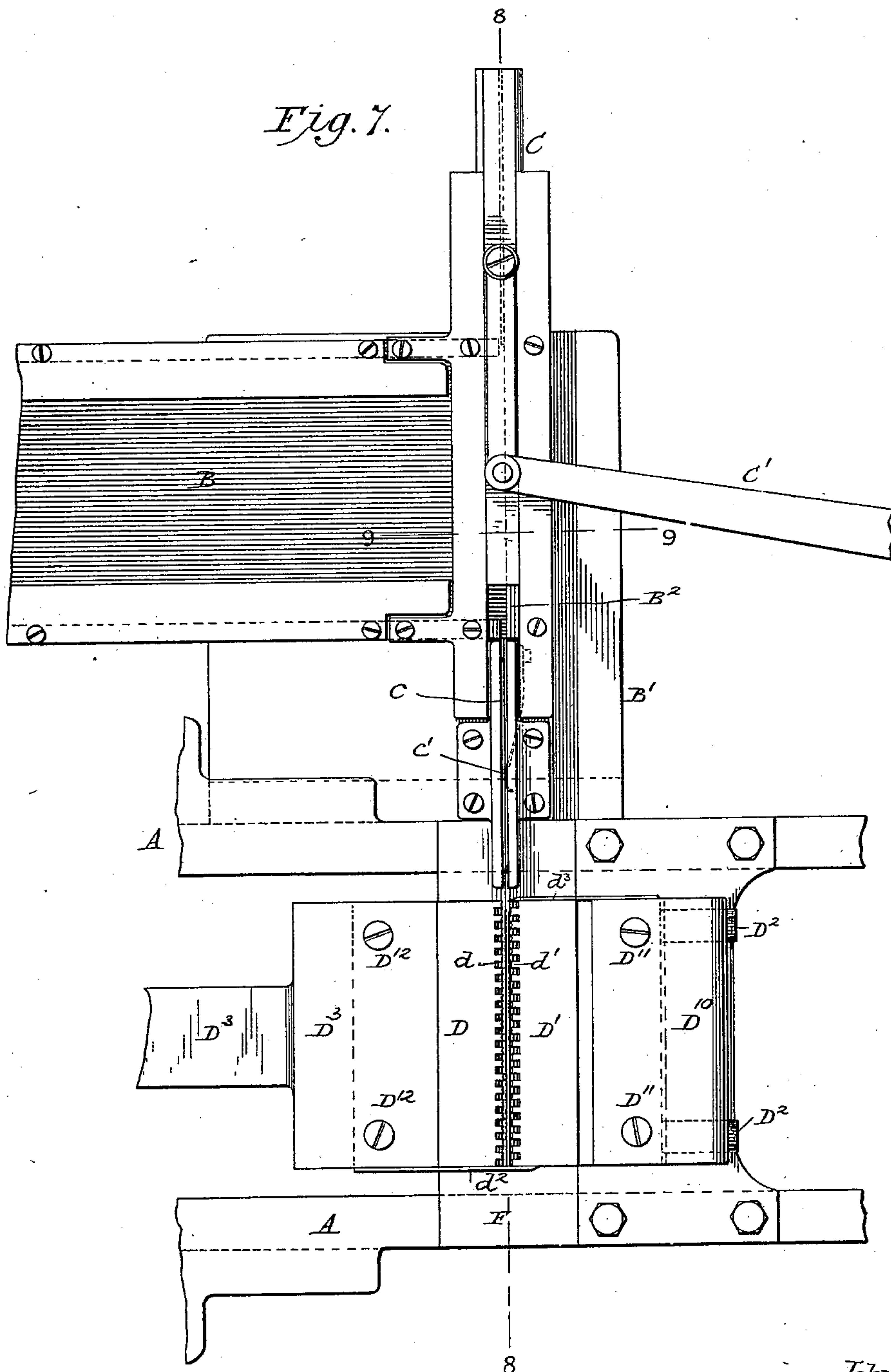
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(No Model.)

9 Sheets—Sheet 6.



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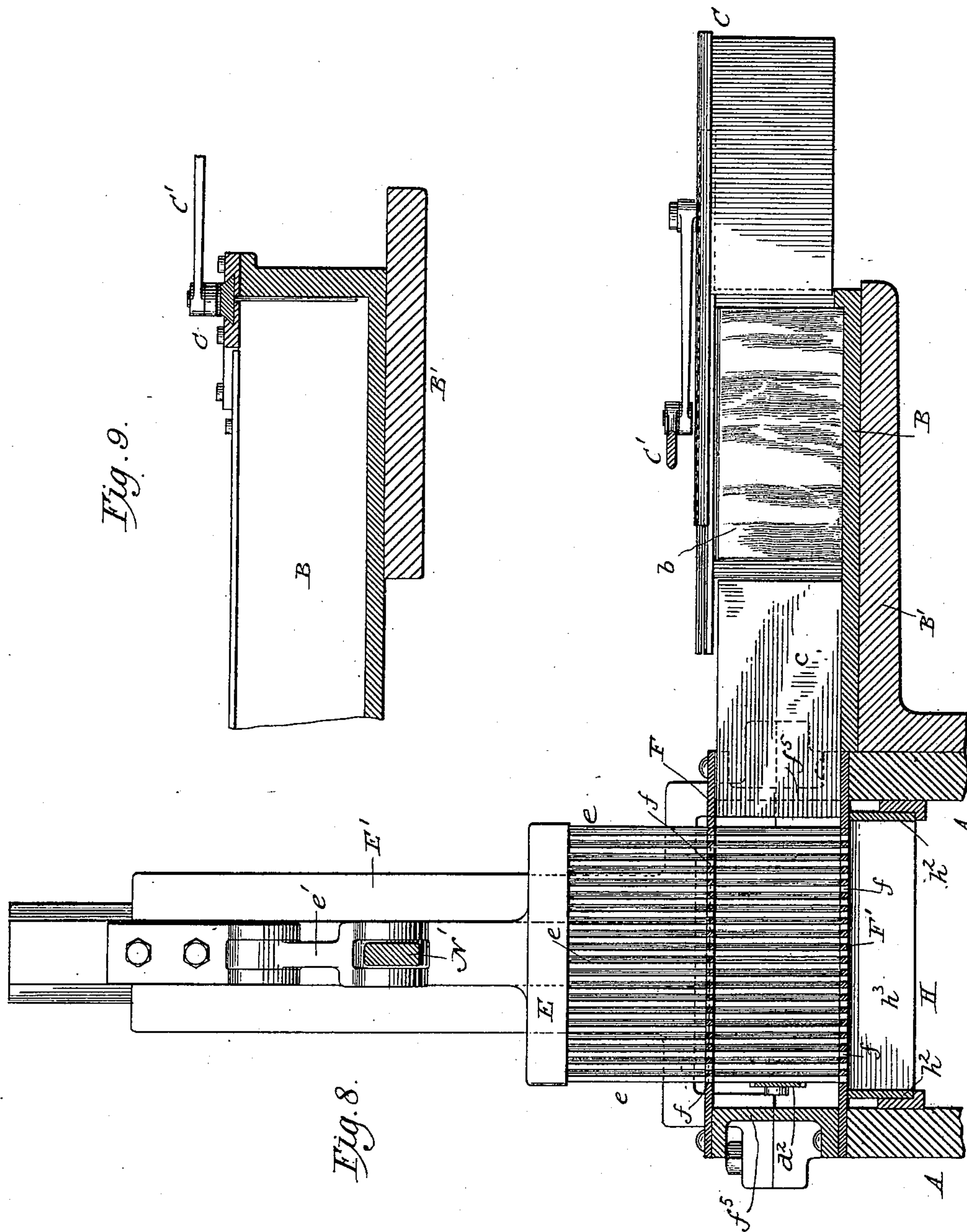
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**MATCH MAKING MACHINERY.**

(Application filed June 10, 1899. Renewed Apr. 21, 1900.)

(No Model.)

9 Sheets—Sheet 7.



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MATCH MAKING MACHINERY.

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(No Model.)

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Fig. 12.

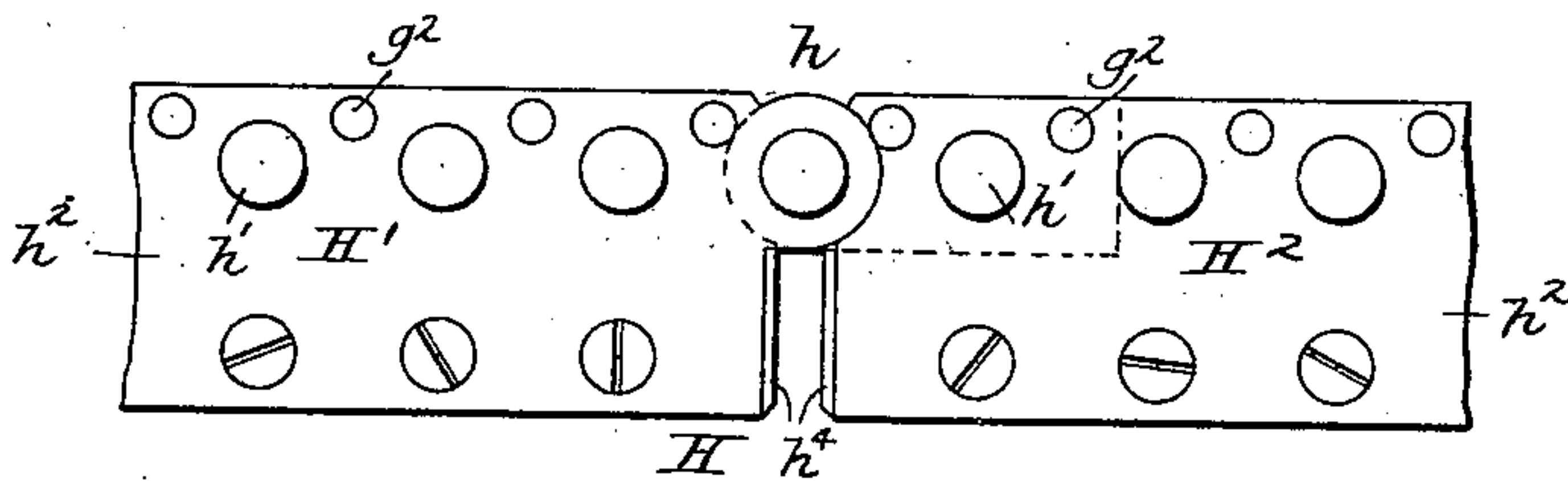


Fig. 15.

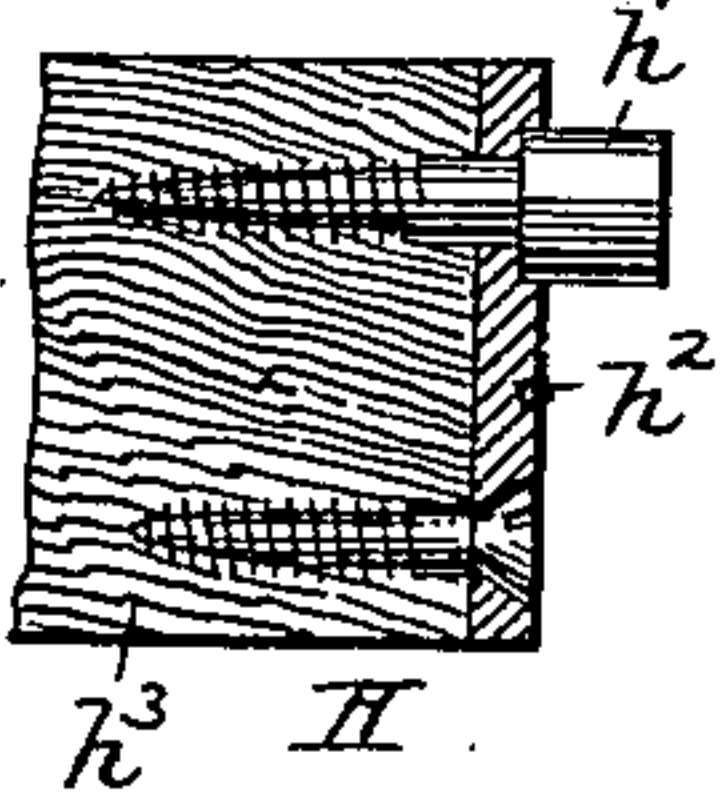


Fig. 13.

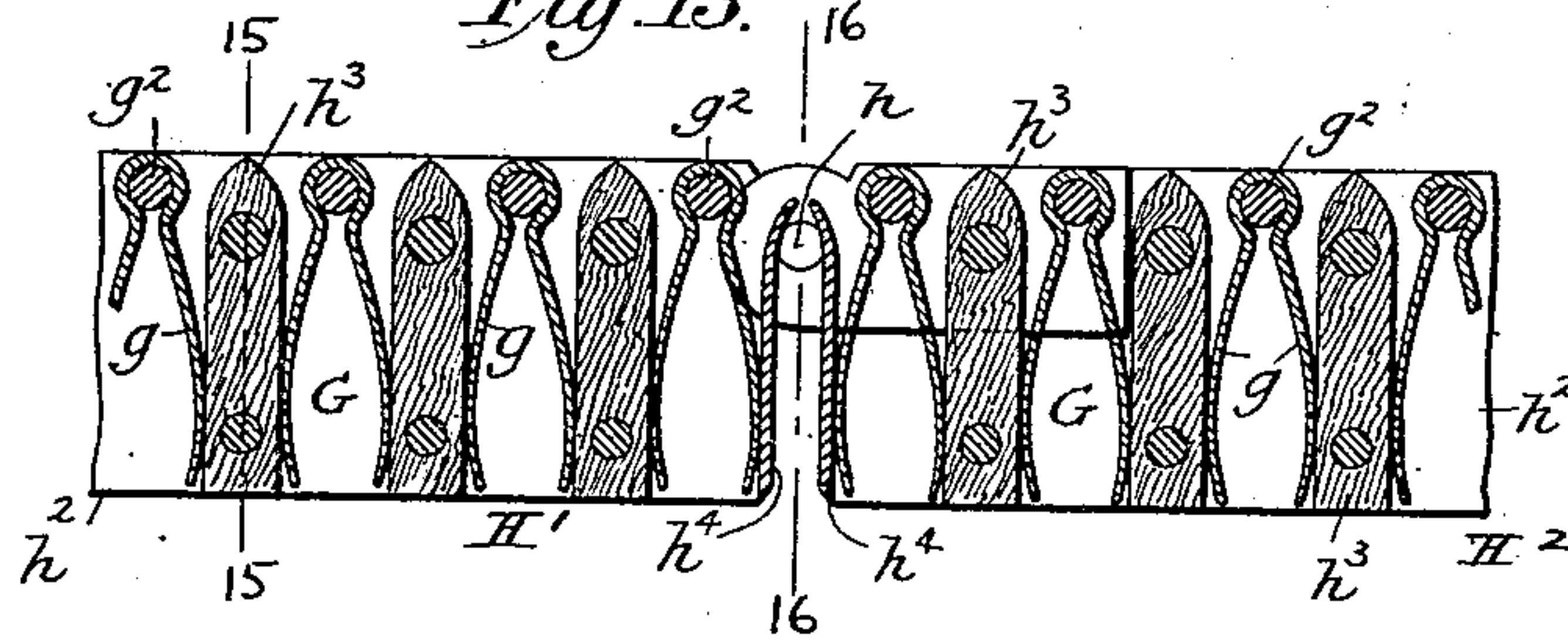


Fig. 16.

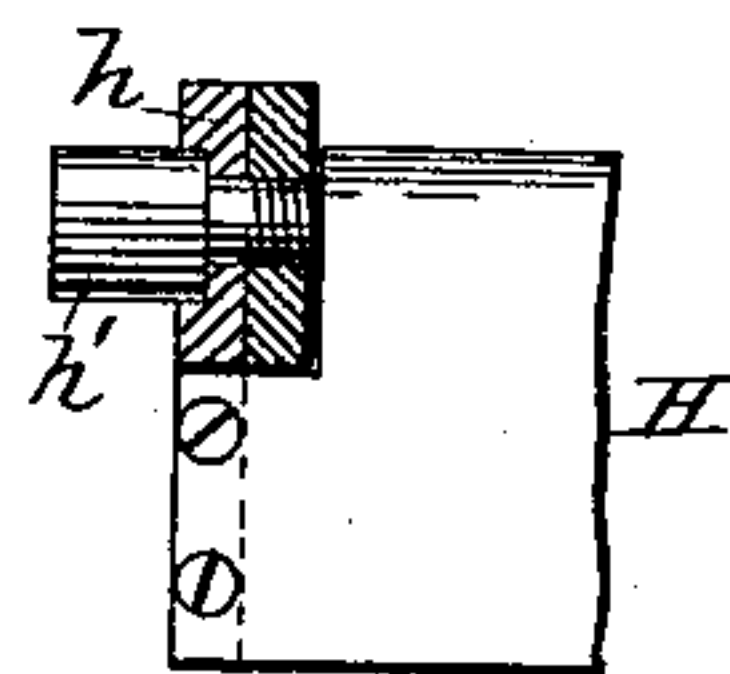


Fig. 14.

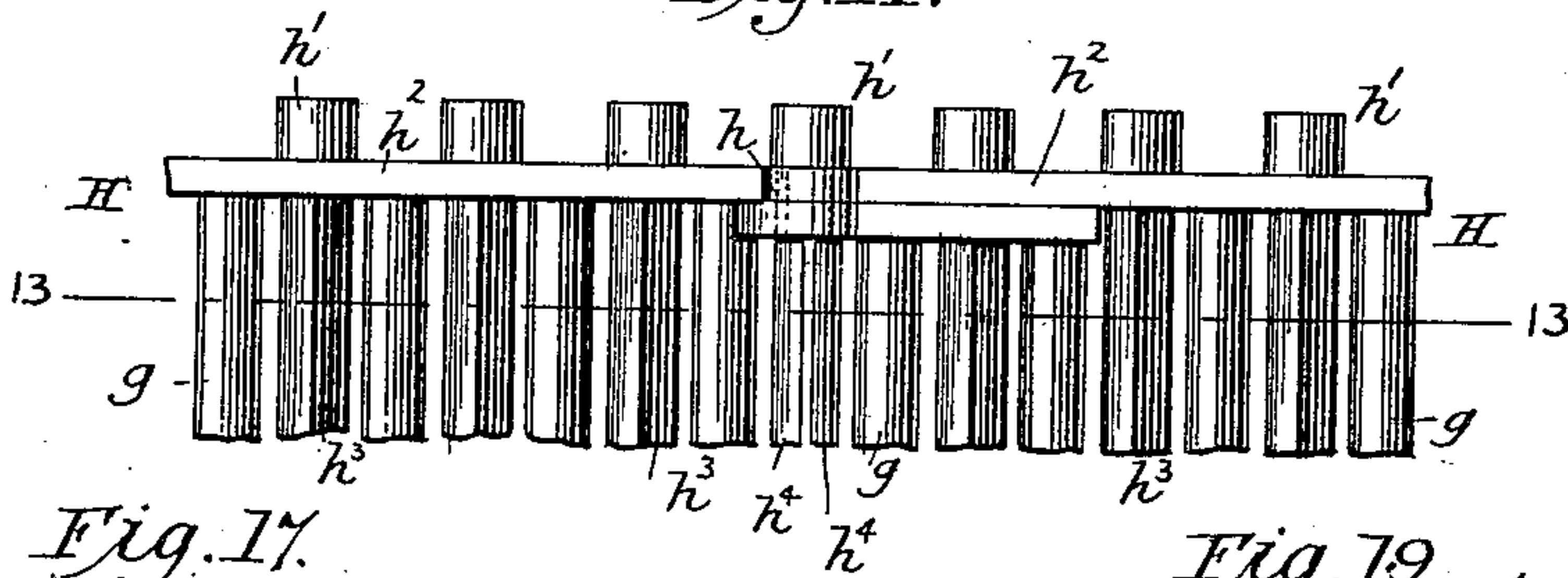


Fig. 17.

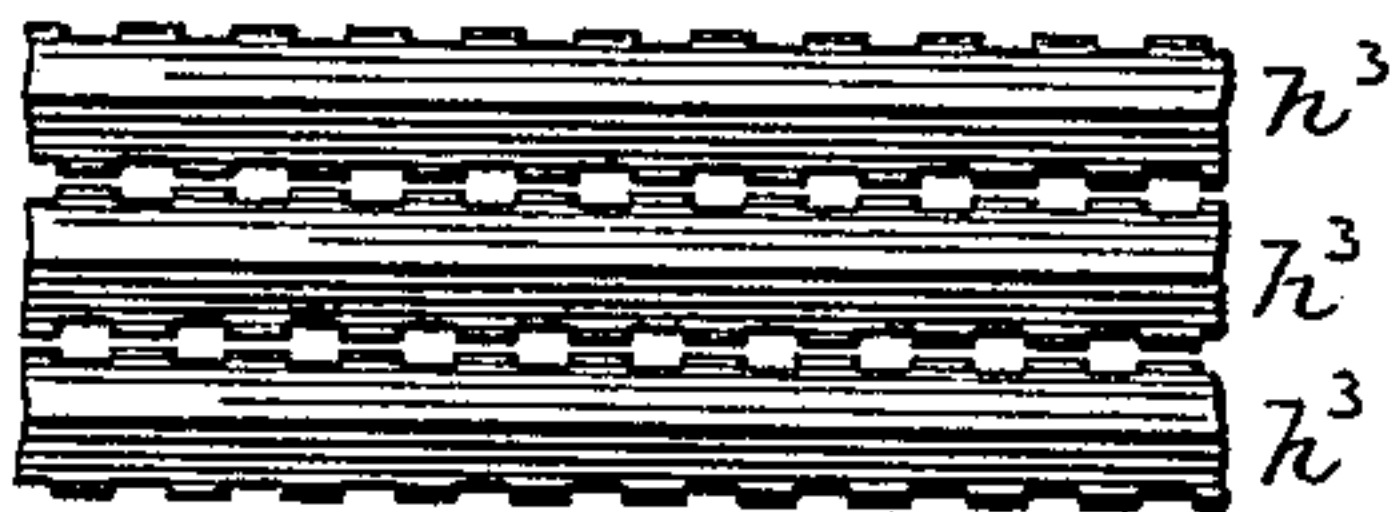


Fig. 18.

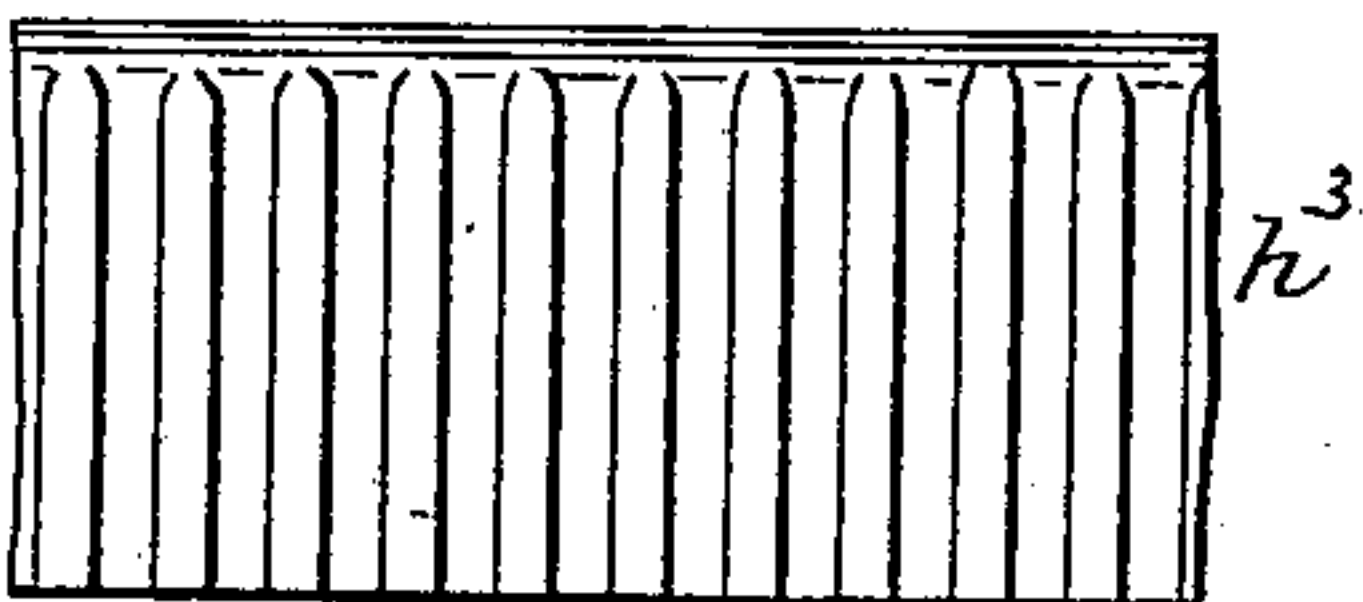


Fig. 19.

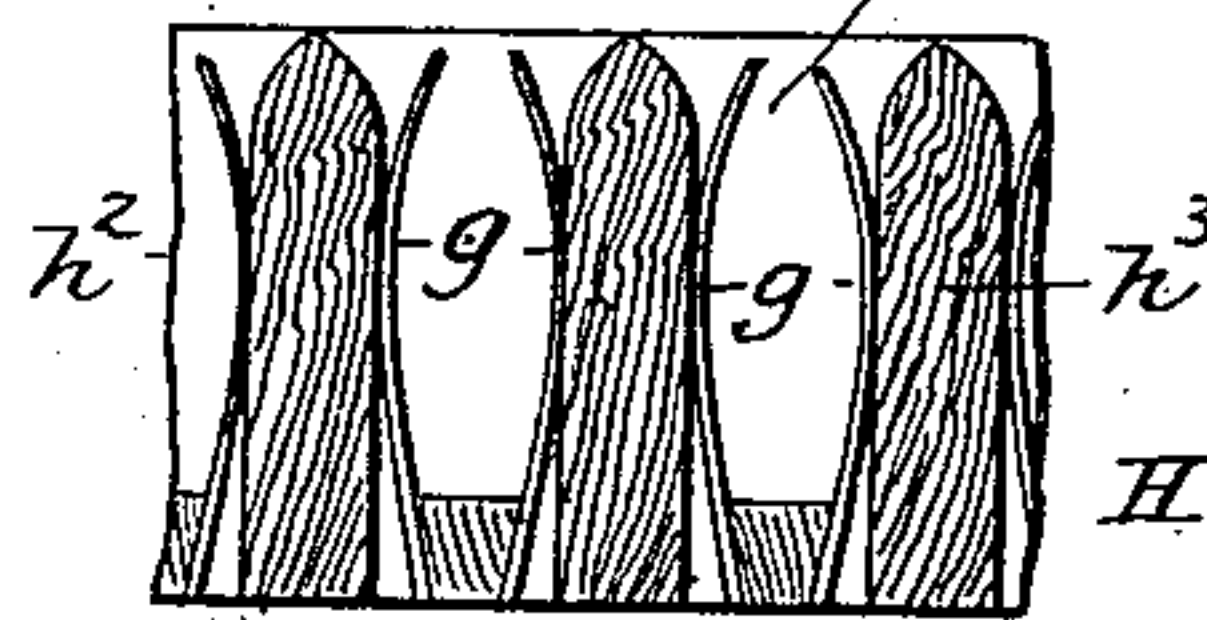
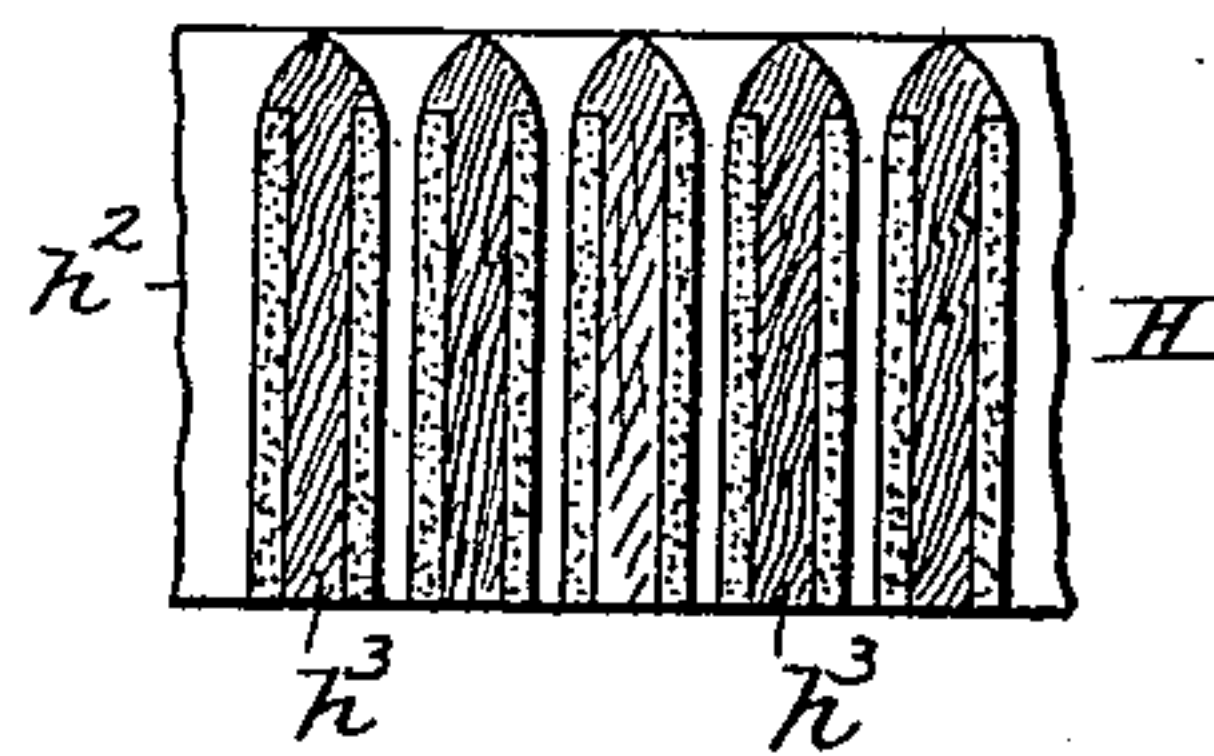


Fig. 20.



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Fig. 21.

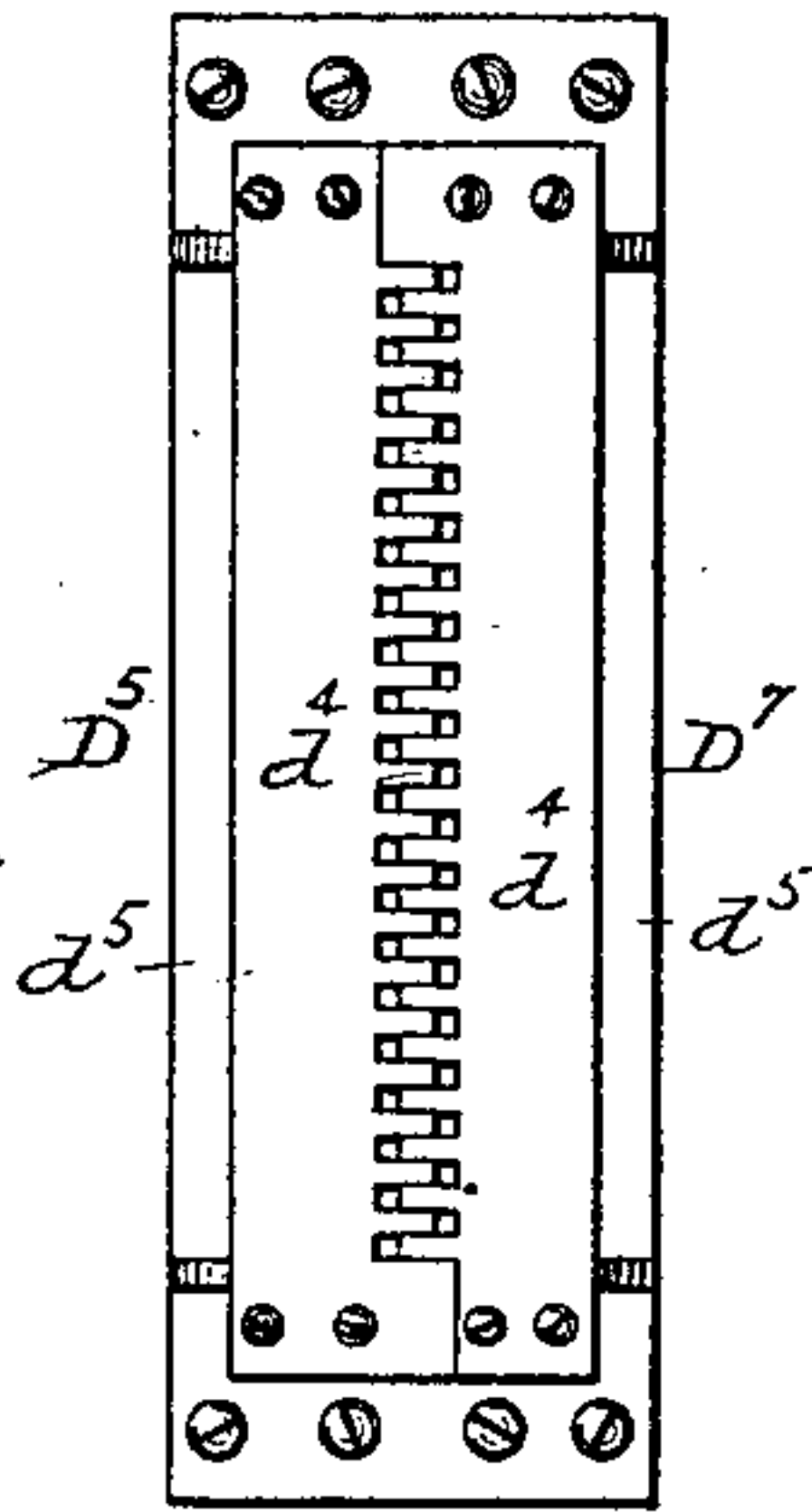


Fig. 22.

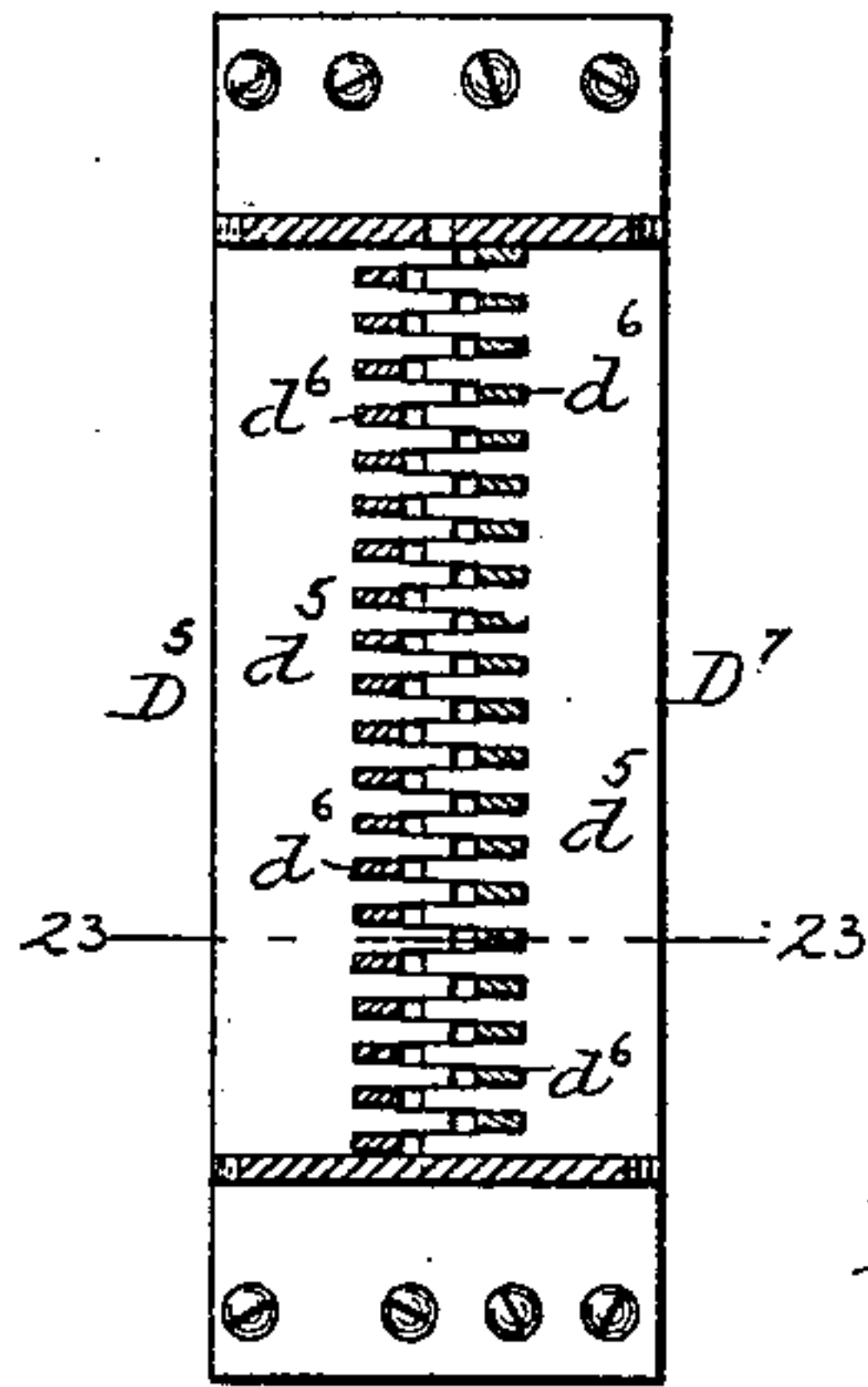


Fig. 23.

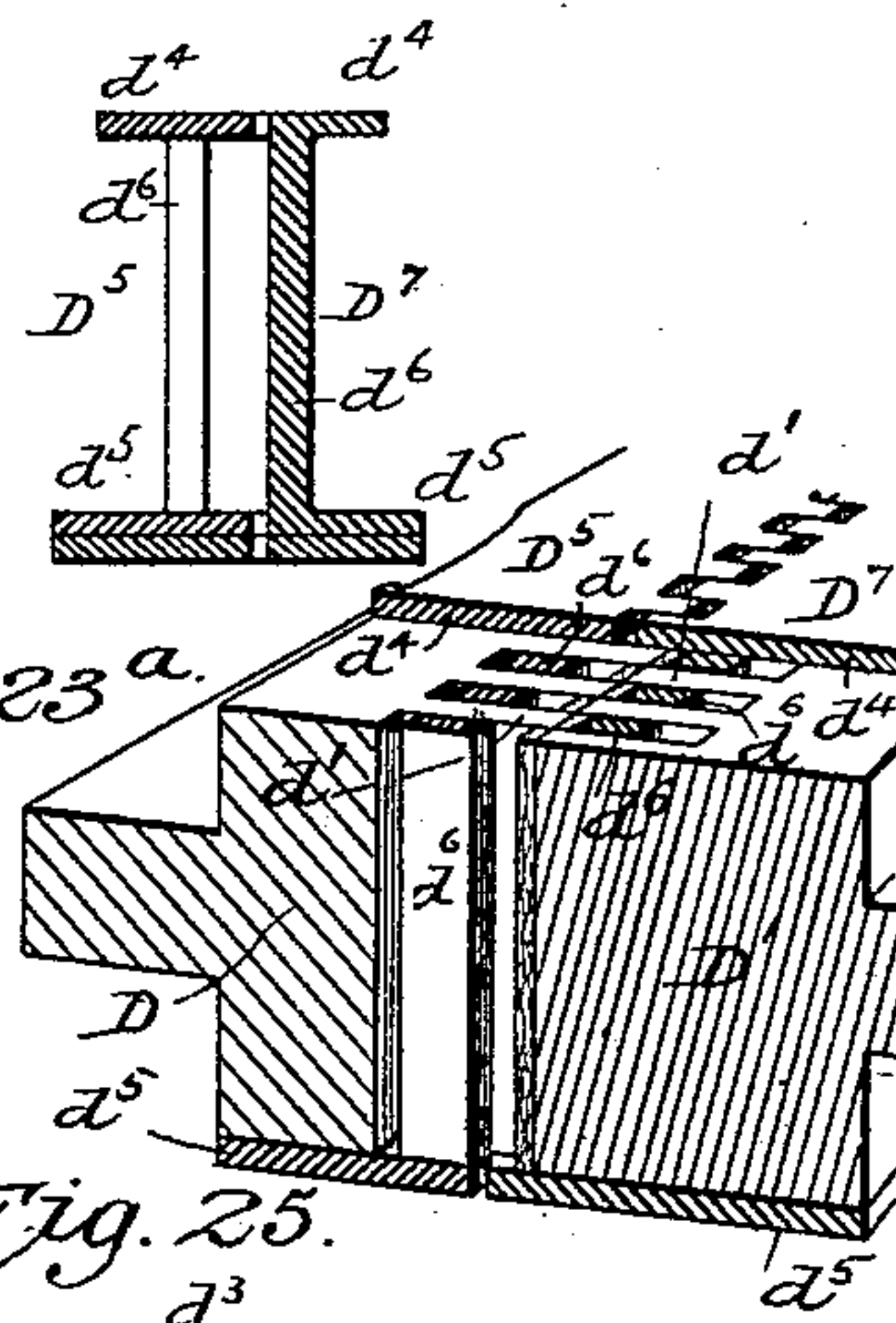


Fig. 23 a.

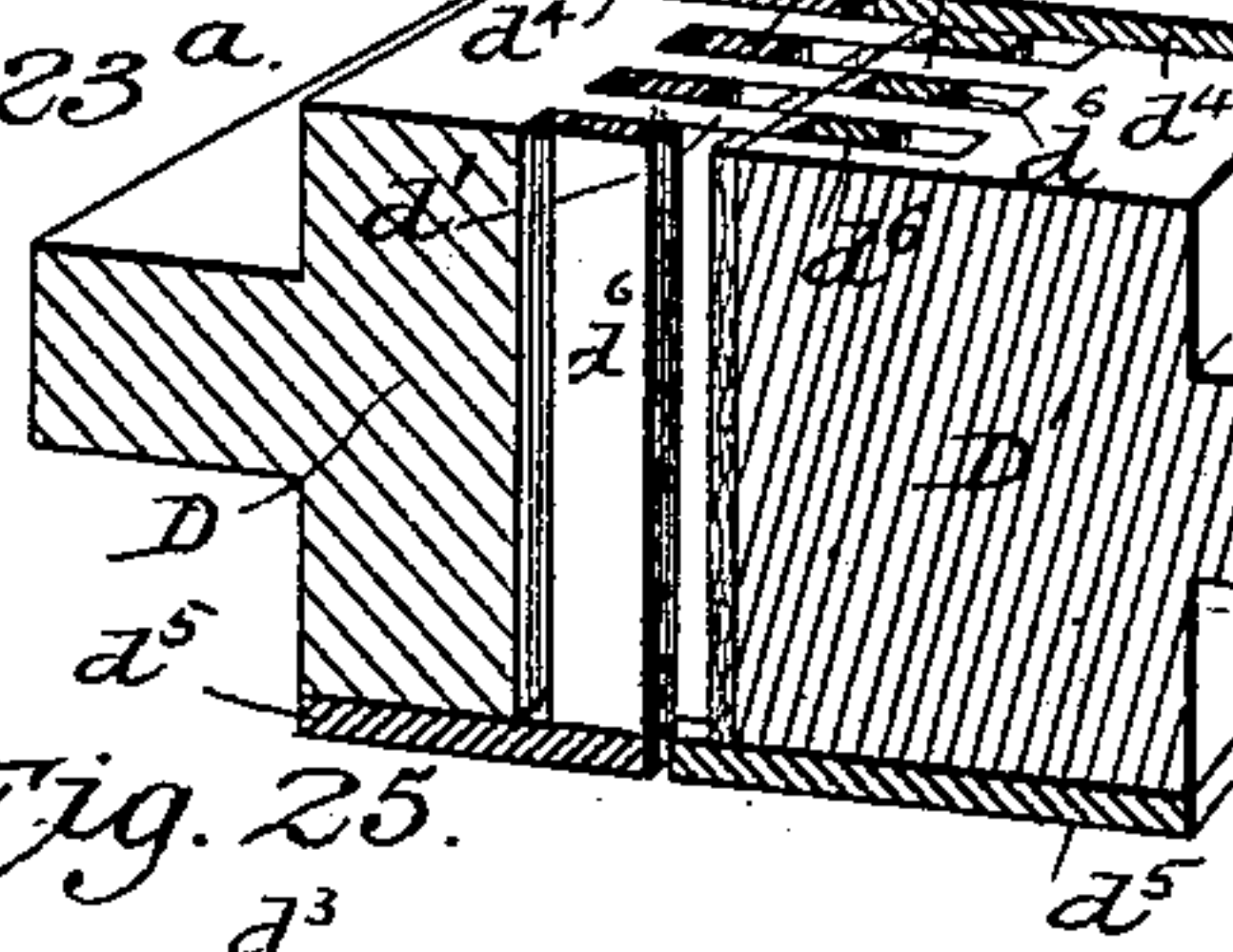


Fig. 24.

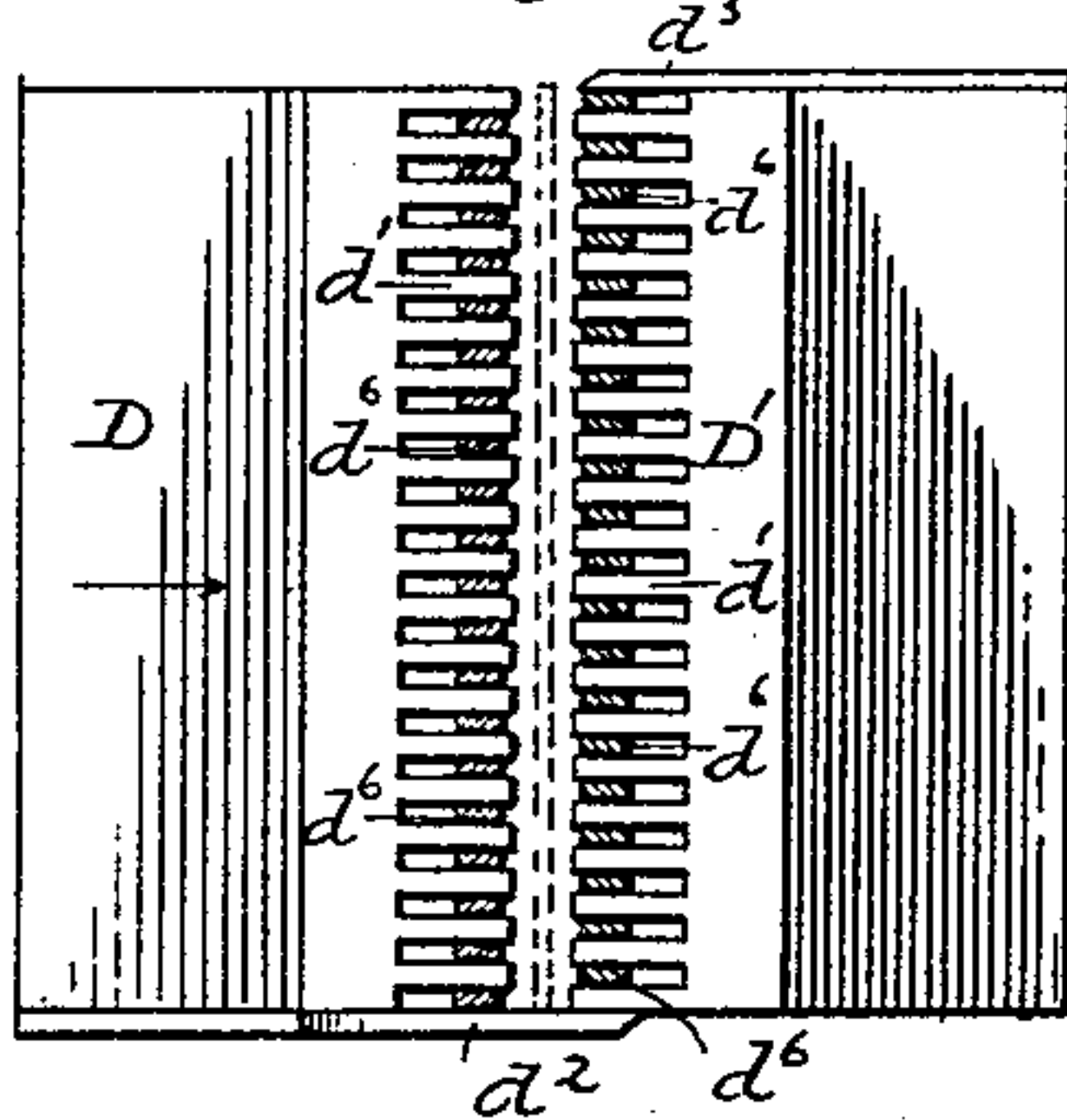


Fig. 25.

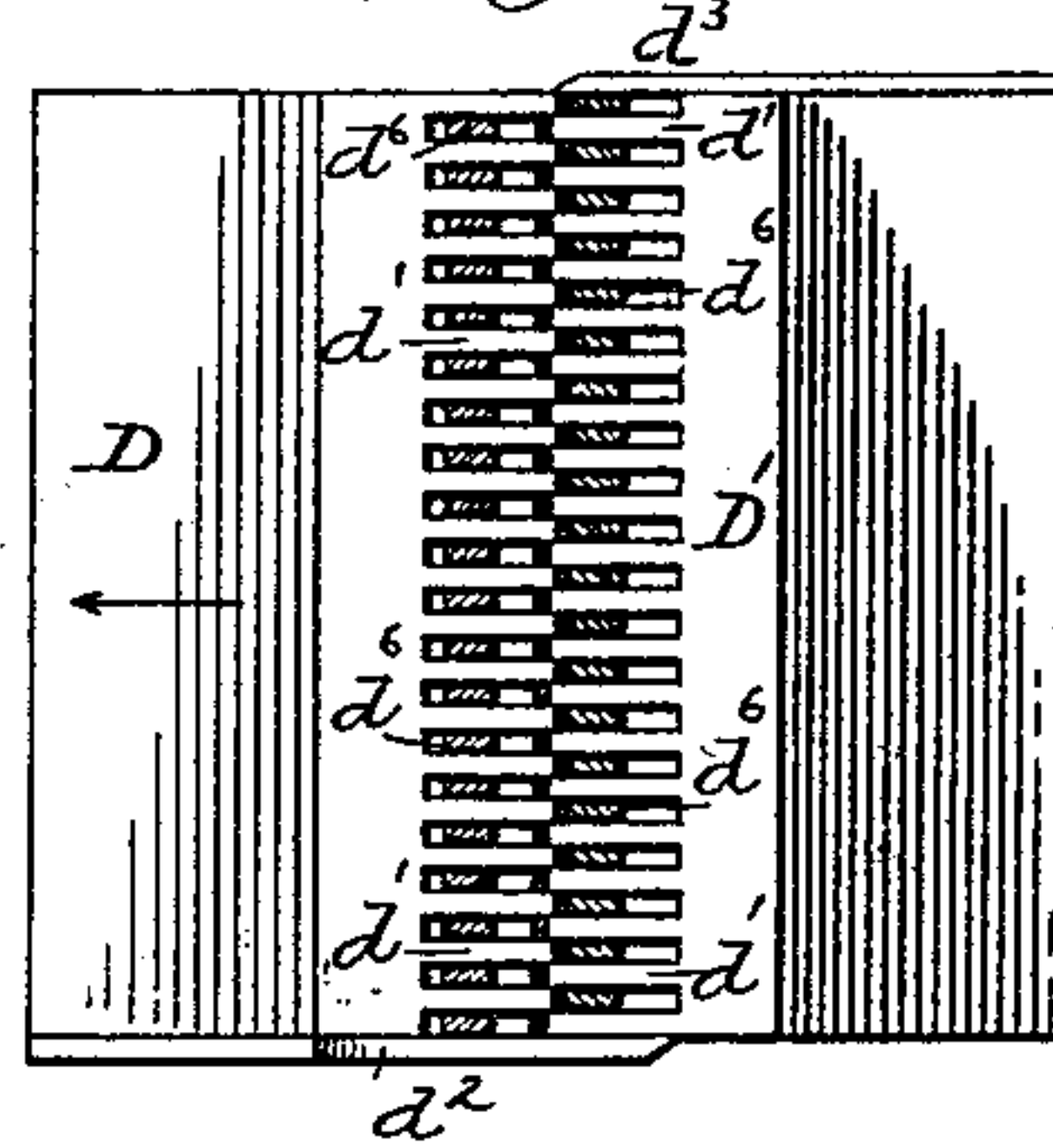


Fig. 26.

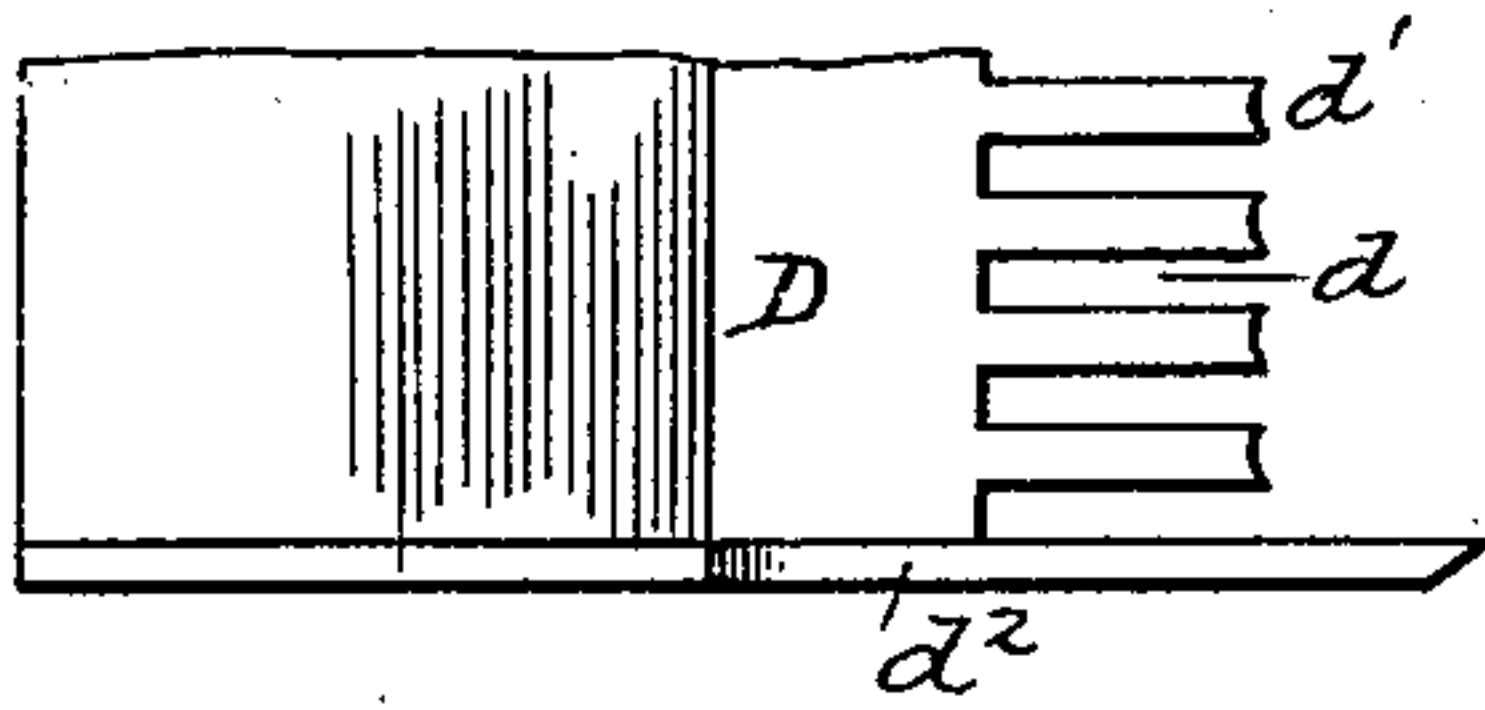


Fig. 27.

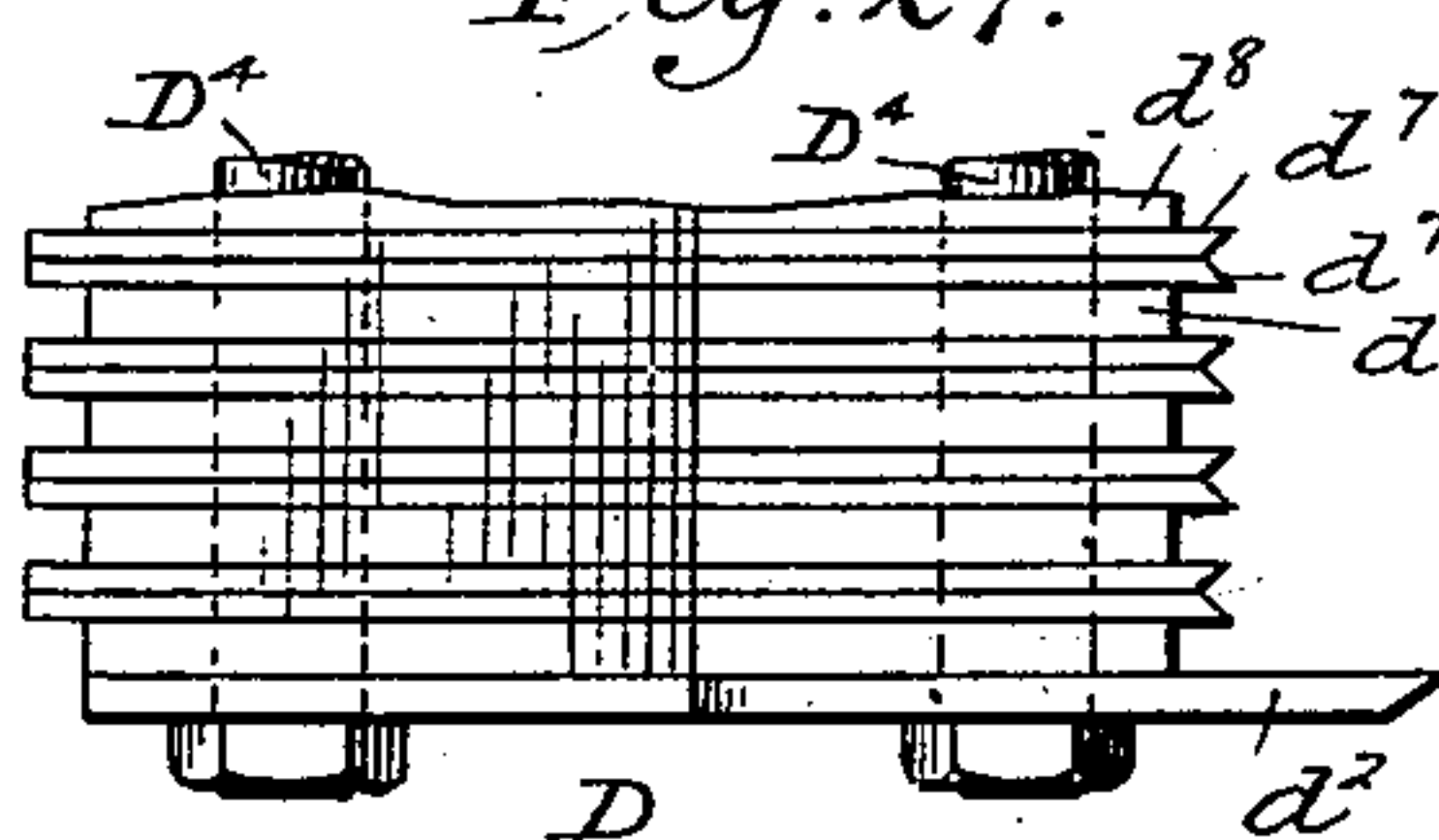
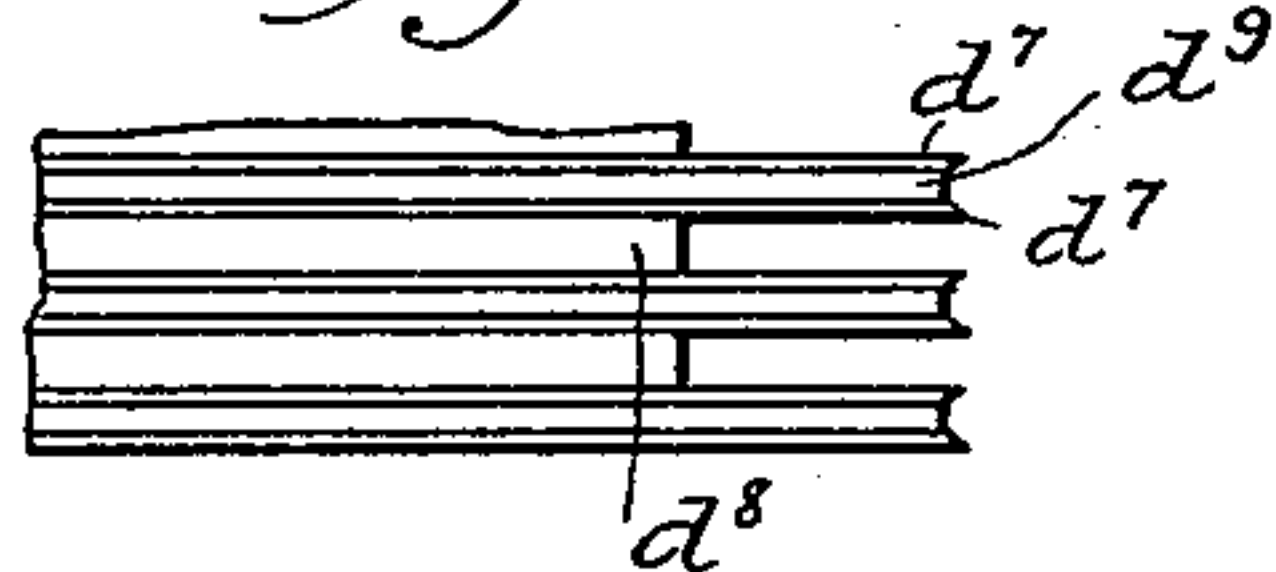


Fig. 28.



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 Attorneys



# UNITED STATES PATENT OFFICE.

JOHN H. WHITE AND EDWARD L. WHITE, OF WASHINGTON, DISTRICT OF COLUMBIA.

## MATCH-MAKING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 689,443, dated December 24, 1901.

Application filed June 10, 1899. Renewed April 21, 1900. Serial No. 13,782. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN HOWARD WHITE and EDWARD LOWRY WHITE, citizens of the United States, residing in Washington city, in the District of Columbia, have invented certain new and useful Improvements in Match-Making Machinery, of which the following is a specification.

Our invention relates to match-making machinery of the class in which strips or sheets of veneer are fed successively to cutters which sever the blanks into match-splints, which are then separated, inserted in a carrier-belt or dipping-frames, carried forward, heated, paraffined, dipped in a suitable combustible composition, dried, and delivered in convenient position and in suitable numbers for boxing.

The object of our invention is to cut the splints from the blanks in an improved way, whereby they are separated while being cut, and to insert them in the carrier-belt or dipping-frames by novel devices.

The object of our invention is also to provide an improved carrier-belt or dipping-frame and to automatically perform the operations above referred to of cutting the splints, inserting them in the carrier-belt or frame, and delivering them after they have been properly treated.

In carrying out our invention we preferably feed the strips or sheets of veneer between cutters made in the form of dies having alternating parallel ribs and recesses which when the dies close upon the blanks sever the latter into splints and force them into the recesses of the opposing dies, thus separating them. The splints thus formed are then pushed endwise into a dipping-frame or carrier and held by frictional contact while being conveyed to the proper points for heating, paraffining, dipping, &c. The splints thus treated are ultimately returned to a point near that at which they were inserted in the carrier, where they are discharged therefrom.

While our invention involves an automatic machine for performing the operations referred to, we wish it understood that our invention is not limited to a machine entirely automatic, as some parts of the invention may be used without others and some of the

operations may be performed by hand. The subject-matter deemed novel is set forth in the claims.

The accompanying drawings represent so much of the machine embodying our improvements as is necessary to illustrate the subject-matter herein claimed. Unless otherwise indicated, the parts are of usual well-known construction.

Some of the mechanism herein shown is similar in some respects to that shown in Letters Patent of the United States No. 410,622, granted to one of us (JOHN H. WHITE) September 10, 1889.

That end of the machine containing the driving-gear we term the "front;" the opposite end, the "rear." That side of the machine on the right of a person facing the front we term the "right" side; the opposite, the "left" side.

Figure 1 represents a plan or top view of the machine; Fig. 2, a left-hand side elevation, the main driving-shaft, however, being in section just inside the pulleys; Fig. 3, a vertical longitudinal section on the line 3 3 of Fig. 1 looking to the right; Fig. 4, a front end elevation; Fig. 5, a detail plan view of the dies or cutters and upper guide-plate; Fig. 6, a detail view, partly in vertical longitudinal section, of the cutters, pushers, and dipping-frame or carrier-belt; Fig. 7, a detail plan view of the blank feeding and cutting devices; Fig. 8, a vertical cross-section therethrough on the line 8 8 of Fig. 1 looking toward the discharge end of the machine; Fig. 9, a vertical longitudinal section showing a detail of the feeding device; Fig. 10, a vertical cross-section through the dipping-frame or carrier-belt and its actuating-gear; Fig. 11, a vertical longitudinal section on the line 11 11 of Fig. 10 looking to the right, showing a face view of one of the worm-gears and also showing in section some of the pins on the dipping-frame or carrier-belt actuated thereby; Fig. 12, a detail view showing the method of hinging the sections of the dipping-frames together; Fig. 13, a vertical longitudinal section therethrough, on the line 13 13 of Fig. 14, looking to the right; Fig. 14, a plan view of one side thereof; Fig. 15, a vertical cross-section on the line 15 15 of Fig.



13, showing the method of securing the side plates and transverse partitions; Fig. 16, a vertical cross-section, on the line 16 16 of Fig. 13, through the hinge connecting the sections 5 of the dipping-frames or carrier-belt. Figs. 17 and 18 are respectively plan and side views showing details of a modified form of the holding devices. Figs. 19 and 20 are detail sectional views showing other modifications of the splint-holding devices. Figs. 21 to 25, both inclusive, illustrate a modified form of cutting and separating mechanism. Figs. 26, 27, and 28 represent other modifications of the construction of the cutters. Figs. 1, 2, and 4 are on the same scale. The other figures are on an enlarged scale.

We will first describe the principal parts of the mechanism and their modifications in their order of operation and then the mechanism by which they are actuated.

The drawings show the mechanism as mounted on or in a suitable main frame A. Blanks *b*, preferably in the form of thin rectangular sheets or slices of veneering, are placed edgewise vertically, one behind the other, in a magazine or feed-trough B and fed forward therethrough by suitable actuating mechanism, which may be of well-known construction. Such mechanism is not shown in the drawings, as any suitable mechanism may be employed. We may, for instance, use the mechanism shown in Patent No. 410,622, above referred to.

The trough B is mounted on a bracket B', projecting from the main frame, as shown in Fig. 8. The blanks pass from the trough B into a guide B<sup>2</sup>, traversed by a slide C. This slide forces the blanks one at a time into a guideway *c*, provided with a spring or presser foot *c'*. After a blank has been fed into the guideway *c* the slide C retreats, and on its next movement to the left it feeds forward another blank into the guideway *c*, the blank formerly located in this guideway being pushed to the left laterally between cutters or dies D D'. These cutters are made in the form of blocks the full length vertically of the splints to be cut and formed with rectangular parallel grooves in their opposing faces. As shown, for instance, in Fig. 7, the grooves *d* of one cutter are directly opposite the projections or ribs *d'* of the other cutter and the arrangement is such that when the cutters come together the blank is divided into splints which are simultaneously forced laterally in opposite directions into the grooves of the two opposing cutters, thus separating the splints into two rows, which are held a suitable distance apart when the cutters are separated and in proper position for the subsequent dipping and other treatment. One of the cutters is preferably fixed, while the other is movable. The cutter D' is fixed, but it is preferably made adjustable.

As shown in Fig. 6, the cutter D' has a forwardly-projecting arm which enters a guide-block D<sup>10</sup>, provided with set-screws D<sup>2</sup> D<sup>11</sup>,

by means of which the cutter D' may be adjusted and held in proper position. The cutter D is movable. It is secured to a slide D<sup>3</sup>, which is mounted to reciprocate longitudinally toward and from the stationary cutter D'. This cutter may also be adjusted in its slide by means of screws D<sup>12</sup>. The cutter D is provided on its outer or left-hand side with a shield or stop-plate *d*<sup>2</sup>, which overlaps the edge of the cutter D' in the manner shown in Fig. 7. This stop limits the movement of the blank when it is fed between the cutters. A knife *d*<sup>3</sup> is secured to the cutter D', and when the cutters come together the blank is trimmed to the proper extent. Guide-plates F F' are arranged above and below the cutters, and they are provided with rows of opening *f*, which are directly in line with the splints severed by the cutters. The guide-plate F is secured to standards *f*<sup>5</sup>, rising from the main frame of the machine, while the guide-plate F' is secured to the main frame below the standards, as shown in Fig. 8.

Above the plate F is arranged a plunger-frame E, carrying a series of pusher-rods *e*, which are adapted to operate through the openings *f* in the plates F F' and to pass down between the cutters and force the splints into the holder-frames or carrier-belt H below the plate F'. The severed and separated splints, being in line with the openings in the guide-plates, are shoved downward endwise through the openings in the plate F' by the pusher-rods *e* and enter suitable holders G in the dipping-frames or carrier-belt, and they are inserted in such manner that their upper ends are flush with or below the top of the dipping-frames, while their lower ends project beneath them, as illustrated in Fig. 3. The plunger E is arranged to reciprocate vertically in guides formed in a casting E' above the cutters. The casting may be mounted on the bed-plate in any suitable way, and it is provided with an opening through which the cutter D reciprocates.

Figs. 3, 6, and 12 to 14, inclusive, show the preferred form of dipping-frame or carrier-belt. As there shown, it is constructed in sections H' H<sup>2</sup>, &c., connected at their adjacent upper corners by pivots or hinges *h*. Each section of the dipping-frame is shown as consisting of two vertical parallel side plates *h*<sup>2</sup>, connected with transverse partitions *h*<sup>3</sup>, arranged suitable distances apart and held to the plates by means of screws, the upper ones of which are provided with studs *h'*. In Fig. 15 these studs are shown as countersunk into the side plates, so as to relieve the screws from strain and afford a firm bearing, as these studs are engaged by the actuating mechanism which moves the frames. The transverse partitions *h*<sup>3</sup> are arranged sufficiently far apart to leave room for the insertion of holding-springs *g*, which are mounted on cross bars or rods *g*<sup>2</sup>, located near the top of the frames. The splints are inserted endwise between the partitions and



5 springs, so that each set of springs bears upon two rows of splints. The upper ends of the partitions  $h^3$  and springs  $g$  are rounded, so as to allow the splints to enter the holders freely. Where the sections are hinged together the cross-partitions are dispensed with and their place is taken by springs  $h^4$ . There is a spring-plate on each adjacent end of the sections. The plates lie for the most part vertically and parallel; but their upper ends are curved, so that match-splints may be inserted on opposite sides of the two plates in the same way that they are inserted on opposite sides of each spring  $g$ . The spring-holders may consist either of plates extending transversely the whole distance between the side frames, or a separate spring may be employed for each splint.

20 Figs. 17 and 18 show a modified form of holder, consisting simply of transverse partitions placed close together and having a series of grooves in their faces in which the splints are held by frictional contact.

25 Fig. 19 shows the holding-springs  $g$  as reversed or open at the top instead of at the bottom.

30 Fig. 20 shows the partitions as lined with some yielding material, such as buckskin or plush, which will serve to hold the splints without the use of metallic springs.

35 The details of the mechanisms to which the carrier-belt conveys the splints for completing the matches are not shown in the drawings, being too well known to require detailed description here, and they form no part of the invention herein claimed.

40 After being treated the matches, while still in the dipping-frames or carrier-belt, are brought back to a point near that at which they were inserted in the frames and are discharged therefrom by ejector-plates  $i$ , mounted on a cross-head or plunger  $I$ , which reciprocates vertically in suitable guides in a casting  $I^4$ , that is preferably bolted to the block  $D^{10}$ . We preferably employ two parallel plates arranged at suitable distances apart to act simultaneously on two rows of matches and force them downward out of the frame into any suitable receptacle or to a carrier which may convey them to any point desired.

50 In Figs. 21 to 28, inclusive, we have shown modified forms of cutters. In Figs. 21 to 25 the cutters are shown as consisting of two rectangular grooved blocks similar to those before described, but so grooved as to form longer teeth  $d'$  than the others. The cutting edges of these teeth may be either square or of the concave form shown in Fig. 26. Grates  $D^5 D^7$ , consisting of upper and lower plates  $d^4 d^5$ , connected by vertical rods  $d^6$ , are so arranged with relation to the cutters that their vertical connecting-bars lie in the grooves thereof, as shown in Figs. 23, 24, and 25, the inner faces of the two series of vertical bars being a proper distance apart to constitute a stop or guide to hold the splints in proper position for being forced into the holding-

frames after the cutters are separated. The grates are secured rigidly to the main frame of the machine, and their vertical rods  $d^6$  are always the same distance apart. The cutter  $D'$  is stationary, while the cutter  $D$  is reciprocated. The grates and cutters are assembled in the manner shown in Fig. 23<sup>a</sup>. Fig. 24 shows the relation of the parts as the cutter  $D$  is approaching the cutter  $D'$  in the act of forming the splints from the blank, and the blank is shown by dotted lines. Fig. 25 shows the relation of the parts when the cutter  $D$  is just commencing to retreat. It will be observed that one row of splints on the right-hand side of Fig. 25 is arranged at the outer ends of the grooves in the cutter  $D'$  and another row of splints is arranged at the outer ends of the grooves in the cutter  $D$ . As the cutter  $D$  retreats it carries this row of splints back against the vertical bars  $d^6$  of the grate  $D^5$ . The grate arrests the splints and holds them in the proper position to be acted upon by the pusher-rods  $e$ , which force the splints down through the openings  $f$  in the lower guide-plate  $F'$  and into the carrier-belt below. Fig. 27 shows a modified form of cutter consisting of two plates  $d^7 d^7$ , placed face to face, with interposed spacing-blocks  $d^8$ , connected by clamping-bolts  $D^4 D^4$ . The plates  $d^7$  have beveled edges, forming a V-shaped groove in cross-section. Fig. 28 shows another modification, in which a cutter is shown as composed of two blades  $d^7 d^7$ , with an interposed spacing-block  $d^9$  in addition to the spacing-blocks  $d^8$ , above described. The blades  $d^7$  are beveled and the spacing-block  $d^9$  is set in away from the edges of the blades, so as to form a groove in each cutter.

105 Passing now to the mechanism for operating the various parts above referred to, the drawings show a driving-shaft  $k$ , carrying fast and loose pulleys  $K K'$  at one end and a balance-wheel  $K^2$  at the opposite end. A spur-gear  $L$  on this shaft drives a corresponding wheel  $L'$  on a counter-shaft  $l$ . A cam-wheel  $M$  on this shaft is provided with a peripheral cam-groove  $m$ , in which a pin or roller  $m'$  travels. This roller is mounted on a rocking lever  $C'$ , which actuates the feed-slide  $C$  at suitable intervals. Another cam-wheel  $N$  on the counter-shaft is provided with a cam-groove  $n$ , in which a pin or roller  $n'$  travels. This pin is mounted on a lever  $N'$ , rocking vertically on a pivot  $n^2$ , mounted in bearings near the central portion of the main frame. The pusher-rod cross-head or plunger  $E$  is actuated by a link  $e'$ , connected with the lever  $N'$ . The ejector cross-head  $I$  is actuated by a link  $I'$ , connected to the rocking lever  $N'$ . This organization enables us to insert the splints into the dipping-frames and discharge the finished matches therefrom simultaneously while the carrier-belt or dipping-frame is at rest. A cam-wheel  $O$  on the counter-shaft is provided with a cam-groove  $o$ , actuating an elbow-lever  $o'$ , connected by a pitman  $O^2$  with a crank-arm  $P$  on a rock-



shaft P', carrying an arm P<sup>2</sup>, connected by a link p with the movable cutter D. The movement of the rock-shaft P' may be regulated by adjusting devices of well-known construction, and the length of the stroke of the cutters may likewise be similarly adjusted. Worm-gears R, turning in bearings on each side of the dipping-frames, engage with the studs h' thereon to actuate them. The pitch of the gears is so regulated as to cause the dipping-frames to pause while the splints are being inserted and discharged and then to move forward the required distance for a repetition of the operation. This is effected by forming the convolutions of the worm-gears in the manner shown in Fig. 11—that is, to present a straight vertical portion and inclined portions. Such gearing has been heretofore employed in match-making machines and need not be further described. The worm-gears shown are actuated from the counter-shaft by the train of bevel-gears r r' r<sup>2</sup> r<sup>3</sup>, as shown in Fig. 4. The organization of the mechanism is such as to secure the harmonious coöperation of all the parts, whereby the blanks are fed forward one at a time. The cutters are operated at proper times to sever the blanks successively into splints, and the splints are inserted immediately after being formed into the carrier-belt, which pauses while the splints are being inserted and then proceeds on its journey, ultimately bringing the splints back again to near the starting-point after they have been converted into matches, at which point the ejectors operate to discharge the matches while new splints are being inserted in the belt.

We claim as our invention—

1. The combination, substantially as hereinbefore set forth, of two cutters or dies formed with interlocking ribs and grooves, means for feeding blanks between the dies while they are separated, means for reciprocating one cutter or die toward and from the other to thereby cut the blank into splints and withdraw one portion of the splints from the others and hold them out of line therewith and pusher-rods for then ejecting the two separate rows of splints from the grooves of the cutters.

2. The combination, substantially as hereinbefore set forth, of a pair of cutters or dies having interlocking ribs and grooves, means for feeding blanks between the cutters while they are separated, means for reciprocating one of the cutters toward and from the other to cut the blank into splints and withdraw one part of the splints from the others and hold them out of line therewith, two rows of pusher-rods for ejecting the two rows of splints thus separated, and a carrier-belt or dipping-frame into which the splints are ejected by the pusher-rods from the cutters.

3. The combination, substantially as hereinbefore set forth, of a pair of cutters or dies having straight interlocking ribs and grooves

arranged vertically, a magazine or trough for blanks, a slide for feeding the blanks, one at a time, horizontally, between the cutters when they are separated, means for reciprocating one cutter toward and from the other to cut the blank into splints and withdraw one portion of the splints from the others and hold them out of line therewith, and pusher-rods for ejecting the two rows of splints from the grooves of the cutters.

4. The combination, substantially as hereinbefore set forth, of a stationary cutter having vertically-arranged, parallel, alternate ribs and grooves, a reciprocating cutter having parallel, vertically-arranged, alternate ribs and grooves adapted to interlock with the ribs and grooves of the stationary cutter, means for feeding blanks between the cutters while they are separated, a stop for limiting the forward movement of the blanks, a blade for trimming the blanks, and pusher-rods for ejecting the splints after they are cut from the blank and separated from each other.

5. The combination, substantially as hereinbefore set forth, of a stationary cutter having alternately-arranged, parallel ribs and grooves, means for adjusting this cutter, a reciprocating cutter having alternately-arranged, parallel ribs and grooves adapted to interlock with those of the first-mentioned cutter, means for reciprocating said cutter toward and from the other to thereby cut the blank into splints and to withdraw one portion of the splints from the others and hold them out of line therewith, means for feeding the blanks between the cutters while they are separated, and pusher-rods for ejecting the two rows of splints from the grooves of the cutters.

6. The combination, substantially as hereinbefore set forth, of ribbed and grooved cutters which sever an interposed blank laterally into two rows of match-splints, means for reciprocating one cutter toward and from the other, and a spacing-grate against which part of the splints are drawn as the reciprocating cutter retreats from the other, and which adjusts the splints, substantially in the manner described.

7. The combination, substantially as hereinbefore set forth, of two cutters or dies provided with interlocking ribs and grooves, means for feeding blanks between the cutters when they are separated, guide-plates provided with perforations above and below the cutters, means for reciprocating one of the cutters toward and from the other, to sever the blanks into splints and to separate part of the splints from the others, and pusher-rods reciprocating through the perforations in the guide-plates and ejecting the splints through the perforations in the lower guide-plate.

8. The combination of the cutters or dies having interlocking ribs and grooves, means for feeding blanks between the cutters when



they are separated, means for reciprocating one of the cutters toward and from the other, to sever the blank into splints and to withdraw part of the splints thus severed from the others and hold them out of line therewith, a carrier-belt below the cutters, pusher-rods for ejecting both rows of the splints from the cutters and inserting them into the carrier-belt, and an ejector for ejecting the completed matches from the carrier-belt.

9. The combination of the cutters provided with interlocking ribs and grooves, means for feeding blanks between the cutters while they are separated, means for reciprocating one of the cutters toward and from the other to sever the blank into splints and to withdraw one part of the splints from the others and hold them out of line therewith, a carrier-belt below the cutters, pusher-rods for discharging both rows of the splints from the grooves of the cutters and inserting them into the carrier-belt, and an ejector operating simultaneously with the pusher-rods to eject completed matches from the carrier-belt while splints are being inserted therein.

10. The holder-frame or carrier, comprising in its organization side plates, transverse partitions and holding-screws, the projecting heads of which constitute part of the means for actuating the holders.

11. In combination with match-splint-holder-sections and their connecting-hinges, of plates,  $h^4$ , secured to the adjacent ends of opposing sections and having curved upper ends, and springs on the holder-sections ad-

jacent to the plates and between which and the plates match-splints may be inserted.

12. A holder-frame consisting of the combination of the side plates, transverse partitions secured thereto having curved upper ends, springs interposed between the partitions and having curved upper ends mounted on transverse rods, another similarly-constructed holder-frame hinged to the frame first mentioned, and plates secured to the adjacent ends of the two frames and having curved upper ends, for the purpose specified.

13. The combination, substantially as hereinbefore set forth, of two cutters or dies formed with interlocking ribs and grooves, means for feeding blanks between the dies while they are separated, means for reciprocating one cutter or die toward and from the other to thereby cut the blank into splints, and pusher-rods for then ejecting the two separate rows of splints from the grooves of the cutters.

14. The combination, substantially as hereinbefore set forth, of two cutters or dies formed with interlocking ribs and grooves, means for reciprocating the cutters toward and from each other, and pusher-rods for ejecting the splints from the grooves.

In testimony whereof we have hereunto subscribed our names.

JOHN H. WHITE.

EDWARD L. WHITE.

Witnesses:

W. D. BALDWIN,

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