

No. 887,007.

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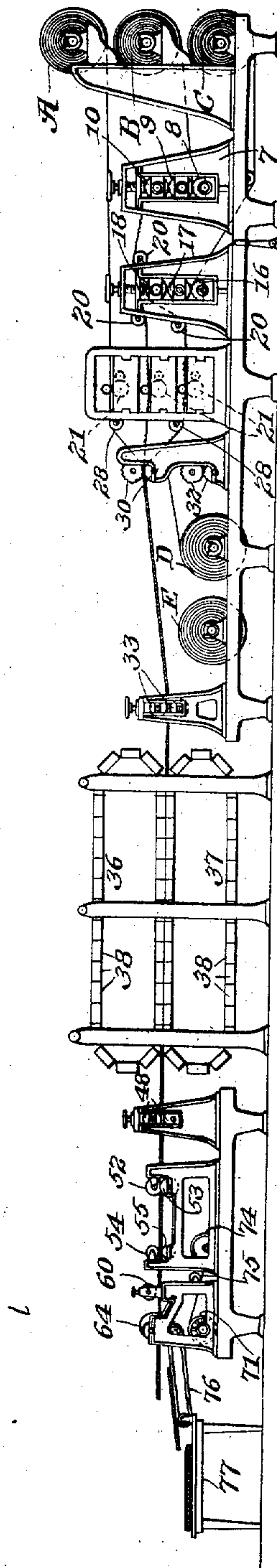
PATENTED MAY 5, 1908.

MACHINE FOR MAKING COMBINATION PAPER BOARD.

APPLICATION FILED SEPT. 19, 1907.

11 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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11 SHEETS—SHEET 2.

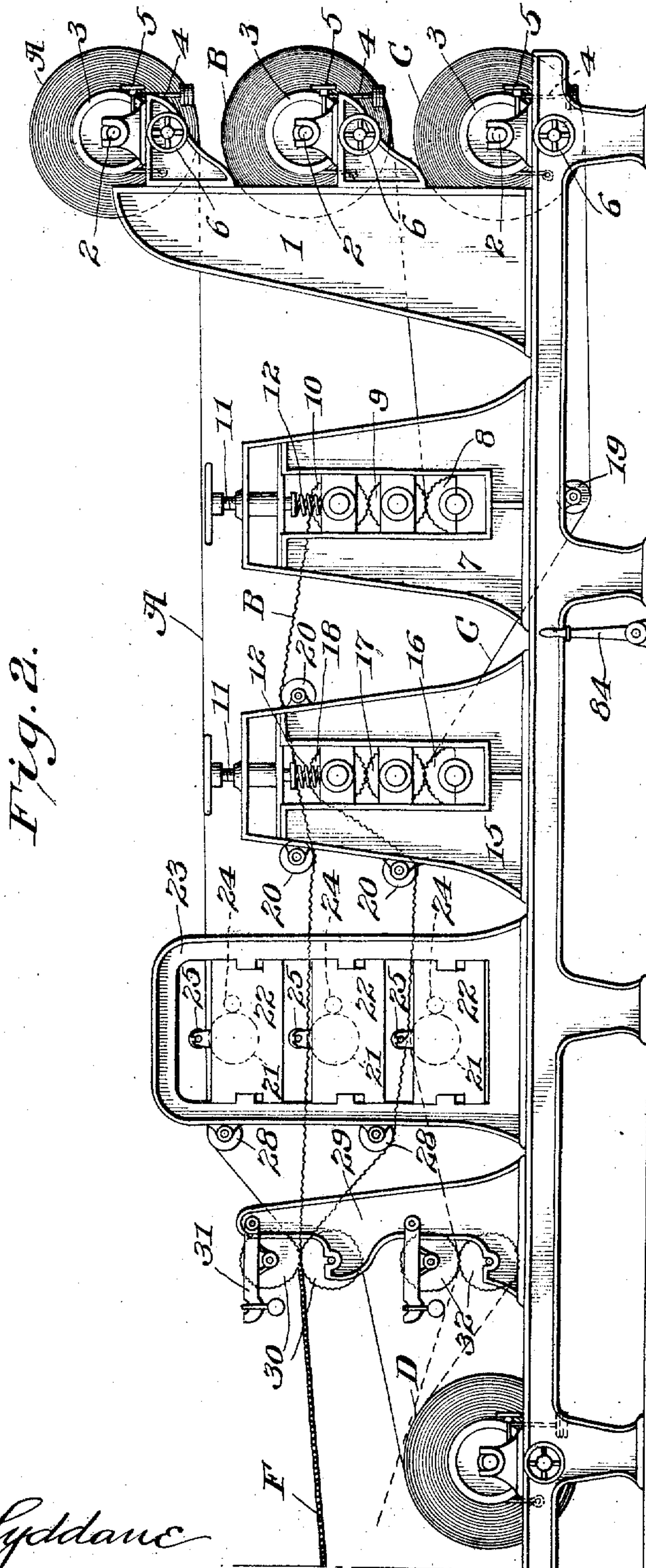


Fig. 2.

Witnesses

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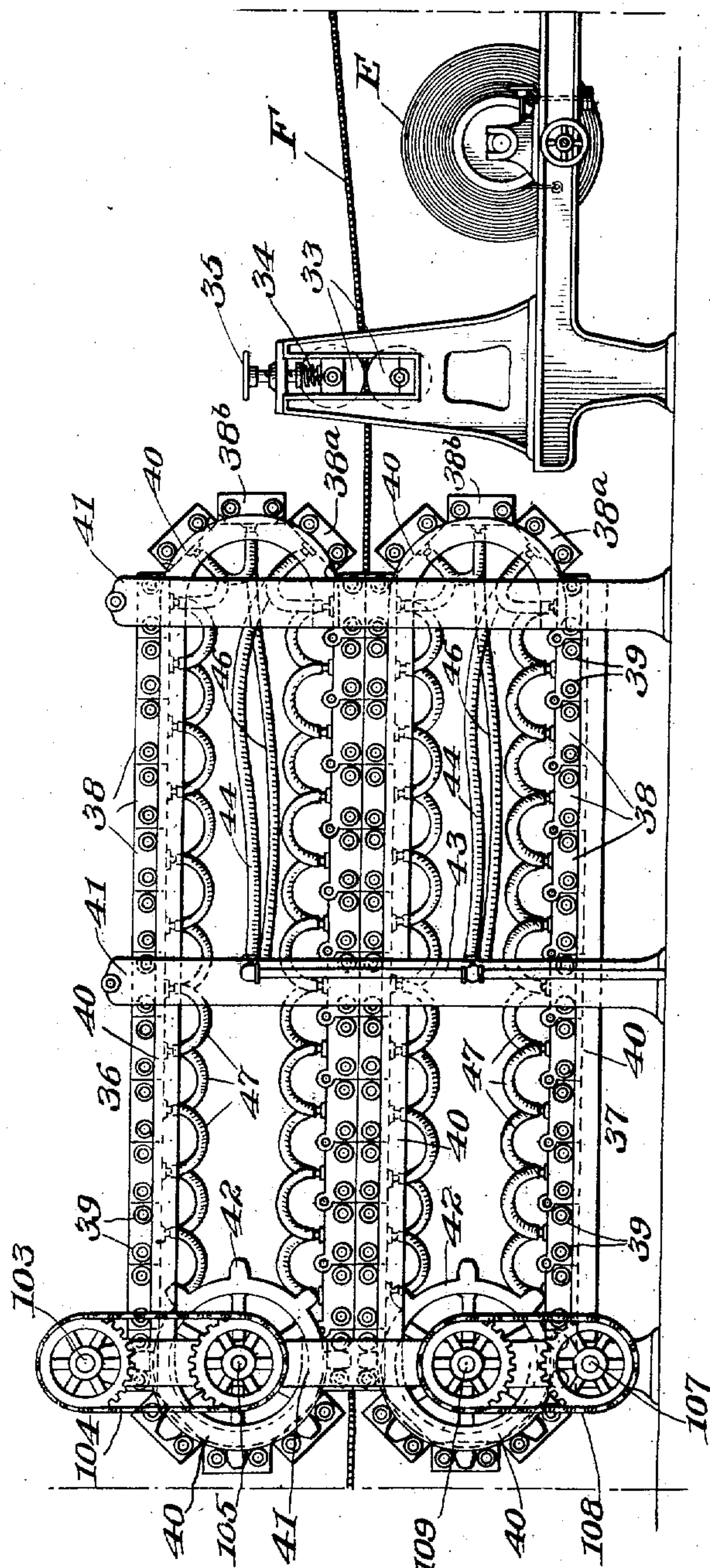
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11 SHEETS—SHEET 3.

Fig. 3.



Witnesses

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11 SHEETS—SHEET 4.

Fig. 5.

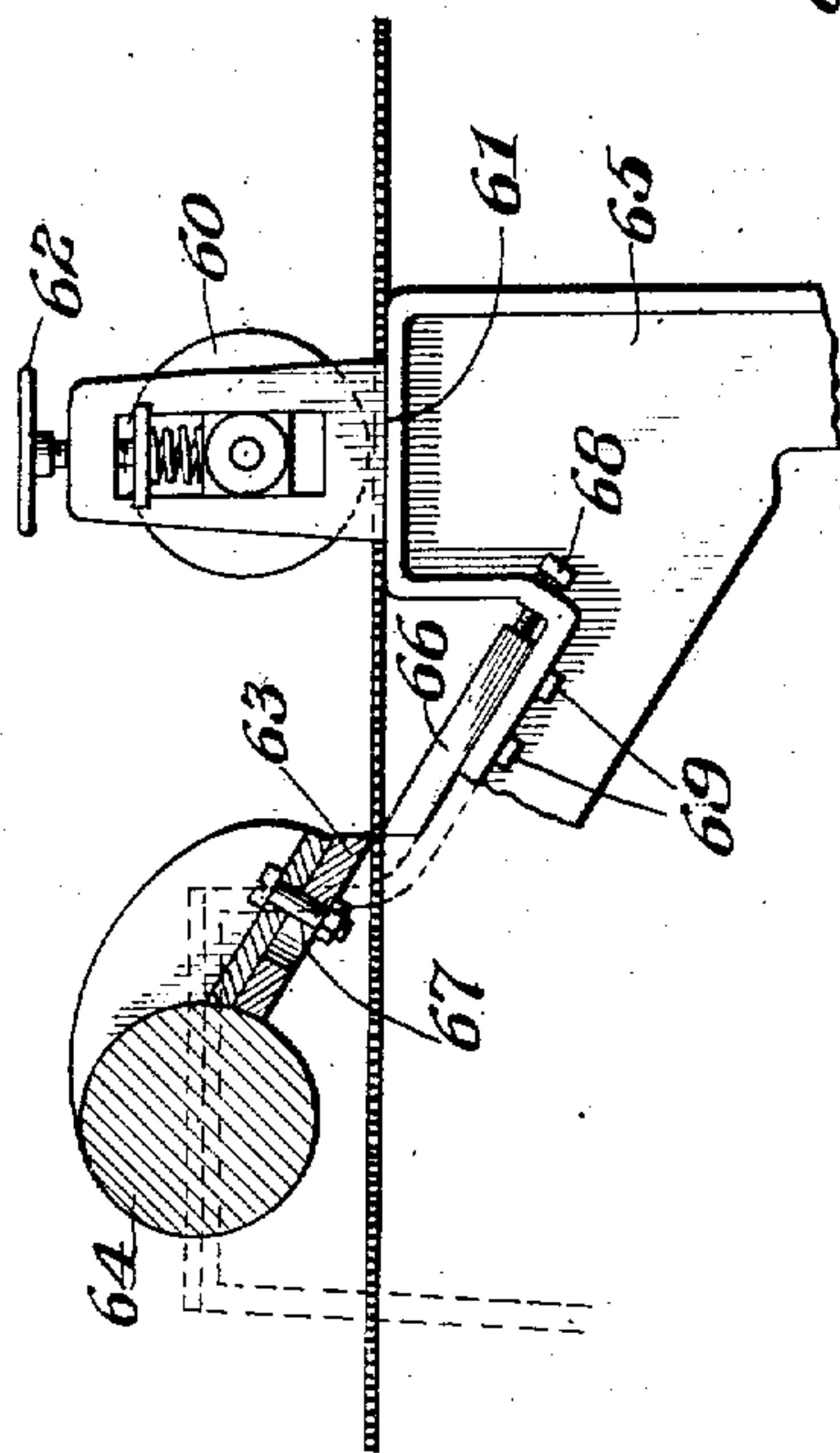
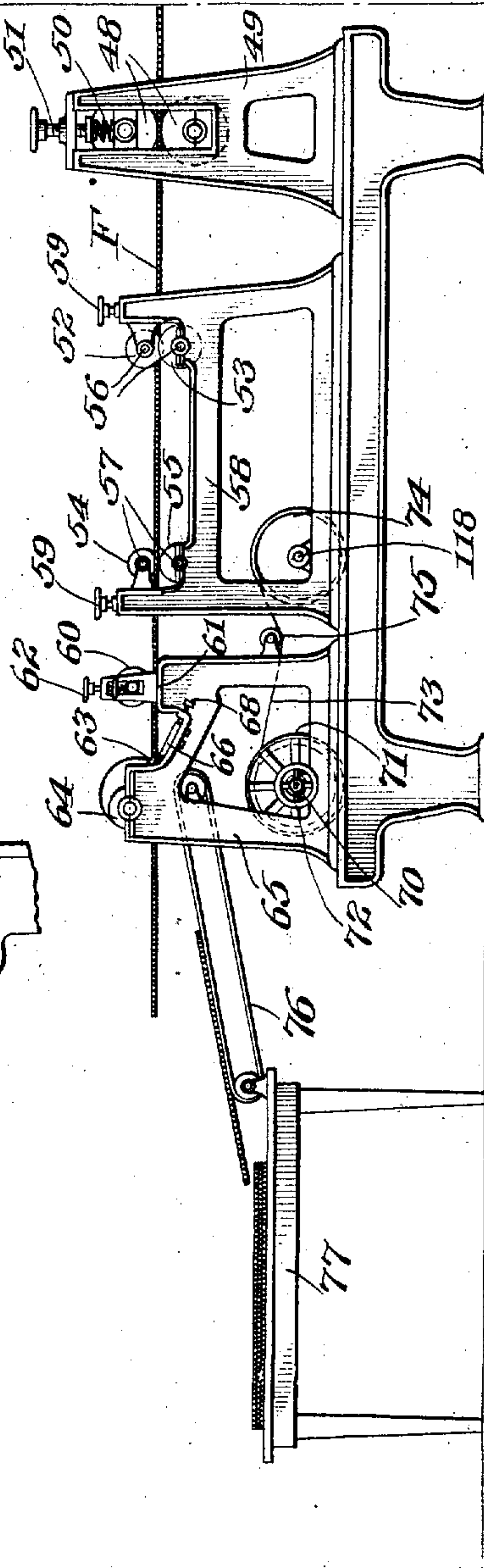


Fig. 4.



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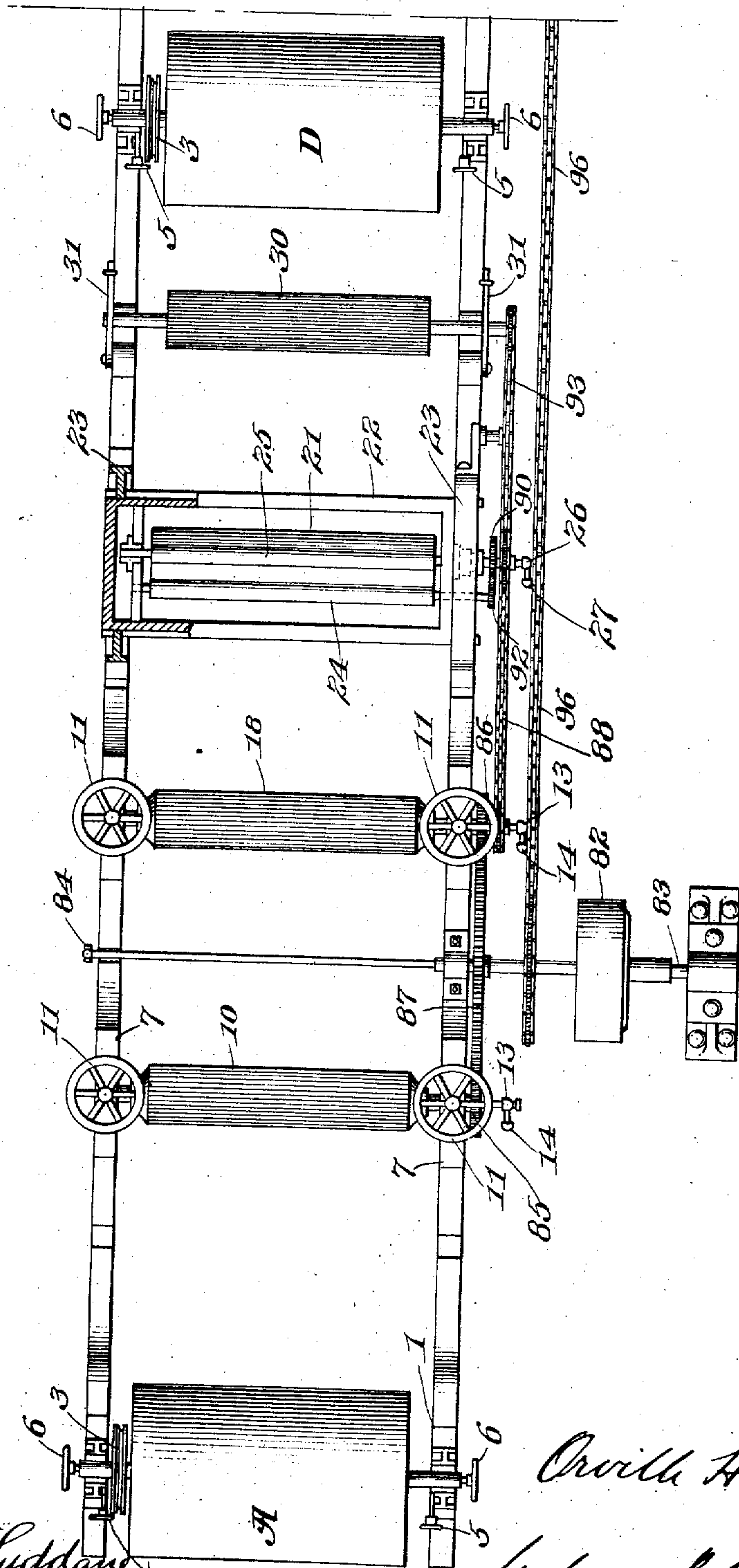
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11 SHEETS—SHEET 5.

Fig. 6.



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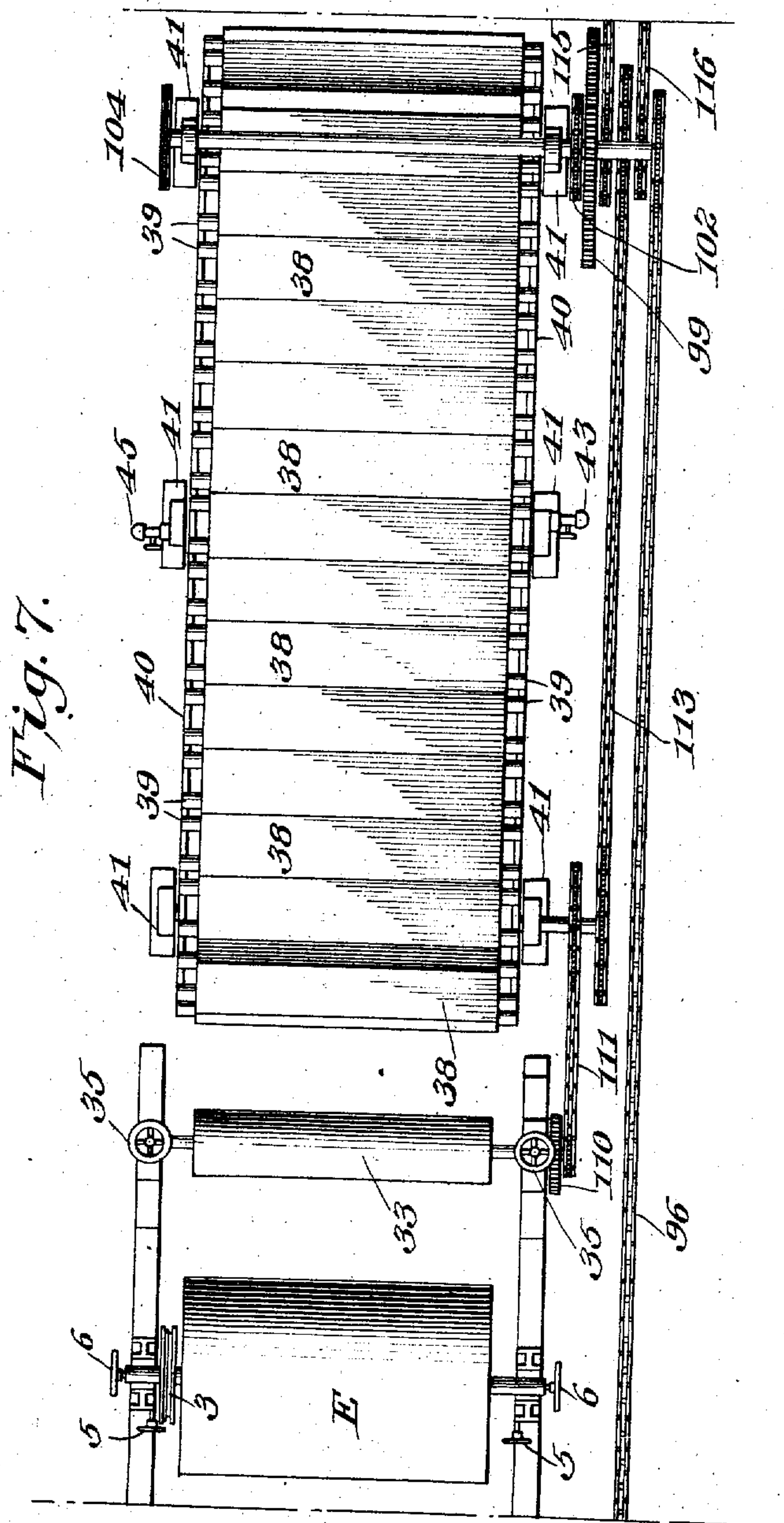
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11 SHEETS—SHEET 8.



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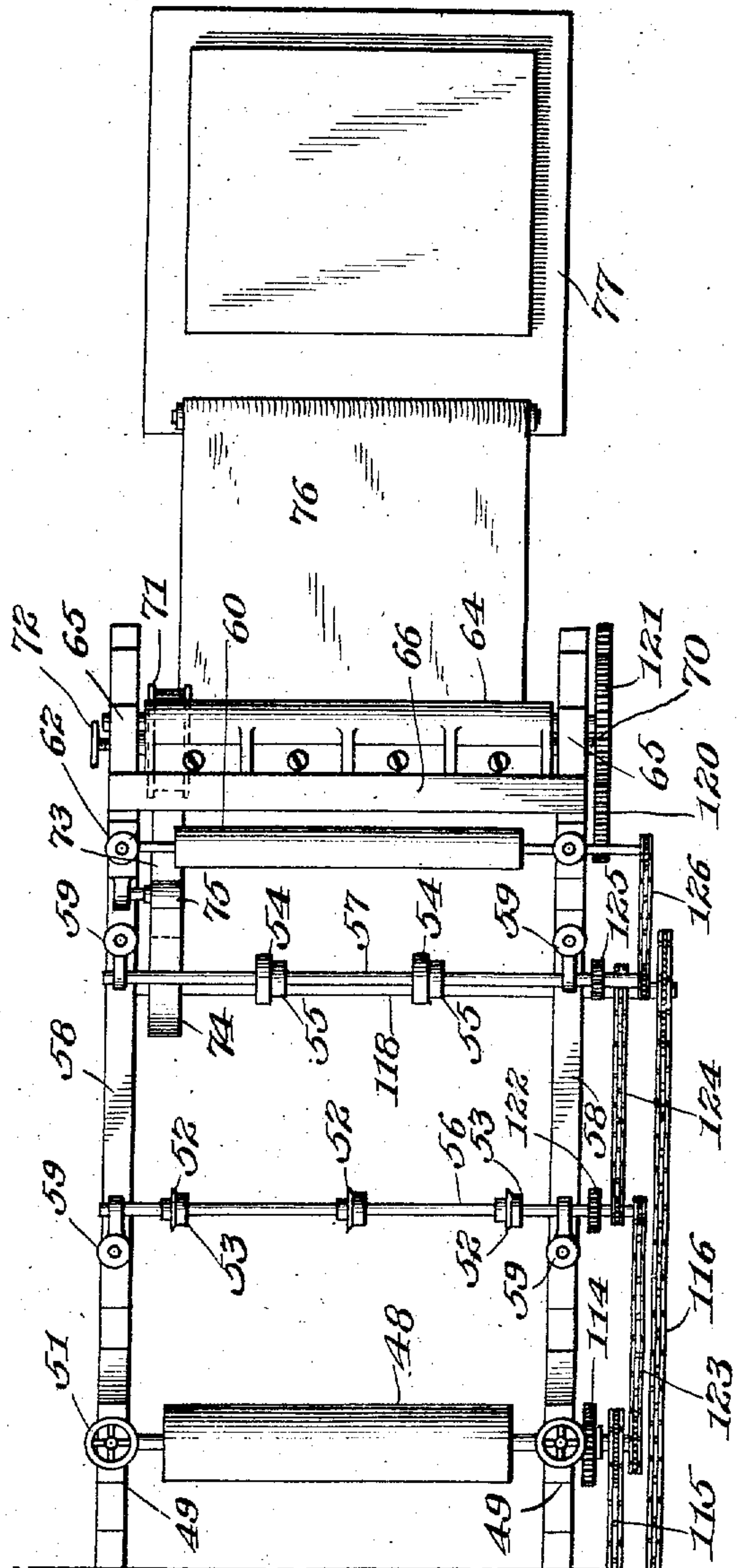
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MACHINE FOR MAKING COMBINATION PAPER BOARD.

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11 SHEETS—SHEET 7.

Fig. 8.



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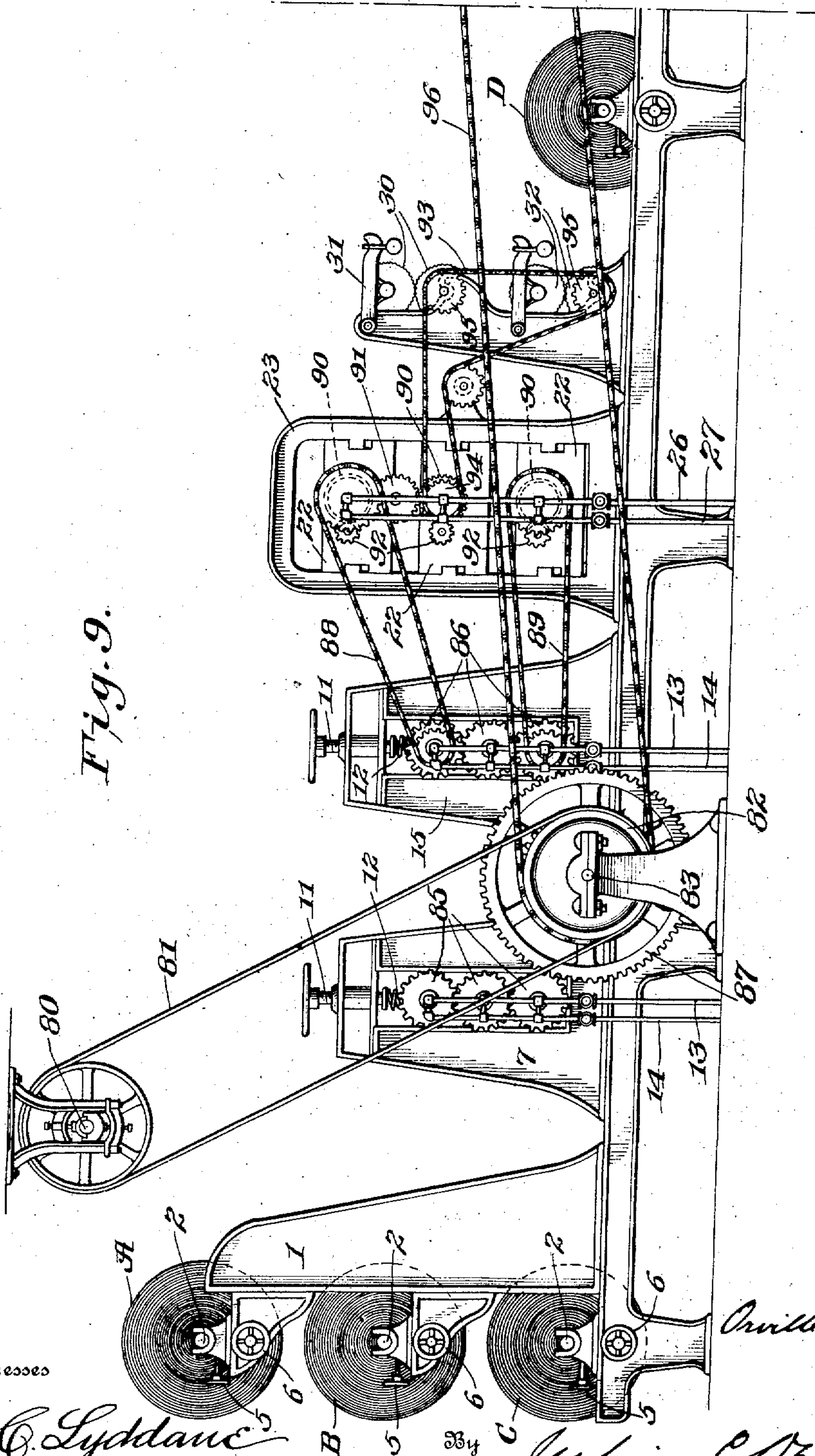
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11 SHEETS—SHEET 8.

Fig. 9.



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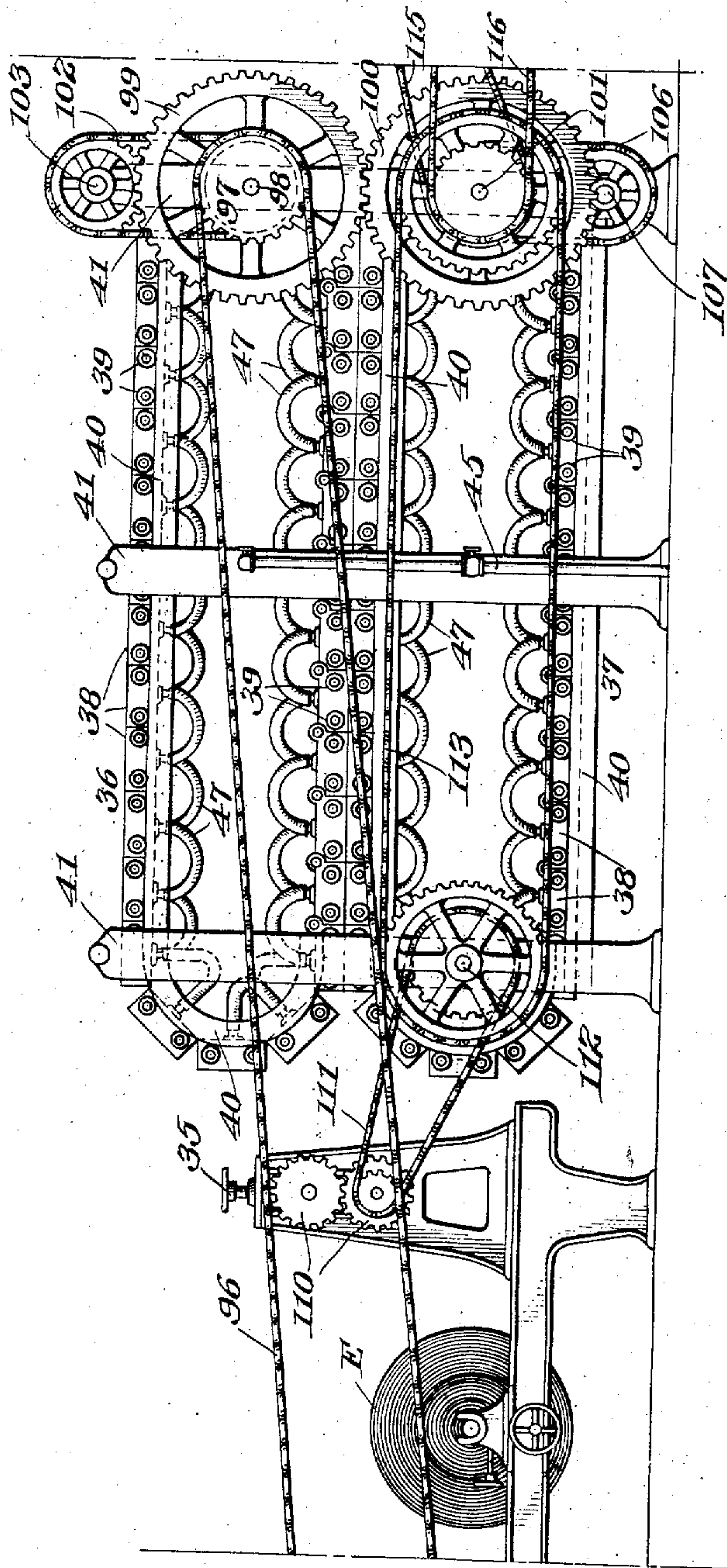
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11 SHEETS—SHEET 9.

Fig. 10.



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11 SHEETS—SHEET 10.

Fig. 12.

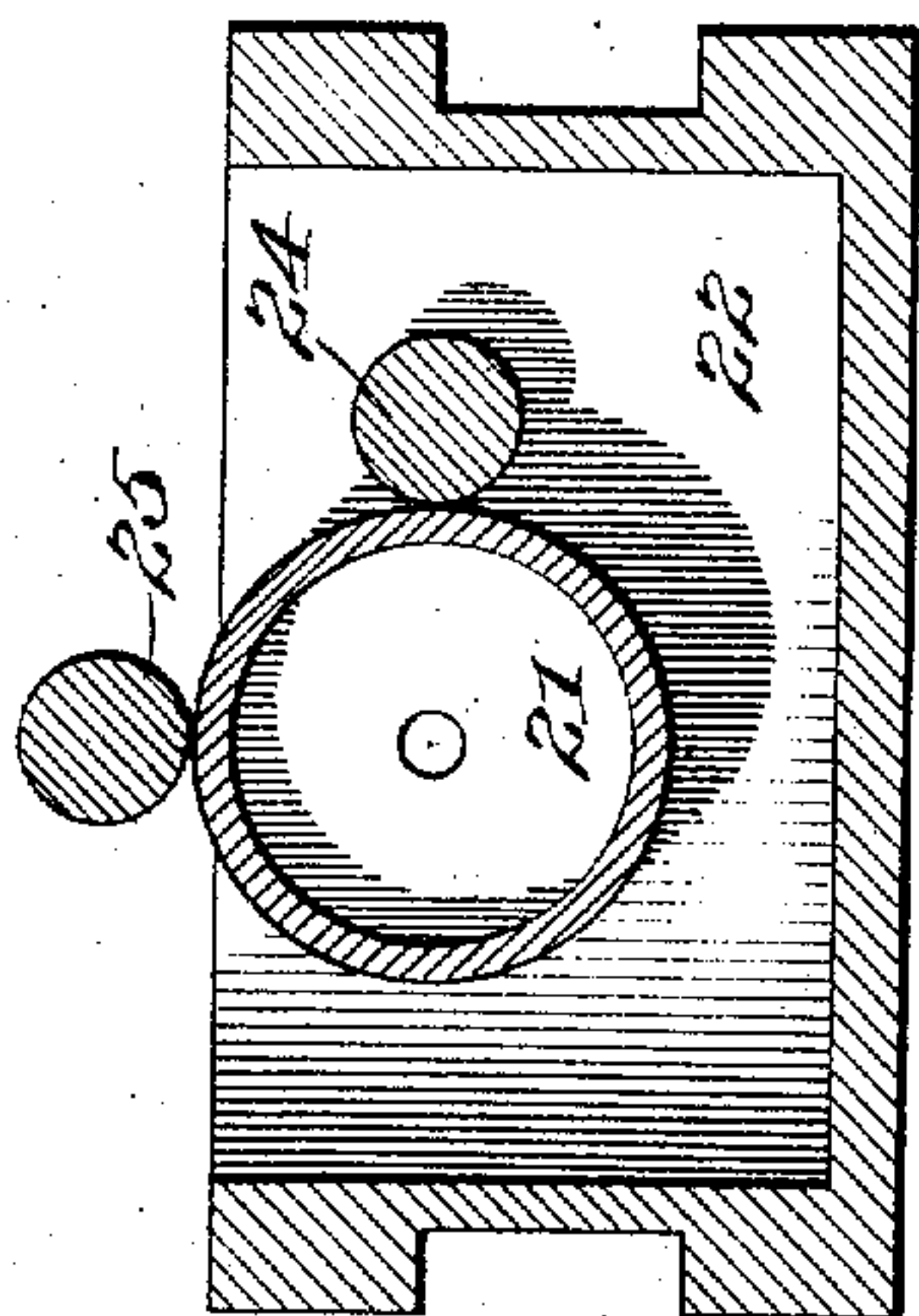
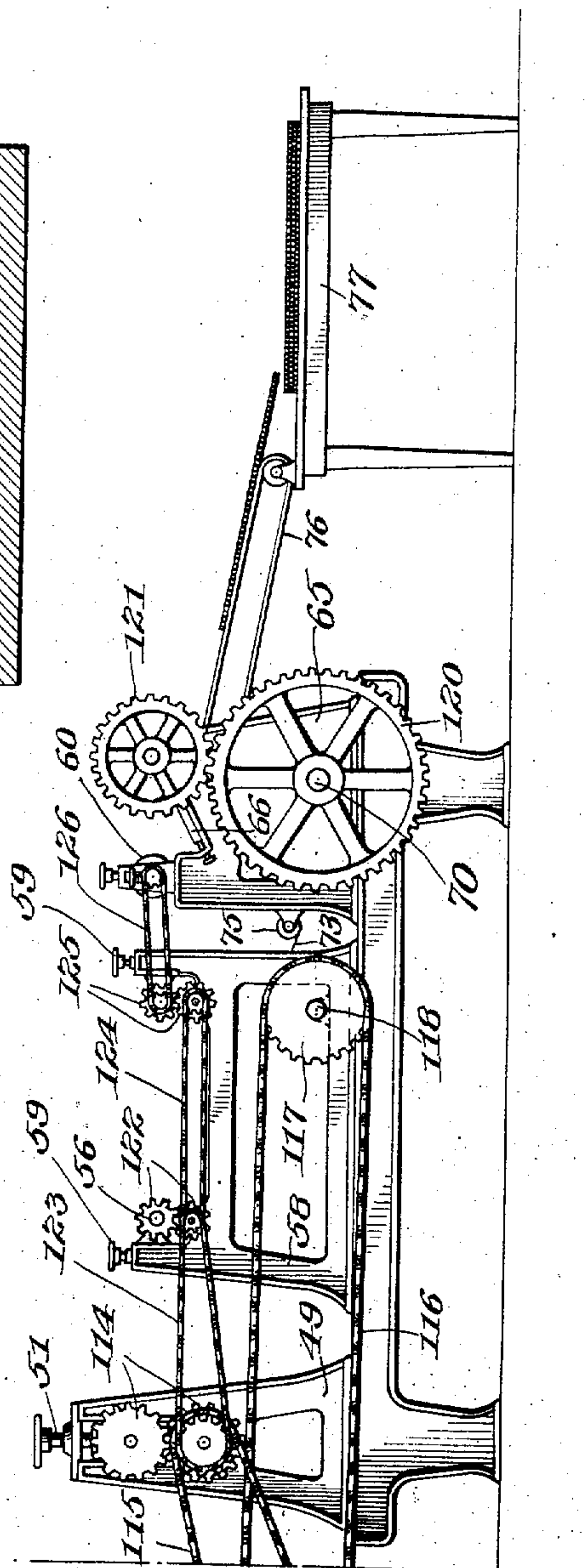


Fig. 11.



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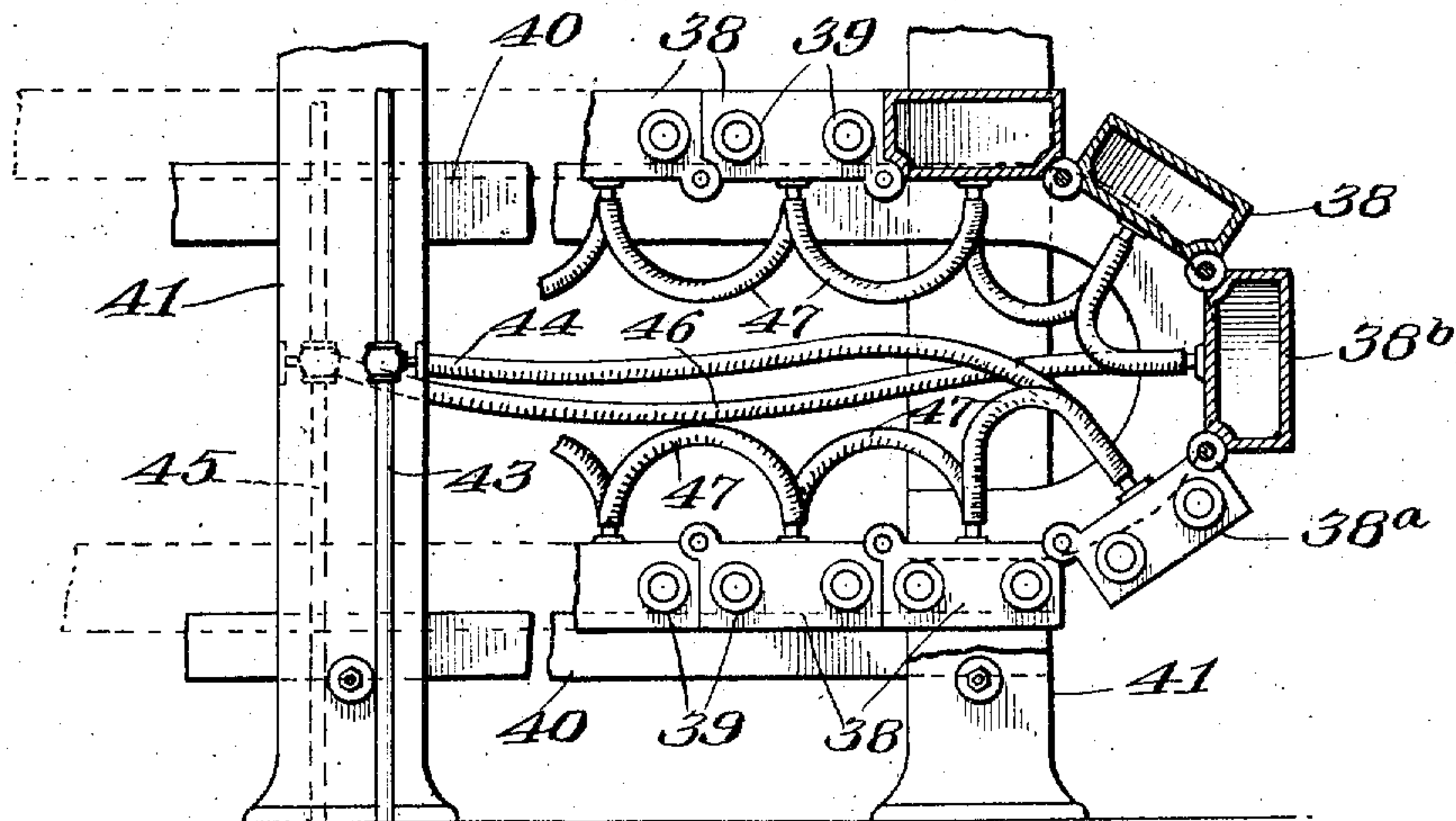
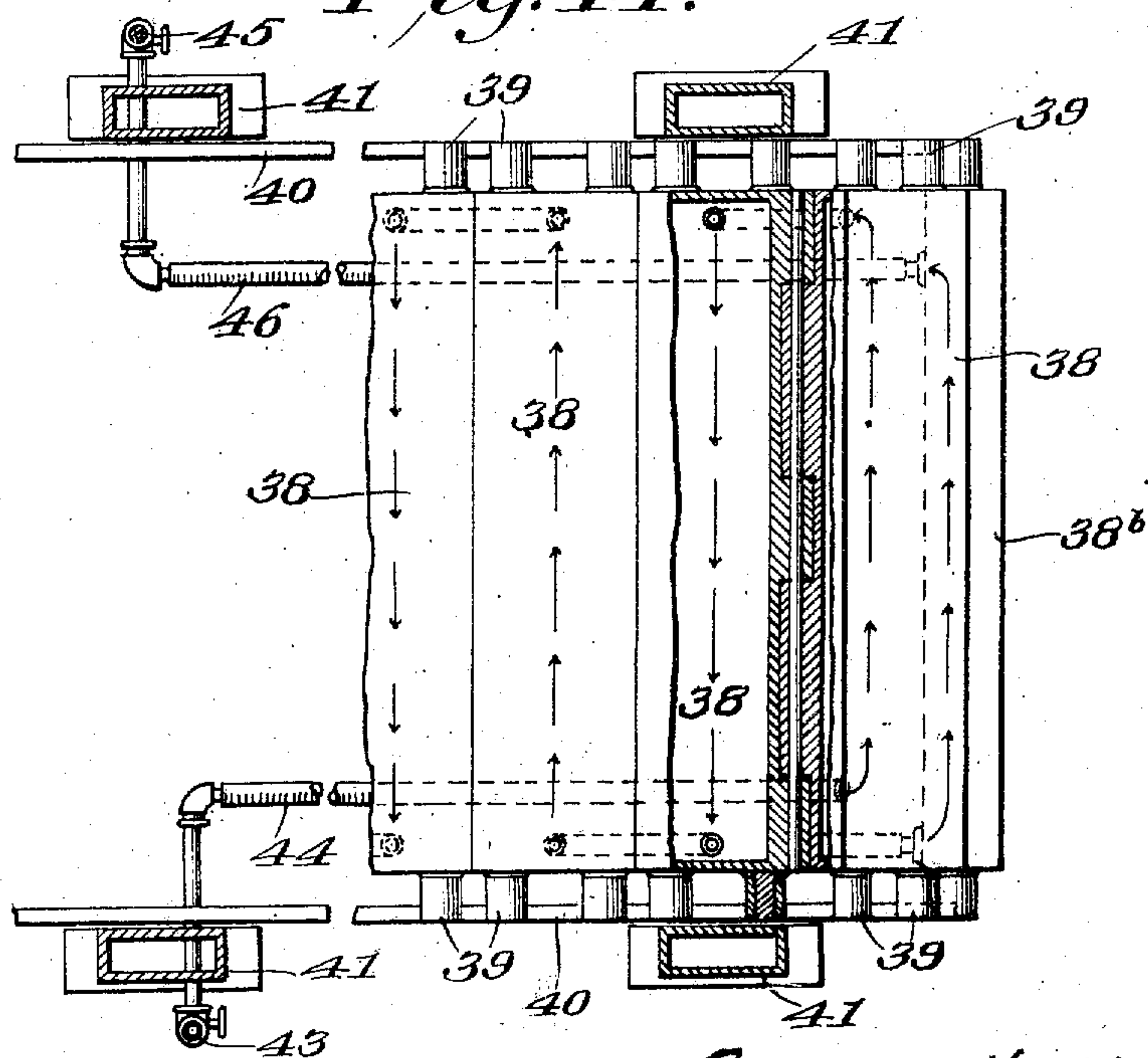
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11 SHEETS—SHEET 11.

Fig. 13.*Fig. 14.*

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UNITED STATES PATENT OFFICE.

ORVILLE H. MOORE, OF FORT EDWARD, NEW YORK.

MACHINE FOR MAKING COMBINATION PAPER-BOARD.

No. 887,007.

Specification of Letters Patent.

Patented May 5, 1908.

Application filed September 19, 1907. Serial No. 393,684.

To all whom it may concern:

Be it known that I, ORVILLE H. MOORE, a citizen of the United States, residing at Fort Edward, in the county of Washington and State of New York, have invented certain new and useful Improvements in Machines for Making Combination Paper-Board; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The general object of this invention is to improve the construction and increase the capacity and efficiency of machinery for making combination paper board, more especially board composed of one or more plies of corrugated paper or paper board with or without one or more smooth facing sheets.

A particular object of the invention is to provide for corrugating one or more sheets of paper at the same time, pasting them together, applying one or more facing sheets as desired, drying the composite sheet, and slitting or trimming, scoring and cutting the material into desired lengths, all in one continuous operation.

Another particular object is to provide a highly improved traveling drying apparatus for drying the composite sheet or green board in transit, as fast as it is produced, and while pressing or holding the material flatwise; such drier being also adapted for drying other kinds of paper board, such as mill-board, etc., or any stiff material that should be kept from bending or warping during the drying operation.

Without limiting myself to the specific construction herein illustrated, which obviously would be modifiable in various ways, the invention will hereinafter be first fully described by reference to the accompanying drawings, which form a part of this specification, and then more particularly pointed out in the appended claims.

In said drawings: Figure 1 is a diagrammatic side view of a machine embodying my invention. Figs. 2, 3 and 4, taken together, show an enlarged side elevation of the complete machine. Fig. 2 represents the first or front section thereof, comprising principally the paper supply rolls, corrugating and pasting mechanisms. Fig. 3 represents a medial section comprising principally the traveling drying apparatus, and Fig. 4 rep-

resents the rear section comprising principally the slitting, scoring, cutting and delivery mechanisms. Fig. 5 is an enlarged detail sectional view of the cutting mechanism shown in Fig. 4. Figs. 6, 7 and 8, taken together, give a top plan view of the entire machine, said figures representing the subject-matters of Figs. 2, 3 and 4 respectively. Figs. 9, 10 and 11, taken together, show a side elevation of the entire machine looking at the opposite side to that indicated in Figs. 2, 3 and 4, and representing corresponding sections of the machine. Fig. 12 is an enlarged vertical section through one of the paste boxes. Fig. 13 is an enlarged detail side view, with parts in section, of a portion of one of the endless traveling drying belts or aprons. Fig. 14 is a top plan view of the subject-matter of Fig. 13, partly in section.

At the front of the machine, mounted in a suitable stand or rack 1, are a plurality of supply rolls of paper, preferably three rolls designated A, B and C, from which respective sheets of paper are adapted to be unrolled and drawn rearward in alinement with each other. The shafts 2 on which the said rolls of paper are mounted are shown equipped with pulleys 3, keyed or fast on said shafts, said pulleys being frictionally engaged by weighted straps 4 or strips of leather, canvas or the like, acting as brakes to retard the rotation of the rolls and prevent the sheets of paper from feeding faster than they are drawn through the machine. For insuring the feed of the several sheets of paper in correct alinement, the usual or any appropriate adjusting devices may be provided. In this connection, the illustrated hand-wheels 5 are intended for shifting or adjusting the roll-shafts 2 transversely, while the hand-wheels 6 are intended for adjusting said shafts axially, the said hand-wheels operating adjusting screws which engage the movable shaft-bearings.

According to the illustrated embodiment of my invention, the roll A is intended to supply a smooth sheet of paper, while the other rolls B and C are intended to supply corrugated sheets to be pasted together and to be faced on one side by the smooth sheet A, also to be faced on the opposite side by a fourth sheet of paper hereinafter mentioned. In carrying out this purpose, the sheet B from the middle roll of paper is drawn rearward through a corrugating mechanism,

shown mounted in a stand or rack 7. Said corrugating mechanism comprises coacting or intermeshing fluted or corrugated rolls, preferably three of such rolls designated 8, 9 and 10. The paper sheet B passes successively between rolls 8 and 9 and the rolls 9 and 10, as shown in Fig. 2, whereby the corrugations in the paper are first formed and then more permanently set. The pressure between the corrugating rolls may be regulated by adjusting-screws 11 bearing upon pressure-springs 12, the latter being seated upon the bearings of the topmost corrugating roll, which bearings, together with those of the middle corrugating roll, are vertically movable or adjustable in guide-ways therefor in the stand or rack 7. The rolls may be heated by any appropriate means, as by steam, gas or electricity, but as steam is generally used by the manufacturers, I have illustrated suitable steam-connection in Figs. 6 and 9, wherein 13 and 14 designate valved steam supply and exhaust pipes in communication with the hollow trunnions of the several corrugating rolls, said rolls being also hollow.

Behind the corrugating rolls 8, 9 and 10 is a stand or rack 15 supporting a similar set of corrugating rolls 16, 17 and 18, provided with similar adjusting means (screws 11 and springs 12) and steam supply and exhaust pipes 13 and 14 for heating. The sheet C from the lowermost roll of paper is drawn rearward past a guide-roller 19 and carried between the corrugating rolls 16, 17 and 18 in the same manner as the sheet B is carried through the rolls 8, 9 and 10. Thus the two sheets are drawn rearward and corrugated at the same time. Both sets of corrugating rolls are shown longitudinally fluted for corrugating both sheets B and C transversely of the widths of the sheets. But, if desired, one set of corrugating rolls may be annularly or peripherally corrugated for corrugating the sheet longitudinally, for the purpose of making two corrugated sheets at one time with corrugations crossing each other, which would be advantageous in some cases where a very stiff material is required. In case of corrugating one sheet longitudinally, it would be desirable that the sheet should be initially wider than the other sheet, and the mechanism for making the longitudinal corrugations should preferably be preceded by appropriate means for gathering the paper or contracting its width to accommodate the amount of paper taken up by the longitudinal corrugations.

The smooth sheet A together with the two corrugated sheets B and C (which latter pass from their respective corrugating mechanisms over suitably-disposed guide-rollers 20) are drawn rearward over or in contact with a set of paste-rolls 21, which are arranged in paste-boxes 22 holding the paste, glue or adhesive mixture for applying to the sheets of

paper. Said paste boxes 22 are shown mounted one above another in a rack or stand 23 and can be withdrawn laterally from the side of the machine shown in Fig. 2. Associated with each paste-roll is a parallel small roll 24 for spreading the paste or glue evenly upon the larger paste-roll, so that it will be applied uniformly upon the surface of the paper. Above each paste-roll is another small roll 25 for the purpose of holding the paper down firmly on the paste-roll. The small roll 25 can be lifted off when it is desired to withdraw the paste-box. The bearings of the paste-roll 21 and spreading-rolls 24 are contained wholly within the paste-boxes, so as to keep the paste from escaping and soiling the machine. The paste-rolls are also heated, preferably by steam, for which purpose said paste-rolls are made hollow and are shown in communication with steam-supply and exhaust pipes 26 and 27 in Figs. 6 and 9, packing-glands being provided between the steam-connections and the hollow journals or trunnions of the paste-rolls.

On leaving the paste-rolls, the several sheets A, B, C, with adhesive coatings applied to their respective under sides, are drawn rearward past guide-rollers 28 and between co-acting press-rolls 30, which latter may be slightly roughened or corrugated as circumstances may require. The pressure between the press-rolls 30, in the illustrated construction, is furnished by the weight of the upper roll which bears upon the lower roll, the bearings of the upper roll being carried by weighted levers 31. Below the press-rolls 30, the supporting rack or stand 29 also supports a similar set of press-rolls 32, the purpose of which will appear later.

Behind the press-rolls 30 and 32, a fourth supply roll of paper D is mounted similarly to the rolls A, B and C. Said roll D is provided for the purpose of supplying another smooth facing sheet at the under side of the sheets furnished by the three rolls A, B and C; the sheet D being drawn from its roll and carried between the press-rolls 30 together with the other sheets. Another roll E (Figs. 1 and 3) is shown mounted behind the roll D, and is placed there merely for the purpose of continuing the feed of the under facing sheet when the supply of the roll D is exhausted.

By passing through the press-rolls 30, the several sheets or plies of paper become pressed and stuck together, the paste or adhesive mixture having been applied to the under sides of the sheets A, B and C, so that the adhesive coating comes between the several confronting sheets or plies of paper. The thick composite sheet or green board so formed, indicated by the letter F, is then drawn rearward through another set of press-rolls 33 (Fig. 3), shown in this instance

equipped with pressure-springs 34 and adjusting screws 35. Said press-rolls 33 serve not only to press the composite sheet, but also to feed it rearward to the traveling
5 driers and to draw the several constituent sheets through the machine.

It will be noted that in practice any one or more of the several sheets can be omitted or dropped from use, so that it is possible to run
10 either two corrugated sheets, or one or more corrugated sheets with a smooth facing on either one or both sides. If it be desired to run only a single corrugated sheet and single
15 sheet C and the smooth sheet from the roll D may be brought through the press-rolls 31 as indicated by dotted lines in Fig. 2. Such modifications as placing the supply-roll D above instead of below the press-roll 31 and
20 arranging for corrugating the sheets A and B instead of B and C, or for corrugating the sheet C in advance of the corrugating of the sheet B, and other modifications in the general construction and arrangement, would
25 of course fall within the scope of the invention.

On leaving the press-rolls 35, the composite sheet or green board F passes to and is operated upon by a traveling drying apparatus shown in Figs. 3, 7, 10, 13 and 14,
30 which dries the material in transit and while pressing it out flatwise, thereby avoiding bending and consequent injury to the stiff board, and carrying out the drying process as
35 fast as the material is produced and in one continuous operation with the corrugating and pasting processes. Said drying apparatus comprises coacting endless belts or aprons 36 and 37, each composed of a series of hol-
40 low pans or boxes 38 hinged or flexibly-connected together so as to move freely around the ends of turns of the belt, but so that the co-acting runs of the two drying-belts or aprons form practically continuous flat sur-
45 faces which will hold or press the green board or material flatwise between them. Said hollow pans or boxes are provided on their ends with pairs of small wheels or rollers 39, which bear upon and travel over and around
50 suitable tracks 40 which hold the horizontal runs of the belts level and guide the belts properly around their turns. Said tracks 40, constituting the supporting and guiding means for the drying belts or aprons, are
55 shown mounted between the uprights 41. Each drying belt is driven from one end by lateral spur-wheels 42, the teeth of which engage between the pairs of small wheels or rollers 39 on the ends of the hollow pans.
60 Adjustable bearings for the spur-wheels permit adjustment or tensioning of the belts. These endless drying belts or aprons are heated by steam (or other hot fluid) passing through the hollow pans or boxes, the means
65 for which purpose are shown in Figs. 3 and 7

and more clearly in Figs. 13 and 14. At one side of the drying apparatus, substantially midway thereof, a steam supply-pipe 43 is connected by a flexible pipe or hose section 44 with one of the hollow pans or boxes of
70 each drying-belt, the length of the hose section 44 being sufficient to maintain connection between the steam supply-pipe 43 and said hollow box during the complete circuit of travel of the latter. The said hollow pan
75 or box into which the steam enters may be designated 38^a. At the opposite side of the drying apparatus, an exhaust pipe 45 is connected by a similar hose section 46 with an adjacent box or pan of each drying-belt,
80 which box may be designated 38^b. The several hollow pans or boxes are connected in series by short hose sections or flexible pipe connections 47, each coupling one box with the adjacent box, except that there is no
85 such connection between the boxes 38^a and 38^b. In this manner, the live steam entering the box 38^a will pass successively through all the boxes and finally exhaust from the box 38^b; the incoming steam pushing out
90 the exhaust steam behind it.

As shown in Fig. 14, the flexible connections or hose sections 47 are also arranged alternately at opposite ends of the hollow
95 pans or boxes 38, so that the steam is sure to pass throughout the boxes and heat them uniformly. The flexible hose connections 47 between the boxes will bend freely as the drying belts are making the turns, while the hose-sections 44 and 46 connecting with the
100 steam inlet and exhaust pipes 43 and 45 will follow the drying belts in all positions. The several hose sections may be of rubber, fabric or any flexible material suitable for the purpose.
105

The object of the above described drying apparatus is to dry corrugated paper, or paper board, mill board or any stiff material that cannot properly be bent or warped while drying, and for drying the same in
110 transit, or as fast as the material is produced and fed to the drier, so as to carry out the drying process as a continuation of the operation of making the material in the green state. The drier is not limited in its useful
115 applications to the particular machine herein set forth.

The drying apparatus can be arranged horizontally, vertically, or in such other position as the case may require, and may if
120 necessary be built in one or more sections so that any desired amount of heat can be secured in the driers at different points. They can be built in such a way that the first section would press the paper at different points,
125 while the second section would press the paper passed by the first section and so on. If circumstances should require it, the driers could be placed a short space from each other so that the moisture would evaporate freely.
130

As the material is delivered or emerges from the traveling drying belts, it passes between press-rolls 48, which serve to press the sheet and also to help drag the material through the machine and force it rearward through the slitting and scoring rolls and cutter. Said press-rolls 48, mounted in a stand or rack 49, are shown provided with pressure-springs 50 and adjusting screws 51. From the press-rolls 48, the material passes between coacting slitting wheels or disk shears 52 and 53, which are for the purpose of trimming or cutting the paper the desired width or widths as it passes along, and thence between co-acting scoring wheels 54 and 55 which mark the material longitudinally so that it will fold readily. The transverse shafts 56 and 57 of the slitting and scoring wheels are shown journaled in a rack or stand 58. Adjusting screws 59 are provided for the shafts of the upper slitting and scoring rolls.

On leaving the slitting and scoring rolls, the material passes under a guide-roll 60, shown revolving above a flat bed 61 for the purpose of holding the material flat as it passes under the revolving knife or cutter. An adjusting screw 62 permits regulating the pressure of the roll 60.

The numeral 63 denotes the revolving knife or cutter blade, which is mounted on a rotary drum 64, the latter being mounted in the stand 65. Said revolving knife co-acts with a stationary blade 66. The revolving blade 63 is adjustably attached to its drum by bolt and slot connections 67 as shown in Fig. 5, while the stationary blade 66 is also adjustable by the adjusting screws 68 and bolts 69. The relative speed of revolution of the revolving knife is also adjustable for the purpose of varying the lengths of cut. For this purpose, the drum 64 carrying the revolving knife is driven from a shaft 70, the latter having fast thereon an expansible pulley 71 which is expanded or contracted by means of the hand-wheel 72. Said expansible pulley 71 is driven by a belt 73 from a pulley 74, said belt 73 having sufficient slack to accommodate variations in size of the pulley 71, and such slack being taken up by a suitable adjustable pressure-roll 75. It is obvious that the expansion and contraction of the pulley 71 will vary the speed of revolution of the knife 63. As the material is cut into lengths, it falls upon an endless conveyer belt 76 and is delivered thereby upon a table 77.

Thus is completed, in a continuous operation, the successive processes of corrugating one or more sheets of paper at a time, running one or more facing sheets as desired, pasting them together, drying the composite sheet or material in transit and while pressing it out flat, and slitting, scoring and cutting the material into desired lengths.

It is understood that the several mechanisms hereinbefore mentioned are positively driven for the purpose of feeding the paper and maintaining the proper relative timing of the mechanisms. Power may be applied by any suitable means and the machine may be driven either in sections, or the machine may as a whole be connected with a single source of driving power, the latter being preferred. For this purpose I have represented suitable driving mechanism shown in elevation in Figs. 9, 10 and 11, and in plan view in Figs. 6, 7 and 8.

In Fig. 9, the numeral 80 denotes a driving shaft from which power is transmitted by a belt 81 to a pulley 82 on a shaft 83, said pulley 82 being preferably loose on said shaft 83 and adapted to be locked therewith by means of any suitable clutch (not shown), which clutch may be operated by a starting lever 84, shown in Figs. 2 and 6.

Referring to the first section of the machine, comprising the corrugating mechanisms, paste-rolls and press-rolls, it will be observed from Figs. 6 and 9 that the shafts of the first set of corrugating rolls 8, 9 and 10 are provided with intermeshing gears 85. The shafts of the second set of corrugating rolls 16, 17 and 18 are similarly provided with intermeshing gears 86. Between the two sets of gears 85, 86, and meshing with one gear of each set, is a large spur 87 on the shaft 83, whereby power is communicated to the two sets of corrugating rolls.

For driving the paste-rolls 21, the upper and lower paste-rolls are driven by chain and sprocket gearing 88 and 89 respectively from the upper and lower corrugating rolls 18 and 12. The middle paste-roll is driven from the upper paste-roll by gears 90 and interposed idler 91. The spreader rolls 24, opposite the paste-rolls 21, are driven by pinions 92 meshing with the gears 90. The press-rolls 30 and 32 are driven by a sprocket chain 93 which is driven by a sprocket-wheel or gear 94 on the shaft of the middle paste-roll, said sprocket-chain engaging gears 95 on the shafts of the press-rolls.

Referring to the endless drying belt or aprons, power is transmitted thereto from the aforesaid shaft 83 (Fig. 9) by a sprocket chain 96 which engages a sprocket-wheel 97 on a stub shaft 98 (Figs. 7 and 10). On the stub shaft 98 is a spur-wheel or gear 99 meshing with a spur-wheel or gear 100 on a subjacent stub shaft 101. The stub shafts 99 and 101 have thereon the spur wheels 42 which engage the endless drying belts at one side of the apparatus. The spur-wheels 42 at the opposite side of the driers are driven by over and under connections as follows: The stub shaft 98 is connected by sprocket and chain gearing 102 with an overhead shaft 103 which extends transversely across the upper drying belt,

and at the opposite side (Fig. 3) said shaft 103 is connected by sprocket and chain gearing 104 with the stub shaft 105 of the spur 42 for the upper drying belt. Similarly, referring to Fig. 10 again, the lower stub-shaft 101 is connected by sprocket and chain gearing 106 with a lower shaft 107 which extends transversely below the under drying belt, and at the opposite side (Fig. 3) said shaft 107 is connected by sprocket and chain gearing 108 with the shaft 109 of the spur 42 for the lower drying belt. It is noted that there are no axial connections between the spurs 42 at the opposite sides of the drying apparatus, this arrangement being necessary in order to permit the flexible hose sections 47 and pipes 44 and 46 to pass between the driving spur-wheels as the drying belts make the turn.

The press-rolls 33, shown in Fig. 3, are, as shown in Fig. 10, provided with intermeshing gears 110 and driven by a sprocket chain 111 from a shaft 112, the latter being driven by a sprocket chain 113 from the shaft 101. The press-rolls 48 behind the drying apparatus (Fig. 4) are likewise provided with intermeshing gears 114, as shown in Fig. 11 and are driven from the shaft 101 (Fig. 10) by chain and sprocket gearing 115. Said shaft 101 (Fig. 10) also communicates power by chain and sprocket gearing 116 to the cutting mechanism shown in Figs. 4 and 8 as follows: The sprocket chain 116 engages a gear or sprocket wheel 117 (Figs. 8 and 11) on the shaft 118. At the opposite end of said shaft 118 is the pulley 74 (Fig. 4) which drives by belt 73 the before mentioned expansible and contractible pulley 71. The shaft 70 of said expansible pulley 71 is (as shown in Figs. 8 and 11) provided with a gear 120 meshing with a gear 121 on the shaft of the revolving knife or cutter 63.

The slitting rolls 52 and 53 (Figs. 4 and 8) have their shafts 56 provided with intermeshing pinions 122 (Figs. 8 and 11) and are driven by a sprocket chain 123 from a pinion on the shaft of one of the gears 114. From the slitting rolls 122 power is communicated by a sprocket chain 124 to the shafts of the scoring rolls 54 and 55, the latter being also provided with intermeshing pinions 125. From the scoring rolls, power is communicated by a sprocket chain 126 to the shaft of the press roll 60.

It is understood that the foregoing description of the drying connections is made only with reference to the illustrated mechanism, since, as aforesaid, power may be supplied to the various parts of the machine by any suitable connections.

The term "paper" as used in this specification and claims is intended to include paper of any appropriate thickness, or paper-board, the several plies of which when assembled to-

gether make the combination board which is the production of this machine.

I claim as my invention and desire to secure by Letters Patent of the United States:

1. In a machine for making paper-board, the combination with a plurality of supply-rolls of paper from which the respective sheets can be unrolled and drawn out in alinement, of a plurality of corrugating mechanisms each arranged to receive and operate upon one of said sheets as it is drawn through the machine, a series of paste-applying rolls or devices over which the said sheets are respectively passed after operation by said corrugating mechanisms, press-rolls arranged to press the several sheets together after application of the paste thereto, and a drier comprising co-acting endless drying-belts arranged to receive the composite material delivered from said press-rolls and to dry the same in transit.

2. The combination of a plurality of corrugating mechanisms, means for running sheets of paper therethrough for corrugating the same, means for running a smooth sheet in alinement with and at one side of the corrugated sheets, a series of paste-rolls arranged for applying paste to corresponding sides of the several sheets, the arrangement being such that said smooth sheet receives its application of paste on its side confronting the corrugated sheets, press-rolls behind said paste-rolls between which the several sheets are drawn, and means for running another smooth sheet through said press-rolls with the other sheets and at the opposite side from the first-mentioned smooth sheet.

3. The combination with a plurality of suitably-mounted supply-rolls of paper from which the respective sheets are drawn out rearward in alinement, the top sheet being run as a smooth sheet, corrugating mechanisms arranged for operating on the other sheets, a series of paste-rolls over which the smooth sheet and corrugated sheets are respectively drawn, press-rolls behind said paste-rolls through which all the sheets are carried, and another smooth sheet arranged for running through said press-rolls with and under the other sheets.

4. In a machine for making paper board, a drier comprising co-acting endless belts or aprons adapted for drying material in transit and while holding the same flat, each belt or apron composed of an endless series of suitably-connected hollow pans or boxes, and means for supplying and exhausting steam or hot fluid to and from said pans or boxes.

5. In a machine for making paper board, a drier comprising co-acting endless drying belts or aprons each composed of a series of flexibly-connected hollow pans or boxes, flexible hose-sections connecting said hollow

5 pans or boxes one with another, supply and exhaust pipes for steam or heating medium each having a flexible pipe-connection with one hollow pan or box; said flexible pipe-connections being of sufficient length to follow the pans or boxes to which they are attached throughout their currents.

6. In a machine for making paper board, a drier comprising co-acting endless drying 10 belts or aprons each composed of a series of flexibly-connected hollow pans or boxes, flexible supply and exhaust pipes for steam or heating medium respectively connected with adjacent pans or boxes and of sufficient 15 length to follow them throughout their course, and flexible hose or pipe-sections connecting said pans or boxes in series, said hose or pipe-sections being arranged alternately at opposite sides of the endless belts, whereby 20 the hollow pans or boxes are connected with each other alternately at opposite ends.

7. In a machine for making paper board, a drier comprising an endless drying-belt or apron composed of flexibly connected hollow 25 pans or boxes to which heat is supplied, said pans or boxes carrying rollers on their opposite ends, and lateral tracks on which said rollers ride for supporting and guiding said belt or apron.

30 8. In a machine for making paper board, a drier comprising an endless drying-belt or apron composed of flexibly connected hollow pans or boxes to which heat is supplied, said pans or boxes carrying rollers on their opposite 35 ends, and lateral tracks on which said rollers ride for supporting and guiding said belt or apron, and driving spur-wheels whose teeth or spurs engage between said rollers.

9. In a machine for making paper board, a drier comprising coacting endless drying 40 belts or aprons composed of flexibly-connected hollow pans or boxes, flexible pipe-connections between said pans, and supply and exhaust pipes for steam or heating medium flexibly connected with the series of 45 pans, driving spur-wheels engaging said belts at opposite sides, the aforesaid flexible pipe-connections passing between the opposite spur-wheels during the travel of the belts, transverse drive-shafts above and below the 50 belts, and lateral driving connections between said shafts and spur-wheels.

10. The combination with co-acting drying belts or aprons between which material is held flat and dried in transit, of positively- 55 driven press-rolls which draw the material from said belts and feed it rearward, and mechanism behind said press-rolls for slitting, scoring and cutting the material into lengths.

11. In a machine for making paper board, 60 the combination with a revolving knife or cutter which strikes or engages the material at intervals, as the material is fed, and cuts the same into lengths, of driving-mechanism therefor comprising a shaft connected with 65 the knife-shaft, and a belt-driven expansible pulley on said first mentioned shaft, whereby adjustment of the size of said pulley will vary the timing of the knife for the purpose of cutting different lengths of material. 70

In testimony whereof I affix my signature, in presence of two witnesses.

ORVILLE H. MOORE.

Witnesses:

ANNIE MOORE,

R. VAN DERWERKER.